Evaluating the Determinants of Innovation Outcome in Information Technology Companies in SEE: The Influence of Interorganizational Relationships and Knowledge Transfer

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

Name:

DANIMIR LJEPAVA

Signed:

Date:

February 2020.

"It always seems impossible until it's done."

Nelson Mandela

"You shouldn't do things differently just because they're different. They need to be... better."

Elon Musk

"*Innovation has nothing to do with how many R&D dollars you have. When Apple came up with the Mac, IBM was spending at least 100 times more on R&D. It's not about money. It's about the people you have, how you're led, and how much you get it.*"

Steve Jobs

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ABSTRACT

Purpose of this study was development of scales to understand impact of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes. Organizational behaviours of KT and IOR are recognized as critical drivers to innovation outcomes in organizations.

Methodology used for development of scales was Act Frequency Approach (AFA), a mixed qualitative-quantitative methodology consisting of three independent field samples with output from each phase leading into the next one - one qualitative (interview data) and two quantitative (survey data), designed for development of behavioural measures in cases when there exists no strong theoretical support, nor there exist previous or comparable measures.

Resulting scales developed consist of 30 organizational behavioural acts measuring positive and negative behaviours of knowledge transfer (KT+, KT-) and positive and negative behaviours of interorganizational relationships (IOR+, IOR-) to innovation outcomes. Findings indicate there exists highly significant positive correlations between positive measures of KT+ and IOR+, and between negative measures of KT- and IOR-. Positive and negative measures between KT+ and KT- and positive and negative measures between IOR+ and IOR- do not seem to be a mirror of each other with no significant correlation between then. Scales were tested through a field research and found to be stable and reliable measures.

Theoretical implication of the study is contribution to development of theoretical models of innovation effectiveness in organizations. Integrated theoretical framework of organizational innovation is extended with mapping the area of knowledge transfer and interorganizational relationships through development of scales measuring organizational behaviours positively (KT+, IOR+) and negatively (KT-, IOR-) influencing innovation outcomes. This has provided understanding of internal organizations' behavioural dynamics with external innovation outcomes. Impact of this is contribution in bridging the theories of process view with the outcome view of innovation. Integrated organizational innovation framework was extended from a single organization view with the external view of an organization innovating in collaboration with other organizations. This research has also uncovered a duality nature of positive and negative behaviours of KT and IOR both co-existing and simultaneously influencing innovation outcomes.

Practical implication of the study is contribution to innovation effectiveness in organization as scales developed through this research can be used to regularly measure and understand positive and negative behaviours of KT and IOR in organizations. Regular assessment of innovation measurements in organizations is important as it influences managers to initiate quicker course corrections and organisational improvements, in turn positively influencing innovation outcome.

Originality of the study is in developing scales measuring influence of KT and IOR organisational behaviours to innovation outcomes as the first scale of its kind in the academic literature. The study contributes to connecting the theories of process view with outcome view of innovation as identified knowledge gap, including a view of duality nature of positive and negative organizational behaviours influencing innovation outcomes. Methodology of the study is also a novel contribution being the first application of AFA methodology in the field of innovation research.

Keywords: innovation effectiveness, measure of knowledge transfer (KT), measure of interorganizational relationships (IOR) to innovation outcomes, duality nature of innovation determinants, negative aspects of innovation.

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ABBREVIATIONS AND ACRONYMS

IM	Innovation Management
IP	Intellectual Property
IT	Information Technology
ICT	Information and Communication Technologies
KM	Knowledge Management
R&D	Research and Development
RBV	Resource Based View
RI	Research Instrument
RQ	Research Questions
CoP	Communities of Practice
SEE	South East Europe
SME	Small and Medium Size Enterprises
GDP	Gross Domestic Product
AFA	Act Frequency Approach (methodology)
KT	Knowledge Transfer
IOR	Interorganizational relationships
KT+	Knowledge transfer positive (behaviours)
KT-	Knowledge transfer negative (behaviours)
IOR+	Interorganizational relationships positive (behaviours)
IOR-	Interorganizational relationships negative (behaviours)
SPSS	Statistical Package for the Social Sciences (software)
ANOVA	Analysis of variance (statistical test)
PCA	Principal Component Analysis (statistical test)
CbA	Cronbach alpha (statistical test)
sig.	Significance
p	Probability
M	Mean
SD	Standard Deviation
F	F-test (statistical test – used to compare models)
r	Range (variance between the highest and lowest value)

1 Introduction

The first chapter sets the tone of this dissertation starting with a background overview of significance of innovation to sustainable competitive advantage and economic growth. Research aims, research objectives and expected outcomes of the study are presented first. Summary of the research gaps and summary of the key literature on theories of innovation, knowledge management and interorganizational relationship is presented next. Methodology how the research gaps were addressed through a filed study is presented followed by contributions to knowledge made and significance of this study. Unique contributions of this study are summarized focusing on its novel approach in connecting internal dynamics of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes and its main contribution development of scales measuring influence of KT and IOR to innovation outcomes. This chapter is concluded with outlining the structure of this thesis.

1.1 Background

Survival in today's hypercompetitive global environment is possible only if companies become dynamic and flexible organizations capable of continuously adapting to the rapidly changing global environment (Iturrioz *et al.*, 2015; Camison and Villar-Lopez, 2014). This transformation is possible through innovation as a key driver of economic growth (Ahram, 2017; Rudra *et al.*, 2017; Forés and Camisón, 2016; EC, 2015; Damanpour and Aravind, 2012; Rubera and Kirca, 2012) and a core microeconomic driver of macroeconomic growth (Rudra *et al.*, 2017; Kung and Schmid, 2015). Companies no longer have a choice if they should innovate or not as the consequence of not innovating is that any company regardless of its size or global origin can compete in the global marketplace and take away non-innovator's market share with a better product or service. As such, non-innovators cannot sustain the pressures of the global competition for prolonged periods of time (Ahram, 2017; Rubera and Kirca, 2012; Fallah and Lechler, 2008).

Innovation is defined as a novel change produced through adoption, assimilation or exploration in business and social spheres (Crossan and Apaydin, 2010). Innovation can take a form of tangible outputs: products, services, business processes and business models, and intangible forms: services and social innovation (Gunday *et al.*, 2011; Yang, 2011; Adams and Hess, 2010; Madsen *et al.*, 2010). Innovation can also be classified as technological and non-technological (Damanpour and Aravind, 2012). Not all innovation is equally novel – researchers (Saridakis *et al.*, 2019) provide a referent view of innovation classifying innovation as a globally novel innovation, novel to the industry\country only, and novel to an organization only. The impact of innovation also varies by its magnitude and it is classified as incremental innovation – introduction of innovation with a minor degree of novelty (e.g. improvements of the existing) and radical (breakthrough or disruptive) innovation – introduction of innovation with a major degree of novelty (Forés and Camisón, 2016; Van Beers and Zand, 2014; O'Connor and Rice, 2013; Sainio *et al.*, 2012; Pavitt, and Bessant, 2011).

Understanding the phenomenon of innovation is not an easy task, as innovation is an abstract and a multidimensional concept (Khosravi *et al.*, 2019; Saunila, 2017b; Černe *et al.*, 2016; Damanpour and Aravind, 2012; Crossan and Apaydin, 2010; Van de Ven *et al.*, 2007; Anderson *et al.*, 2004). Academic knowledge is siloed in observing innovation from multiple viewpoints – outcome view, process view and determinants view, and there does not seem to exist a consolidated theoretical framework of innovation connecting the separate theoretical facets together (Khosravi *et al.*, 2019; Saunila 2017b; Crossan and Apaydin, 2010; Xu *et al.*, 2007). Research indicates that innovation, although an abstract concept can be a managed organizational process (Albats *et al.*, 2019; Geissdoerfer *et al.*, 2016; Camison and Villar-Lopez, 2014; Damanpour and Aravind, 2012; Dervitsiotis, 2010; Desouza *et al.*, 2009; Fallah and Lechler, 2008; Mrinalini and Nath, 2008; Hansen and Birkinshaw, 2007). Innovation management represents a system that organizations need to implement in order to be able to manage innovation as a continuous process for delivery of innovative products and services (Khosravi *et al.*, 2019; Cerne *et al.*, 2016; Nieves, 2016; Desouza *et al.*, 2009; Gold, 2009; Pollard, 2009). Perhaps one of the most relevant understandings to innovation effectiveness today is that organizational knowledge and organizational learning, i.e. creating new knowledge, are one of the most crucial factors attributable to innovation performance (Khosravi *et al.*, 2019; Damanpour and Aravind, 2012; Alipour and Karimi, 2011; Crossan and Apaydin, 2010; Madsen *et al.*, 2010; Lichtenthaler, 2011; Zhang *et al.*, 2010; Flynn, 2008; Liao *et al.*, 2007; Murray and O'Mahony, 2007; Prajogo, 2006; Tether, 2005; Nonaka *et al.*, 2001). In order to study and better understand innovation effectiveness, one should observe how new knowledge is created through knowledge transfer (KT) in organizations (Aggarwal and Madhavi, 2018; Park *et al.*, 2015; Lichtenthaler *et al.*, 2010; Palmatier *et al.*, 2007; Davis and Eisenhardt, 2007; Faems *et al.,* 2005; Nonaka, 1994).

Understanding innovation effectiveness through an empirical example perhaps cloud be best observed through IT service companies, out of which a major fraction are software companies, as they are found to generate most of the innovation at an ever-increasing pace affecting every industry (Ahram, 2017; Rudra *et al.*, 2017; Edison *et al.*, 2013). OECD[1] (EC, 2015) estimates that investment in innovation, such is software and R&D in high growth economies accounts for 60-70% of labour growth. In 25 countries of EU the service sector was found to be one of the most important contributors to GDP (Petrescu, 2011). Service sector, with innovation in software as its major

[1] OECD - Organisation for Economic Co-operation and Development with 36-member countries

component was found globally to be a major contributor to GDP (Rudra *et al.*, 2017; Kung and Schmid, 2015; Burgess, 2011) and with a more accelerated economic growth compared to the manufacturing sector (Santacreu and Zhu, 2018). Nevertheless, it seems that a single software company can only do so much innovating by itself and competing in the global marketplace (McManus and Ardley, 2019). Majority of software products today are composed of components contributed by many providers. It is very unusual for a new software development to start from scratch as this would be economically unfeasible in terms of time, expertise, human resources and the investment standpoint. Instead, most of software developments starts by integrating reusable software components (Barros-Justo, 2019; Subramanyam *et al.*, 2012; Mohagheghi and Conradi, 2007) and building on top of the existing tools and readily available commercial, or open source software (Barros-Justo, 2019; Casadesus-Masanell and Llanes, 2015). There are examples of commercial enterprises such is Microsoft investing considerable amounts of free software to the open source domain as they believe such investment would propel others to build on top of it, in turn producing innovation that could not be attained by a single company only, even of such size (Casadesus-Masanell and Llanes, 2015). Reusing software components provides companies with a better predictability and planning of new development efforts (Mohagheghi and Conradi, 2007). Examples of important interorganizational collaboration between IT companies resulting in significant innovation is for example case of Microsoft and Intel partnering together and creating a joint “Wintel” platform consisting of Windows operating system running on Intel processors, in turn resulting in capturing 80% of the PC market at the beginning of this century (Casadesus-Masanell and Yoffie, 2007). In addition, Apple could have not created iPhone without strategic interorganizational partnerships with Qualcomm and Broadcom enabling features such are GSM/GPS/Wi-Fi/Bluetooth capabilities for the iPhone (Lashinsky, 2012). Since the year 2000 and onwards there has been an explosion of interorganizational partnerships with scholars only starting to understand this area (Davis, 2016; de Faria and Lima, 2012).

Companies form interorganizational relationships (IOR) for the pursuit of efficiency as its main motivator – i.e. organizations partner with others when it is more efficient for them to conduct an activity through a partner relationship rather on its own, or through the marketplace (Parmigiani and Rivera-Santos, 2011). Academic literature is increasingly recognizing that successful innovation performance relies on further extending links to sources of knowledge transcending boundaries of a single organization, applying such knowledge for innovation purposes, and continuing cooperation with external organizations (Kim *et al.*, 2016). Companies who seek knowledge outside of its organizational boundaries are more likely to have a much broader knowledgebase compared to companies who seek knowledge only within own organizational boundaries. Access to a broader knowledgebase, resources and collaborative interorganizational relationships (IOR) with external entities, typically consisting of interorganizational knowledge transfer, result in increased innovation performance (Wang and Lam, 2019; Dolińska, 2015; Hohberger *et al.*, 2015; Lichtenthaler *et al.*, 2010; Phelps, 2010; Bergman and Maier, 2009; Van Wijk *et al.*, 2008; Palmatier *et al.*, 2007). Academic knowledge on influence of interorganizational relationships to innovation effectiveness seems to be lacking a consolidated multi-theoretical framework (Wang and Lam, 2019; Parmigiani and Rivera-Santos, 2011; Crossan and Apaydin, 2010; Davis, 2009; Lichtenthaler *et al.*, 2010).

Academic knowledge and empirical evidence seem to suggest that in order to understand innovation effectiveness in organizations, perhaps some of the most critical determinants of innovation outcome to understand are new knowledge creation through knowledge transfer (KT) as it was found to positively influence innovation performance (Khosravi *et al.*, 2019; Alipour and Karimi, 2011; Crossan and Apaydin, 2010; Madsen *et al.*, 2010; Lichtenthaler, 2011; Zhang *et al.*, 2010), and also interorganizational relationships (IOR) as companies collaborating together having access to a broader knowledge and resources are found to positively influence innovation performance (Wang and Lam, 2019; Dolińska, 2015; Parmigiani and Rivera-Santos, 2011; Lichtenthaler *et al.*, 2010; Phelps, 2010). Connection between these two areas (KT and IOR) seem to be underdeveloped in the academic literature, with no consolidated frameworks or measures on influence of KT and IOR to innovation outcomes.

Conducting an empirical field study on influence of KT and IOR to innovation outcomes is perhaps best suited and relevant on software companies in the region of SEE because this region is on a growth path fuelled predominantly by adoption of globally novel innovation and intensive knowledge transfer and collaboration between local firms and foreign providers of technology (Aggarwal and Madhavi, 2018; Edison *et al.*, 2013; Madsen *et al.*, 2010). Cooperation between SEE software firms and foreign companies able to transfer globally novel software technology and knowledge is necessary in order for companies in SEE to achieve a more successful and impactful innovation outcome novel in SEE through intensive knowledge transfer, combining and utilizing knowledge and other resources from external organizations and entities (Aggarwal and Madhavi, 2018; Park *et al.*, 2015; Fallah and Lechler, 2008; Mrinalini and Nath, 2008; Goyal and Pitt, 2007). There exist examples of global innovation being developed through multinational development centres present in satellite R&D offices, such is SEE (Blit, 2018). Most of the innovation activities and most of the dynamic changes are found to be in the software industry noting that these changes are affecting all other industries (Ahram, 2017; Rudra *et al.*, 2017). SEE is a relatively under-researched part of the world economy which is quite representative of middle-income economies (World Bank, 2013), which in turn has a key role in the world's economy.

1.2 Research Aims

The aim of this research was to contribute to theoretical frameworks of innovation effectiveness through connecting internal dynamics of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes. KT and IOR were recognized as one of the most critical factors influencing innovation performance. The main aim of this study was to:

- **Develop scales measuring influence of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes.**

The scales were developed on a target sample of software companies operating in the region of Southern Eastern Europe (SEE) believed to be the most appropriate for this study. Software companies are recognized to generate most of the innovation at an ever-increasing pace and are affecting every industry (Ahram, 2017; Edison *et al.*, 2013; Davis and Eisenhardt, 2007). Software development in SEE is believed to be knowledge intensive as it is fuelled by transfer of knowledge and technologies from global organizations to SEE resulting in high levels of innovation activity (Aggarwal and Madhavi, 2018; Park *et al.*, 2015; Edison *et al.*, 2013; Madsen *et al.*, 2010). SEE is quite representative of middle-income economies (World Bank, 2013), which in turn has a key role in the world's economy.

1.3 Research Objectives

The following research objectives have been devised to be addressed by this research:

i. **Explore concepts of KT and IOR through innovation outcomes**
ii. **Develop KT and IOR scales to innovation outcomes**
iii. **Test the validity and reliability of the KT and IOR scales developed**
iv. **Analyse relationships between KT and IOR to innovation outcome, and in accordance with the research gaps identified**
v. **Understand individual behaviours in organizations to help facilitate models of innovation effectiveness.**

These research objectives are restated in Chapter V - Conclusions providing detailed information on how these research objectives were addressed through this study.

1.4 Expected Outcomes

This study is expected to develop measures of positive and negative behaviours of knowledge transfer (KT+, KT-) and measures of positive and negative behaviours of interorganizational relationships (IOR+, IOR-) to innovation outcomes as the first attempt of its kind in the innovation literature. The measure is expected to help facilitate models of innovation effectiveness through connecting and mapping the area of influence of organizational behaviours of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes. This understanding will indicate which behaviours of KT and IOR positively and negatively influence innovation outcomes as regulators of the internal organization dynamics driving the innovation outcome.

Through utilizing a novel methodological approach in the first application of Act Frequency Approach (AFA) in the field of innovation research, this study is expected to provide novel insights in the field of innovation research.

As this research connects internal procedural view of innovation through measuring internal organizational dynamics of KT and IOR with external outcomes of innovation, it is expected that this study will help bridge siloed theoretical views of innovation as a process and innovation as an outcome. Further, this study is also expected to help facilitate models of innovation effectiveness through extending the theoretical innovation system of Dervitsiotis (2010).

While it is important for practitioners to understand what works for innovation, it is also important to understand what does not work for innovation as underdeveloped area in innovation literature. Through developing negative measures of KT- and IOR- it is expected that this study provides insights on factors negatively influencing innovation outcome.

Finally, this study is expected to provide insights into innovation activities in SEE and contribute to understanding of influence of knowledge transfer and interorganizational relationships between SEE and the rest of the world.

1.5 Key Research Gaps Identified

Key research gaps identified have provided research opportunities that have been addressed through this study. Theoretical gaps also indicate why it is important to further research and understand these gaps to the field of innovation. Summary of the identified theoretical gaps and research opportunities addressed through this study is provided in Table 1.

Theoretical gaps		Research opportunities (addressed by this study)
▪ Knowledge transfer (KT) was found to be one the most critical factors to creation of new organizational knowledge (Khosravi *et al.*, 2019; Aggarwal and Madhavi, 2018; Park *et al.*, 2015) influencing organizational learning and therefore innovation performance (Khosravi *et al.*, 2019; Damanpour and Aravind, 2012; Alipour and Karimi, 2011; Crossan and Apaydin, 2010). The size of organization and the organizational resources available to innovation was also found to be one of the most critical factors influencing innovation performance (Khosravi *et al.*, 2019; Ford and Paladino, 2013; Bueno *et al.*, 2010). Access to a broader knowledgebase and larger organizational resources beyond a single organization is possible through collaboration with other organizations resulting in increased innovation performance (Wang and Lam, 2019; Dolińska, 2015; Hohberger *et al.*, 2015; Lichtenthaler *et al.*, 2010; Phelps; Parmigiani and Rivera-Santos, 2011). Knowledge transfer between organizations is mediated through interorganizational knowledge transfer (Chen *et al.*, 2014; Phelps, 2010; Van Wijk *et al.*, 2008). Collaboration between organizations is mediated through interorganizational relationships (IOR) as drivers of innovation performance (Davis, 2016; de Faria and Lima, 2012). Literature indicates that KT and IOR seem to be one of the most critical factors moderating the innovation process (Dervitsiotis, 2010). Understanding KT and IOR to innovation outcomes in the context of interorganizational collaboration provides further insights into models of innovation effectiveness and expands the view of innovation dynamics beyond a single organization. ▪ Further, connection between the innovation process governing internal organizational dynamics and innovation outcomes seems important to understand as they are dependent upon each other – the process of how innovation is developed is related to the outcome of innovation (Lee *et al.*, 2019; Saunila, 2017a; Janssen *et al.*, 2011; Crossan and Apaydin, 2010). However, innovation process models (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Geissdoerfer *et al.,* 2016) reviewed observe innovation as an internal organizational process connecting them with determinants and regulating moderators, however without clearly connecting them with outcome view of innovation. Understanding KT and IOR as moderators of innovation process to innovation outcomes bridges gaps across the boundaries of academic knowledge between the process view and outcome view of innovation.	→	**Develop scales measuring positive and negative organizational behaviours of KT and IOR influencing innovation outcomes.**

▪ In addition, individual human behaviours are linked to organizational behaviours and can be used to map organizational behaviours (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Cinite *et al.*, 2009; Hodgson, 2002;). Developing measures of KT and IOR to innovation outcomes using behavioural methodology of AFA – Act Frequency Approach (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Tucker and Turner, 2010; Cinite *et al.*, 2009; Ivcevic and Mayer, 2009; Szamosi and Duxbury, 2002; Buss and Craik, 1984) is likely to provide novel theoretical perspectives (Wahyun, 2012; DeLuca *et al.*, 2008; Buelens *et al.*, 2008) in the field of innovation research.	
▪ Innovation effectiveness is better measured through integration of separated theoretical facets (Saunila, 2017a; Janssen *et al.*, 2011). Understanding relationships between KT and IOR moderating the innovation process, and outcome view of innovation is contributing to models of innovation effectiveness. ▪ Understanding positive influences (positive measures of KT and IOR) to innovation performance, along with negative influences (negative measures of KT and IOR), can contribute to integrated and holistic view of innovation (Anderson *et al.*, 2014) and to models of innovation effectiveness. ▪ Understanding negative influences to innovation performance is important as applied novelty can also produce a neutral or even negative (unwanted) value to an organization (Rosenbusch *et al.*, 2011; Lloyd, 2006). This contributes to models of innovation effectiveness and can help managers focus on mitigating and removing factors negatively influencing innovation performance. ▪ Understanding if there exist differences between positive and negative influencing innovation outcomes could provide novel insights into the literature. Understanding if innovation can be moderated and managed separately for behaviours positively and behaviours negatively influencing innovation outcomes would contributes to development of models of innovation effectiveness.	→ **Understand relationships between KT and IOR.**
▪ Developing countries in SEE are on one hand on a growth path are fuelled predominantly by adoption of globally novel innovation and intensive knowledge transfer and collaboration between local firms and foreign providers of technology (Aggarwal and Madhavi, 2018; Edison *et al.*, 2013; Madsen *et al.*, 2010). On the other hand, there exist examples of global innovation being developed through multinational development centres present in satellite R&D offices (Blit, 2018). Understanding interorganizational collaboration and transfer of technology between developed and developing countries will provide novel insights to understanding of adaptation of global innovation in developing countries (Madsen *et al.*, 2010), and understanding of global innovation produced in developing countries (Blit, 2018).	→ **Understand interorganizational collaboration and transfer of knowledge between developed and developing countries.**

Table 1 – Identified knowledge gaps and proposes approach to address the gaps

1.6 Literature Overview

This section provides a snapshot of the relevant innovation theories to prepare the reader for the next sections staring first with definitions adopted by this study and followed by theoretical synthesis of relevant innovation theories from which theoretical gaps of this study emerged.

1.6.1 Definitions Adopted by This Study

To set the stage for this study and further reading, the following definitions were adopted from the literature review by this study:

- **Definition of innovation:** Application of invention to the realm of an organization in the form of technological or organizational change to provide a positive change to the organization through application of new or existing knowledge across knowledge networks, resulting in the competitive advantage for the organization (De Bassi *et al.*, 2017; Ukko and Saunila, 2013; Madsen *et al.*, 2010; Dervitsiotis, 2010; Van de Ven *et al.*, 2007).

- **Definition of innovation outcomes**: Innovation outcome in organizations can be viewed as tangible and intangible outputs taking form of technological innovation, product innovation, process innovation and marketing innovation whose magnitude could be incremental and radical with novelty levels at the firm, regional or global level (Khosravi *et al.*, 2019; Saunila, 2017b Yang, 2011; Madsen *et al.*, 2010; Gunday *et al.*, 2011; Crossan and Apaydin, 2010).

- **Definition of knowledge transfer (KT):** Knowledge sharing in which organization leverages information assets from various external organizations and learns from the experience of other organizations. (Chen *et al.*, 2014; Easterby-Smith *et al.*, 2008)

- **Definition of interorganizational relationships (IOR):** Strategic cooperative relationship between organization and other external organizations to share and exchange resources for the purpose of improved business performance. (Parmigiani and Rivera-Santos, 2011; Bergman and Maier, 2009)

1.6.2 THEORETICAL VIEWS OF INNOVATION

Innovation is an abstract and a multidimensional concept (Khosravi *et al.*, 2019; Saunila, 2017b; Černe *et al.*, 2016; Damanpour and Aravind, 2012; Crossan and Apaydin, 2010; Van de Ven *et al.*, 2007; Anderson *et al.*, 2004). Theoretical views of innovation are siloed and studied from the following perspectives (Janssen *et al.*, 2011; Saunila, 2017a):

- **Outcome** view of innovation,
- **Process** view of innovation, and
- **Determinants** view of innovation.

Innovation as an **outcome** is observing the outputs of innovation produced (Madsen *et al.*, 2010; Dervitsiotis, 2010; Van de Ven *et al.*, 2007; Narvekar and Jain, 2006; Lloyd, 2006) and innovation as a **process** is observing the process of how innovation was produced (Albats *et al.*, 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2011; Dervitsiotis, 2010; Desouza *et al.*, 2009; Fallah and Lechler, 2008; Hansen and Birkinshaw, 2007). Innovation process and innovation outcome are dependent upon each other as process of how innovation is developed is related to the outcome of innovation – what was actually developed (Lee *et al.*, 2019; Saunila, 2017a; Janssen *et al.*, 2011; Crossan and Apaydin, 2010). **Determinants** of innovation describe factors influencing innovation outcomes (Khosravi *et al.*, 2019; Crossan and Apaydin, 2010; Smith, 2008; Adams *et al.*, 2006).

There does not seem to exist a consolidated theoretical framework of innovation connecting these separate theoretical facets together (Khosravi *et al.*, 2019; Saunila 2017b; Crossan and Apaydin, 2010; Xu *et al.*, 2007). Research indicates that innovation, although an abstract concept can be a managed organizational process (Albats *et al.*, 2019; Geissdoerfer *et al.*, 2016; Camison and Villar-Lopez, 2014; Damanpour and Aravind, 2012; Dervitsiotis, 2010; Desouza *et al.*, 2009; Fallah and Lechler, 2008; Mrinalini and Nath, 2008; Hansen and Birkinshaw, 2007). This managed organizational process, also known as innovation management, represents a system that organizations need to implement in order to be able to manage innovation as a continuous process for delivery of innovative products and services (Khosravi *et al.*, 2019; Cerne *et al.*, 2016; Nieves, 2016; Desouza *et al.*, 2009; Gold, 2009; Pollard, 2009).

1.6.3 KT AND IOR AS MAJOR DETERMINANTS OF INNOVATION EFFECTIVENESS

Determinants of innovation effectiveness clearly standing out in the literature are knowledge management and organizational size (Khosravi *et al.*, 2019; Saunila, 2017b). Knowledge management seems to be at the core of innovation theories as one of the most critical and major drivers of new knowledge generation and hence innovation. New organizational knowledge creation occurs through knowledge transfer (KT) and it positively influence innovation performance (Khosravi *et al.*, 2019; Alipour and Karimi, 2011; Crossan and Apaydin, 2010; Madsen *et al.*, 2010; Lichtenthaler, 2011; Zhang *et al.*, 2010). Access to a broader knowledgebase positively influence innovation performance (Wang and Lam, 2019; Kim *et al.*, 2016; Dolińska, 2015; Hohberger *et al.*, 2015; Lichtenthaler *et al.*, 2010). Extending the knowledgebase access beyond a single organization is possible through interorganizational knowledge transfer with external organizations, and therefore learning from their experiences provides new knowledge that was previously not available within the organization itself (Wang and Lam, 2019; Kim *et al.*, 2016; Dolińska, 2015; Hohberger *et al.*, 2015; Chen *et al.*, 2014; Lichtenthaler *et al.*, 2010; Easterby-Smith *et al.*, 2008). Fundamental aspect of innovation is "*making novel linkages and associations*" in knowledge creation and further extending such linkages to transcend boundaries of a single organization (Kim *et al.*, 2016). Academic literature is increasingly recognizing that successful innovation performance relies on making links with external source of knowledge, transferring and using such knowledge for innovation purpose, and perhaps continuing cooperation with external sources of knowledge. Interorganizational knowledge transfer denotes organizations seeking expertise beyond their corporate boundaries, even outside of national or regional boundaries, as such it is very important for innovation and competitive advantage (Zhou *et al.*, 2019; Kim *et al.*, 2016; Chen *et al.*, 2014; Lichtenthaler *et al.*, 2010; Huggins and Johnston, 2009).

Organizational size is recognized in the literature as one of the major determinants influencing innovation outcomes as its role is in the size of resources available for innovation, which in turn has a positive effect on innovation performance (Khosravi *et al.*, 2019; Forés and Camisón, 2016). Innovation performance in organizations seems to be in a positive relationship with availability of physical and financial resources to an organization (Ford and Paladino, 2013; Paladino, 2007; Atuahene-Gima *et al.*, 2005). Resources and organizational capacity to innovate are closely interlinked to each other and appear critical for the success of innovation in organizations (Albats *et al.*, 2019; Sok and O'Cass, 2011). Organizations seeking to improve organizational capacity to innovate are dependent resources whose availability positively drives organization's capacity to innovate and hence innovation performance and new product development (Santa *et al.*, 2019).

Extending access to resources beyond a single organization is possible through interorganizational collaboration with external organizations. In support, access to broader range of resources through external organizations was found to positively influence innovation performance (Wang and Lam, 2019; Dolińska, 2015; Parmigiani and Rivera-Santos, 2011; Lichtenthaler *et al.*, 2010; Phelps, 2010). In this context, organization working with external organizations and leveraging external knowledge and resources can be observed as an extended organization (Andersen and Drejer, 2008). This effectively can be viewed as an organization enlarging its size and knowledge through partnering and working with external organizations.

It therefore seems that in order expand its access to knowledge base, and to expand its resources, both found to positively influence innovation performance, organizations need to collaborate with external organisations. Fundamental to success of such collaboration are interorganizational relationships (IOR) defined as strategic cooperative relationship between organization and other external organizations to share and exchange resources for the purpose of improved business performance (Parmigiani and Rivera-Santos, 2011; Bergman and Maier, 2009). Companies form relationships for the pursuit of efficiency as its main motivator – i.e. organizations partner with others when it is more efficient for them to conduct an activity through a partner rather on its own, or through the marketplace (Parmigiani and Rivera-Santos, 2011). Number of interorganizational relationships with external organizations is positively linked with success of interorganizational knowledge transfer (Van Wijk *et al.*, 2008). Stronger the social interactions are between organizations, stronger are interorganizational relationships and positive influence to innovation performance (Najafi-Tavani *et al.*, 2012).

It therefore emerges from the literature that knowledge transfer (KT) and interorganizational relationships (IOR) in the context of extended organization innovating with other external organizations are perhaps the two most critical determinants of innovation outcomes. Fragmented view of innovation effectiveness in literature seems to be underdeveloped on connections between KR and IOR, with no consolidated frameworks or measures on influence of KT and IOR to innovation outcomes. Understanding KT and IOR to innovation outcomes in the context of interorganizational collaboration provides further insights into models of innovation effectiveness and expands theoretical views of organizational innovation dynamics beyond a single organization. As such, developing a measure of KT and IOR to innovation outcomes as the main objective of this study is addressing this literature gap as the first attempt of its kind in the academic literature.

1.6.4 INTEGRATED FRAMEWORKS OF INNOVATION

Reviewed integrated frameworks of innovation in the literature (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Geissdoerfer *et al.,* 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007) observe innovation as an internal organizational process. Observing innovation as an organizational process is perhaps one of the most represented theoretical viewpoints in the academic literature describing a value-adding transformation process between components of the innovation system (Albats *et al.*, 2019; Boukamel *et al.,* 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007; Sirkin, 2007; O'Connor and DeMartino, 2006; Stalk 2006). The synthesised view of components representing the *innovation value chain* from reviewed innovation frameworks (Albats *et al.*, 2019; Boukamel *et al.,* 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007) is comprised of the following links:

1) **Idea generation and capture** (search, discovery, creation, capture)
2) **Project selection** (conversion of ideas to projects)
3) **Innovation development** (project development and implementation)
4) **Taking to markets** (diffusion - dissemination and commercialization of innovative products and services in the marketplace; capturing economic benefits)

Each of the links in the innovation process adds an innovation value into the system until the outcome of innovation is produced and its recognized as organizational value captured (Albats *et al.*, 2019; Boukamel *et al.,* 2019). To evaluate capacity of an organization to innovate, the innovation value adding capacity of each link within the innovation value chain needs be evaluated to understand the strongest and weakest links. By focusing on improving the weakest link within the innovation value chain the organization's capacity to innovate is most likely to increase (Santa *et al.*, 2019).

Several models (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Geissdoerfer *et al.,* 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007) denote connection with external organizations collaborating on innovation indicating importance of extended innovation network supporting the view of importance of an organization collaborating with external organizations in pursuit of innovation effectiveness. Unlike other models, Albats *et al.* (2019) extends the influence of KT and IOR as moderators of the innovation process to all chains of the process. They also extend the knowledge-based approach in implementation and capturing commercial benefits with external expertise and resources obtained through a network of companies. This is in line with theories of interorganizational knowledge transfer (Wang and Lam, 2019; Dolińska, 2015; Lichtenthaler *et al.*, 2010) and interorganizational relationships as drivers of innovation performance (Davis, 2016; de Faria and Lima, 2012).

Albats *et al.* (2019) innovation framework also connects the first stage of idea generation with triggers arguing there has exist a trigger initiating the innovation process. Researchers argue these triggers can be either internal – team's ideas, intelligence, entrepreneurial ideas and external – market demand, market opportunities, and market turbulence. Both internal and external triggers of innovation are connected with knowledge exchange, either internal or external required as an input to the innovation process. This is aligned with market-oriented and resource-oriented view of innovation (Albats *et al.*, 2019; Chang *et al.*, 2014; Ford and Paladino, 2013; Janssen *et al.*, 2011) and knowledge transfer as one of the main drivers of innovation (Wang and Lam, 2019; Dolińska, 2015; Alipour and Karimi, 2011). Once innovation process has been triggered, companies are selecting which projects to work on and proceed with concept development in an agile manner. This approach is aligned with the modern software development methodologies based on agile software delivery with short development lifecycles based on rapid prototyping and validating models before investing further in development (Scrum.org, 2017; Stray *et al.*, 2016).

Geissdoerfer *et al.* (2016) innovation framework expands the innovation process by further detailing the idea generation link to innovation concept design and detailing the conversion (project selection) link to a detailed design of innovative product. Concept design has two sub-categories: concept design and virtual prototyping with the goal of rapid prototyping and a fast delivery of proof of concept. Detailed design has three sub-categories: experimenting, detailed design and piloting with the purpose of developing an innovation in an agile manner and piloting it in the marketplace as soon as possible. This approach is aligned with the modern software development methodologies based on agile software delivery with short development lifecycles based on rapid prototyping and validating models before investing further in development (Scrum.org, 2017; Stray *et al.*, 2016). This approach is believed to be more effective in saving time and investments as with a working prototype early on and testing it in the marketplace, a quicker feedback on the product adoption by the market and any needs to adjust the product is obtained before deciding to invest in a full-scale product.

Innovation frameworks of Albats *et al.* (2019); Geissdoerfer *et al.* (2016) and Hansen and Birkinshaw (2007) observe innovation as an internal organizational process connecting it with determinants and regulating moderators, however without clearly connecting them with outcome view of innovation. Understanding connection between the innovation process governing internal organizational dynamics and innovation outcomes is important as they are dependent upon each other – the process of how innovation is developed is related to the outcome of innovation (Lee *et al.*, 2019; Saunila, 2017a; Janssen *et al.*, 2011; Crossan and Apaydin, 2010). This emerges as one of the gaps in the academic literature.

Dervitsiotis (2010) innovation model is perhaps the most comprehensive integration of various theoretical facets in a single model, shown in Figure 1 (extended with knowledge gap of understanding KT and IOR to innovation outcomes, as identified by this study). This model, similar to other models (Albats *et al.*, 2019; Geissdoerfer *et al.*, 2016 and Hansen and Birkinshaw, 2007) describes the internal process of innovation consisting of idea generation and capture, project selection, innovation development and taking innovation to the market. Outcome view of innovation is shown with outputs (products/services) and business value consisting of value and cost. As such, this model provides an opportunity to connect process with outcome view of innovation.

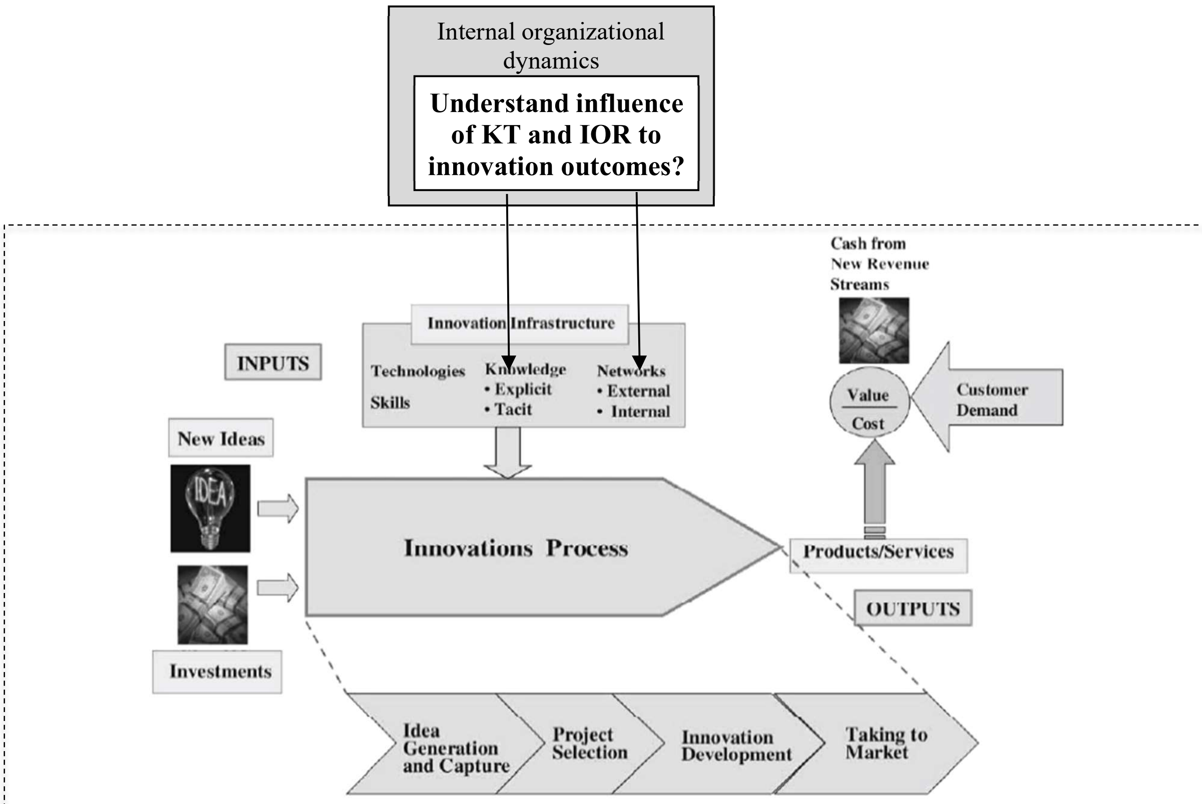

Figure 1 - Innovation System (Dervitsiotis, 2010) – extended with KT and IOR contribution of this research

The model also integrates a market-based view of innovation feeding customer demand as a regulator of innovation's performance, which is in alignment with market-based drivers of innovation (Albats *et al.*, 2019; Chang *et al.*, 2014; Ford and Paladino, 2013; Janssen *et al.*, 2011; Nylund, 2008; Palmatier *et al.*, 2007). Determinants and regulating moderators of innovation process shown in Dervitsiotis (2010) model are shown as innovation infrastructure – resources needed (technologies and skills), knowledge (tacit and explicit - KT), access to networks (internal and external - IORs) and open and closed locus of the innovation process. This is in alignment with theories arguing that KT is one of the main drivers of innovation (Wang and Lam, 2019; Dolińska, 2015; Alipour and Karimi, 2011), along with IOR (in case of this model, these are external networks), as companies collaborating together have access to a broader knowledge and resources which are found to positively influence innovation performance (Wang and Lam, 2019; Dolińska, 2015; Parmigiani and Rivera-Santos, 2011; Lichtenthaler *et al.*, 2010).

As emerged literature gaps indicate that knowledge transfer (KT) and interorganizational relationships (IOR) in the context of extended organization innovating with other external organizations are perhaps the two most critical determinants of innovation outcomes, plugging in the findings of this study through extending Dervitsiotis (2010) model with appropriate discussion is outlined in chapter V – Findings of this study. Further, through understanding KT and IOR (as regulators of innovation process) to innovation outcomes in the context of interorganizational collaboration, it would be possible to connect the theoretical facets of process and outcome view of innovation and provide further insights into models of innovation effectiveness. In addition, this will help expands theoretical views of organizational innovation dynamics beyond a single organization to a group of organizations collaborating on innovation.

1.7 Methodology Approach

This research has successfully applied AFA (Act Frequency Approach) – a mixed qualitative and quantitative methodology used in behavioural research as the first application of this methodology in the field of innovation research. Methodology consists of three field research phases (one qualitative and two quantitative) with output of each phase leading as an input to the next phase. Application of AFA methodology in the field of innovation research represents a novel and unique methodological contribution of this study.

1.7.1 Justification of using AFA methodology

Application of AFA methodology in this study was the most appropriate for the following reasons: First, AFA was designed for exploratory research of behaviours and development of behavioural measures in cases when there exists no strong theoretical support for an abstract construct, nor comparable earlier measures, which is the case of this study. The aim of this study was to understand influence of KT and IOR to innovation outcomes indicating exploratory nature of the study. There exist no earlier measures of KT and IOR to innovation outcomes in the present literature. Innovation is an abstract and multidimensional concept with literature yet remaining underdeveloped (Khosravi *et al.*, 2019; Saunila, 2017b; Crossan and Apaydin, 2010; Xu *et al.*, 2007) and segmented into measuring inputs, processes, outputs and outcomes (Janssen *et al.*, 2011) lacking a consolidated view and a research direction (Saunila, 2017a). This indicates lack of strong theoretical support, no earlier measure of a kind, and exploratory research indicating AFA as an appropriate methodology. Second, AFA seems to be a mature and proven methodology in the field of behavioural research. AFA was successfully used and adopted by researchers in the field of behavioural research for the past thirty years (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Reif, 2012; Schimmack, 2010; Tucker and Turner, 2010; Cinite *et al.*, 2009) since its original development by Buss and Craik (1980, 1981, 1983a, 1983b, 1983c, 1984). Third, innovation literatures views innovation as an abstract and multidimensional construct, arguing it should be studied through a multi-methodology approach (Khosravi *et al.*, 2019; Saunila, 2017b; Damanpour and Aravind, 2012; Crossan and Apaydin, 2010; Xu *et al.*, 2007). AFA is a multi-methodology (qualitative and quantitative) and it is in line with the philosophical stance of pragmatism adopted by this study, allowing for a mixed use of epistemology, ontology and axiology. This approach allows a better understanding of complexities of the social reality through observing both subjective and objective on a continuum and not as mutually exclusive (Bryman, 2012; Wahyun, 2012; Saunders *et al.* 2009). Research (Wahyun, 2012) indicates that utilization of multi-methodologies provides a greater validity of the researched, with a better potential to provide new research insights. Fourth, as this study is exploratory, other confirmatory methodologies that could perhaps be used for development of measure, for example CFA or SEM, do not seem the most suitable for this study, as the aim of this study was to understand, therefore explore the influence of KT and IOR to innovation outcomes, and not to confirm the measure's validity. In comparison, CFA or SEM could be used to predict outcomes, however objective of this study was not to predict, but to understand more. In case that objective of this study was to confirm the measure, then CFA or SEM could be used, which is noted as a future research opportunity in Chapter V – Conclusions of this study. In support, Cinite *et al.* (2009) have successfully used AFA as an exploratory methodology to develop a new measure in cases where no previous or comparable measures existed, and without a strong theoretical support. Following the measure development using AFA, these researchers have used SEM methodology to further test validity of the measure. Fifth, as unique contribution of this study is the first application of AFA in the field of innovation research, proceeding with a novel methodology was appropriate as research indicates that when a novel methodology is applied to a new field of study, it is likely to provide new perspectives and novel insights (Wahyun, 2012; DeLuca *et al.*, 2008; Buelens *et al.*, 2008).

1.7.2 Target Sample

The target sample of this research were highly skilled individuals working on producing innovative software in companies located in the geopolitical region of South-eastern Europe (SEE) surrounding the Balkan Peninsula (Aspridis, 2012), consisting of the following countries: Bulgaria, Greece, Romania, Slovenia, Albania, Bosnia and Herzegovina, Croatia, North Macedonia, Serbia and

Montenegro. Targeting software companies seems to be the most appropriate as majority of innovation activities and dynamic changes are found to be in the software industry affecting all other industries (Ahram, 2017; Rudra *et al.*, 2017). Conducting an empirical field study on companies in the region of SEE is perhaps best suited and relevant as this region is on a growth path fuelled predominantly by adoption of globally novel innovation and intensive knowledge transfer and collaboration between local firms and foreign providers of technology (Aggarwal and Madhavi, 2018; Edison *et al.*, 2013; Madsen *et al.*, 2010). Such cooperation on innovation between developed and developing countries indicates a need for foreign companies to transfer technology and knowledge, and utilization of such knowledge and other resources from external organizations and entities (Aggarwal and Madhavi, 2018; Park *et al.*, 2015; Fallah and Lechler, 2008; Mrinalini and Nath, 2008; Goyal and Pitt, 2007). This indicates that innovation activity in SEE seems to be intensive with interorganizational relationships (IORs) and also intensive in knowledge transfer (KT) activities, being the main focus of this study. In addition, as SEE is relatively under-researched part of the world economy which is quite representative of middle-income economies (World Bank, 2013), which in turn has a key role in the world's economy.

In reaching out to the largest possible and most diversified target sample, the researcher has used public directories of SEE accelerators, clusters and technology parks in reaching out to software companies in SEE with an invitation to participate in the study. In support, empirical studies on innovation and software companies in SEE (GIZ 2015; OECD, 2018; OECD 2019) indicate that majority of software companies in SEE are members of an association, cluster or a technology park. Using the public directories of software company associations in SEE, the researcher was able to reach out to over 3,000 companies and seek participation for this research.

1.7.3 Application of AFA Methodology in Developing the Measure

Act Frequency Approach (AFA) is a mixed methodology (qualitative and quantitative) designed for exploratory research of behaviours and development of behavioural measures in cases of abstract constructs, lack of comparable earlier measures or lack of strong theoretical support for an abstract construct. AFA methodology's main premise is that by identifying and summarizing previous individual behavioural acts (participants' historical knowledge of behaviours) in a particular domain and over a certain period of time will likely identify future behaviours, with the main assumption that past behaviours will continue to be the same in the future (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Reif, 2012; Schimmack, 2010; Tucker and Turner, 2010; Cinite *et al.*, 2009; Buss and Craik, 1980, 1981, 1983a, 1983b, 1983c, 1984). This provides a composite behavioural measure (i.e. scale) that can be utilized to identify and measure future organizational behaviours influencing the observed phenomena. The methodology consists of three phases of the field research (AFA I – act nominations, AFA II – prototypicality ratings and AFA III – testing the measure). In all cases, output from one phase feeds as an input into the next phase, essentially connecting all three field research phases together. Three phases of AFA methodology are broken into six steps (Cinite and Duxbury, 2018) as outlined in Table 2.

AFA phase	Type	Step	Description of Activity
AFA I phase – act nominations	**Qualitative** (interviews)	1	Interviews with participants to nominate behavioural acts of KT and IOR to innovation outcomes through a qualitative field study.
		2	Qualitative analysis of collected data for keywording and elimination of duplicate acts, non-act statements, frequency related and vague statements. Construction of survey for the next phase.
AFA II phase – prototypicality ratings	**Quantitative** (surveys)	3	Collect surveys to rate identified behavioural acts from the first phase for prototypicality ratings (agreeing or disagreeing that behaviours identified through interviews in the previous phase influence researched phenomena) through a quantitative field study.
		4	Quantitative analysis with statistical tests to construct the measures – determine consensus from participants on the highest rated behaviours influencing the phenomena researched. Construction of the measure based on the highest rated behaviours identified.
AFA III phase – testing the measure	**Quantitative** (surveys)	5	Collect survey to validate the measure developed in the previous phase through a qualitative field study.
		6	Analyse data with statistical tests for validity, stability and reliability of the measures.

Table 2 – AFA methodology objectives, phases and steps

The objectives of the first two phases (AFA I and AFA II) were to develop the measure, and the objective of the third phase (AFA III) was to test the measure for validity and reliability. The first phase (AFA I) is qualitative and the second and third phases (AFA II and AFA III) are quantitative.

The first AFA I phase is used for act nominations. In this phase individual behavioural acts related to the phenomena researched are identified through qualitative sampling - conducting interviews with participants believed to contain historical knowledge of organizational behaviours influencing the domain researched. The list of acts generated through interviews is as exhaustive as possible as the interviewing process continues until there are no new behavioural acts identified with two subsequent interviews. Once the list is compiled, it is stripped off any redundancies, non-act statements, frequency-related and vague statements (Cinite and Duxbury, 2018; Szamosi and Duxbury, 2002; Buss and Craik, 1983a). The final list of behavioural acts nominated by participants is used as an input to develop a survey for the second phase of the field research.

The second AFA II phase is used for prototypicality ratings. In this phase individual behavioural acts identified in the first phase are rated by participants for prototypicality – a degree of agreement or disagreement in which identified behaviours represent the nature of the inquired phenomena. Such ratings are given by participants' on a seven (7) point Likert scale (from strongly disagree, disagree, somewhat disagree, neither agree or disagree, agree, somewhat agree, to strongly disagree) for each of behaviours nominated in the first phase of the field research. The rated list is analysed through evaluation of the lowest and highest rated prototypical acts in the sample. The lowest rated prototypical acts are discarded (as non-supportive acts of behaviours researched) and the final list contains the highest rated prototypicality acts representing participants' consensus on acts supporting behaviours researched.

For the purpose of prototypicality rating analysis, Principal Component Analysis (PCA) was applied as a statistical variable reduction procedure for reducing a large number of variables into smaller number of components accounting for most of the variance in the set of the variables observed (SAS, 2017; Jolliffe and Cadima, 2016). PCA has been proven as generalizable and used in a wide variety of areas studied for reduction of large data sets and measure developments (Jolliffe and Cadima, 2016). Complementary technique to PCA is CFA (Confirmatory Factor Analysis), however CFA being a confirmatory methodology is perhaps better suited for confirmation of measures, rather than early measure development for which PCA is better suited (Coste *et al.*, 2005). As the nature of this research is exploratory in understanding influence of KT and IOR to innovation outcome and not confirmation of the measure, PCA is selected as the appropriate methodology for variable dimension reduction, that is statistically determining which variables best describing the measure need to be included in the scales being developed (SAS, 2017; Jolliffe and Cadima, 2016; Coste *et al.*, 2005).

The last step in developing the scales in AFA II phase was to ensure measures are stable and reliable. In ensuring that measure developed is stable, all principal components from the PCA of the measure had to be verified to have a meaningful factor loading with the threshold of .40 or higher in the magnitude in the rotated component matrix as recommended for the social sciences (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). In addition, Cronbach alpha statistical tests of internal consistency were conducted for each of the four scales (KT+, KT-, IOR+ and IOR-) to ensure reliability of the measure. All variables tested with Cronbach alpha test of internal consistency had to meet a minimum threshold of being .50 or higher to be included in the scale (Manerikar *et al.* 2015). Cronbach alpha values of α = .50-.60 indicated measure would be poor in its internal consistency, values from α = .60-.70 are considered as acceptable, values from α = .70-.90 are considered as good, and values greater than α > .90 indicate excellent internal consistency of measures tested. The higher Cronbach alpha value is, the more reliable the measure is.

This analysis has provided a composite behavioural measure (i.e. scale) that can be utilized to identify future organizational behaviours supporting the inquired – therefore the composite acts serve as predictor and criterion variables. Completion of AFA II phase produces the organisational behavioural measure that is used as an input to the third and final phase of the field research.

The last AFA III phase of the field research is used to test the measure developed for stability and reliability. In this phase participants rate each of the behavioural acts of the measure developed on the seven (7) point Likert scale for phenomenon researched. The rated list is analysed statistically for integrity of measures using Principal Component Analysis (PCA) and for reliability of measures using Cronbach alpha (Szamosi and Duxbury, 2002). In ensuring that measure is stable, all principal components of the measure were verified to have meaningful factor loading with the threshold of .40 or higher in the magnitude in the rotated component matrix as recommended for social sciences (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). All variables tested with Cronbach alpha as test of measure's internal consistency were verified to meet the threshold of being .50 or higher (Manerikar *et al.* 2015) to be considered as a reliable measure. Measures developed were further tested for stability across demographics utilizing one-way ANOVA statistical test for analysis of variance between the scales and demographics. ANOVA test was chosen over T-test, as T-test can compare means across two groups, whereas ANOVA can make means comparison across multiple groups (Park, 2009). As the research questionnaire has included 13 demographics questions, ANOVA was more appropriate statistical test to test across multiple demographics groups. Upon execution of ANOVA tests, in cases where there existed statistically significant differences between demographics groups, an additional post-hoc test was performed to understand between which demographics groups this difference existed. In case there existed a small variability between demographics groups, this would be a good indicator that measure has a property of repeatability (Zanobini *et al*, 2016), meaning it is stable to use for all demographic groups.

The output of this phase was confirmation of measure stability and validity, development of measures of positive and negative behavioural acts of knowledge transfer (KT+, KT-) and interorganizational relationships (IOR+, IOR-) to innovation outcomes based on the highest rated behavioural acts from the field studies.

1.7.4 Analysis of KT and IOR relationships

As an additional analysis beyond the original prescription of AFA methodology (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017) for the purpose of developing theoretical perspectives, the researcher has performed a series of correlation statistical tests between the four different measures of KT and IOR developed (KT+, KT-, IOR+, IOR-) to understand relationships between the measures. In case there existed strong statistical positive or negative correlations between any two measures, this understanding was used for theoretical interpretation of the relationships between KT and IOR. To consider correlations between any of the four measures (KT+, KT-, IOR+, IOR) as indicative, either positive or negative correlations with value of .5 or higher had to be taken into consideration (Hinkle *et al.*, 2003). Values in the range from .50 until .70 would denote moderate correlation, values in the range from .70 - .90 would indicate high correlation, and value .90 -1.00 would indicate a very high positive correlation between variables measured. Utilizing additional analysis has helped further theoretical understanding of relationships between KT and IOR and has provided novel theoretical insights as discussed in Chapter V – Conclusions.

1.8 Significance of the Study

This study is significant to both practitioners and academics in this period and at this time as understanding of innovation performance in organizations matters to providing sustainable competitive advantage, it impacts corporate performance and contributes to the economic growth (Forés and Camisón, 2016; Iturrioz *et al.*, 2015; Camison and Villar-Lopez, 2014; Damanpour and Aravind, 2012; Rubera and Kirca, 2012). Companies today no longer have a choice if they should innovate as non-innovators cannot sustain pressures of the global competition for prolonged periods of time (Ahram, 2017; Rubera and Kirca, 2012). Challenges companies face is not only in producing novel products or services, but also in enabling and supporting innovation management as an organizational practice for continuous innovation delivery (Nieves, 2016; Damanpour and Aravind, 2012; Desouza *et al.*, 2009) and also developing and expanding organizational capacity to innovate (Boukamel *et al,* 2019; Santa *et al.*, 2019). Understanding innovation effectiveness on a sample of software companies is relevant as they are found to generate most of the innovation at an ever-increasing pace which is affecting every industry (Ahram, 2017; Edison *et al.*, 2013; Davis and Eisenhardt, 2007). Companies who leverage technology for competitive advantage to disrupt the status quo stay in leadership positions in their industries and companies who do not keep up with technology can no longer survive in the global marketplace (Ahram, 2017).

Understanding innovation practices on a sample of companies in SEE necessary as this region is relatively under-researched part of the world economy which is quite representative of middle-income economies (World Bank, 2013), which in turn has a key role in the world's economy. This research is also necessary in order for companies in SEE to achieve a more successful and impactful innovation outcome through combining and utilizing knowledge and other resources from international organizations and entities (Aggarwal and Madhavi, 2018; Park *et al.*, 2015; Fallah and Lechler, 2008; Mrinalini and Nath, 2008).

The significance of this study to academics is in providing globally novel views of innovation effectiveness in organizations by connecting and mapping the area of influence of KT and IOR to innovation outcomes in software companies in SEE. Scales developed through this research measuring the influence of positive and negative behaviours of KT and IOR to innovation outcomes are significant as the first measure of its kind in academic literature. The study bridges the theories of process view of innovation with outcome view of innovation bridging a knowledge gap and contributing to integration of innovation literature. Uncovering the duality nature of positive and negative behaviours of KT and IOR co-existing and in parallel influencing innovation outcome provides novel insights into drivers of innovation. Observing the behaviours negatively influencing innovation outcome is also a novel contribution as the literature largely observes only positive drives of innovation.

This research is significant in providing new knowledge to innovation research as there exist no consolidated theoretical frameworks of innovation (Khosravi *et al.*, 2019; Saunila, 2017b; Crossan and Apaydin, 2010; Xu *et al.*, 2007) and also to models of innovation effectiveness as there exist no consolidated models of measures of innovation performance (Saunila, 2017a; Janssen *et al.*, 2011). This research is also significant for its first application of Act Frequency Approach (AFA) methodology used in behavioural research to the field of innovation research. This research also provides contribution to understanding innovation in SEE as a novel development in this region.

This study is significant to practitioners as scales developed through this research can be used to regularly measure and understand positive and negative behaviours of KT and IOR in organizations. Regular assessment of innovation measurements in organizations is important as it influences managers to initiate quicker course corrections and organisational improvements, in turn positively influencing innovation capability (Saunila, 2017b). Using scales developed through this research can provide indications to practitioners on areas to strengthen and improve, avoid and change to support improvements to innovation effectiveness in organizations.

1.9 Thesis Outline

This thesis is structured in five (5) chapters as follows:

Chapter I – Introduction

The first chapter of this study provides introduction of the main topic being researched – innovation effectiveness and significance of this topic. This chapter provides an overview of the relevant academic knowledge of innovation theories, knowledge management, and theories of interorganizational relationships. Identified knowledge gaps are presented, including research objectives addressing the gaps and unique contribution of this study to knowledge – development of scales to understand impact of KT and IOR to innovation outcomes.

Chapter II – Literature Review

The second chapter provides extensive literature review on the research topic presenting knowledge on theories innovation, knowledge management and interorganizational relationships. Analysis of the gaps in academic literature are presented. Theoretical framework was presented as foundation of this study and development of new knowledge based on this foundation.

Chapter III – Methodology

The third chapter discloses methodology chosen for this study (AFA - Act Frequency Approach) believed to be one of the most suitable to answer the research objectives. This chapter provides reasoning and grounding in beliefs of knowledge creation with support to the methodology approach chosen; it elaborates on the sample target group; it provides theoretical construct for development of the research instrument and methodology for collection and analysis of the field data. The chapter also presents the ethics considerations observed.

Chapter IV – Findings

The fourth chapter presents findings of this study through presenting the three phases of the methodology used: findings from the AFA I, II and III phases of the field research. The chapter provides qualitative and quantitative analysis of the findings. Validity, stability and reliability analysis of scales developed are summarized and presented.

Chapter V – Conclusions

The fifth chapter provides concluding remarks of this thesis connecting the field research findings with the academic knowledge and addressing the knowledge gaps identified. Implications of findings to academia and practitioners are discussed. Limitations of the study are disclosed, and recommendations for further research made. This chapter concludes with overview of the novel contributions made to the knowledge – the main objective being development of scales to understand impact of KT and IOR to innovation outcomes.

1.10 SUMMARY

The first chapter sets the tone for this research by providing a background overview of significance of understanding innovation effectiveness to sustainable competitive advantage and economic growth. Summary of the key literature on theories of innovation, knowledge management and interorganizational relationship are presented. New knowledge generation is identified to be significant to innovation outcomes. As companies need to introduce parts of other solutions and collaborate with external organizations in delivering innovation, interorganizational relationships are also identified as significant to innovation outcomes. Knowledge gaps identified are related to understanding influence of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes. Research objectives are disclosed in this chapter, with the overall aim of this research in closing the knowledge gaps being *development of scales to understand impact of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes.* Contribution to knowledge made are presented in its novel insights to relationships of KT and IOR to innovation outcomes, development of scales as perhaps first of its kind in the literature, novel application of AFA methodology to the field of innovation research, and novel development of this research in the region of SEE. Structure of the thesis is presented in conclusion of this chapter.

2 INTRODUCTION

This chapter provides detailed literature review on theories of innovation, knowledge management and interorganizational relationships in support of the research objectives. The literature review provided in this chapter serves as a foundation upon which new academic knowledge is generated through this study based on the knowledge gaps identified.

The chapter starts with introduction of the software IT industry in SEE being the target group of this research. The literature review consists of the following main categories addressing:

- Theories of innovation
- Theories of knowledge management
- Theories of interorganizational relationships

Theories of innovation start with introduction of definition of innovation. Theories of innovation are discussed next from the outcome and process view of innovation, followed by determinants of innovation influencing innovation outcomes.

Theories of knowledge management are addressed as one of the most important determinants of organizational innovation. The topic of knowledge management is covered extensively explaining the nature and dimensions of knowledge, organizational knowledge creation and knowledge transfer. It is believed that knowledge transfer is perhaps one of the most significant factors in creating new knowledge positively influencing innovation performance. Multiple views on determinants of a successful knowledge transfer are examined.

Access to wider networks of knowledge and resources in collaborating with others seems to result in increased innovation performance. Globally collaborating and innovating with partners seems quite the standard for many IT companies today with such efforts resulting in innovative products and services that a single company could not deliver on its own. The chapter further examines the topic of interorganizational relationships in collaborating with others through observing the nature of relationships and determinants of successful interorganizational relationships. Overview of interorganizational knowledge transfer is provided as it relates to interorganizational relationships and innovation. Specifics of knowledge transfer and innovation in developing countries and SEE are examined.

This chapter is finalized with a synthesis of the literature review integrating theories and frameworks of innovation, knowledge transfer (KT) and interorganizational relationships (IOR), discussing similarities and knowledge gaps in the academic literature. The analysis is concluded with knowledge gaps on missing links between influence of KT and IOR to innovation outcomes. The overall aim of this research was in closing identified knowledge gaps through development of scales to understand impact of KT and IOR to innovation outcomes.

2.1 Approach to the Review

Literature review was conducted online using the following databases of scholarly (peer-reviewed) articles:

- StarPlus – University of Sheffield online library catalogue
- EBSCO – online research database
- Google Scholar – online research database

Filters were used in the search to include articles with full-text online access and to filter publishing dates of articles - typically articles published since the year 2000 and onwards, and for the most updated literature review articles published since 2011 and onwards. Search terms outlined in Table 3 were used to identify literature for the literature review (sorted alphabetically):

Act Frequency Approach	Innovation infrastructure	Organizational knowledge
AFA methodology	Innovation leadership	Organizational knowledge management
ANOVA statistical test	Innovation management	Organizational networks
Axiology and research	Innovation outcome	Organizational performance and innovation
Business process innovation	Innovation performance	Organizational systems and IT
Coding and decoding knowledge	Innovation process	Outsourcing innovation
Communities of practice	Innovation scales	Partner type and knowledge networks
Complexity of knowledge	Innovation system	Partner type and organizational networks
Corporate culture and innovation	Integrated framework of innovation	Pragmatism and research
Corporate innovation	Intellectual property	Principal component analysis
Corporate values and interorganizational relationships	Interorganizational between-partner differences	Principal Component Analysis statistical test
Critique of AFA (Act Frequency Approach)	Interorganizational collaboration	Process and outcome view of innovation
Cronbach alpha analysis	Interorganizational contract frame	Qualitative analysis
Cronbach alpha statistical test	Interorganizational decision making	Quantitative analysis
Definition of innovation	Interorganizational dynamics	Relationships in knowledge networks
Dependent innovation	Interorganizational knowledge absorption	Research approach
Determinants of innovation	Interorganizational knowledge transfer	Research Design

Developed vs developing countries and innovation	Interorganizational relationships	Research ethics
Developing countries and innovation	Interorganizational relationships framework	Research methodology
Developing measures	Interorganizational trust dynamics	Research philosophy
Direction of knowledge transfer	Interpretivism and research	Research sampling process
Drives of innovation	Intuitive decision making	Rich media in knowledge transfer
Duality of behaviours	IT companies in SEE	Scales development
Duality of measures	IT in innovation	Scales development methodologies
Education and innovation	Joint ventures	Scientific research
Epistemological knowledge creation	Justified true belief	Service vs manufacturing and innovation
Epistemology and research methodology	Knowledge capital	Shared interorganizational values
Explicit and tacit knowledge	Knowledge creation model	Social capital
Exploratory and exploitative innovation	Knowledge desorption	Social media and innovation
Forming interorganizational relationships	Knowledge exchange	Social networks
Forms of innovation	Knowledge generation	Social relationships
Forms of interorganizational relationships	Knowledge management	Social Research Methods
Framework of knowledge innovation	Knowledge management and interorganizational relationships	Software industry in SEE
GDP and innovation	Knowledge spiral	Software industry in Southern Europe
GDP and patent activities	Knowledge transfer	Source of innovation
Globally novel innovation	Knowledge transfer channel richness	Statistics in research
Idea conversion and innovation	Licensing innovation	Statistics in social sciences
Idea generation and innovation	Magnitude of innovation	Success of knowledge transfer
Impact of innovation	Measure development methodologies	Synthesis of innovation literature
Incremental and radical innovation	Measures development	Synthesis of interorganizational relationships literature
Inductive vs deductive research	Measures of innovation	Synthesis of knowledge management literature
Informal knowledge transfer	Measuring innovation performance	Systems of innovation
Innovation and interorganizational relationships	Mismanaged knowledge transfer	Tacit knowledge
Innovation and knowledge management	Models of innovation	Technology patents in SEE
Innovation and patent relationship	Nature of innovation	Technology transfer
Innovation and patents	Negative determinants of innovation	Testing measures
Innovation capacity	Networked innovation	Theories of innovation
Innovation definition	New knowledge creation	Theories of knowledge management
Innovation effectiveness	Online social networks	Transformation of knowledge
Innovation factors	Ontology and research	Transmission of knowledge
Innovation forms	Open innovation	Trust and innovation
Innovation framework	Organization theory	Trust and interorganizational relationships
Innovation in multinational corporations	Organizational innovation	Trust and organizational relationships
Innovation in SEE	Organizational Innovation System	Types of innovation

Table 3 - Search terms used to identify literature for the literature review

Timeframe of the literature review spanned from 2010-2014 for the initial research design and delivery of the M. Phil. thesis, and thereafter from 2017-2020 literature research was updated to include the most relevant research articles for the final submission of this doctoral thesis.

While the objective of the review was not to focus on specific journals, the following academic journals were noted as ones with a significant number of highly referenced articles in the field of innovation (sorted alphabetically):

- International Journal of Innovation & Technology Management
- International Journal of Innovation Management
- Journal of Business Research
- Journal of Knowledge Management
- Journal of Management
- Journal of Management Information Systems
- Journal of Organizational Behavior
- Journal of Product Innovation
- Journal of Product Innovation Management
- Journal of Technology Management & Innovation

The following sections will provide introduction on significance of innovation and overview of innovation activities of software companies in SEE, followed by theories of innovation management, knowledge management and interorganizational relationships.

2.2 SIGNIFICANCE OF INNOVATION

Survival in today's hypercompetitive global environment is possible only if companies become dynamic and flexible organizations capable of continuously adapting to the rapidly changing global environment (Iturrioz *et al.*, 2015; Camison and Villar-Lopez, 2014). This transformation is possible through innovation as a key driver of economic growth (Ahram, 2017; Rudra *et al.*, 2017; Forés and Camisón, 2016; EC, 2015; Damanpour and Aravind, 2012; Rubera and Kirca, 2012) and a core microeconomic driver of macroeconomic growth (Rudra *et al.*, 2017; Kung and Schmid, 2015; Clayton *et al.*, 2001). Companies no longer have a choice if they should innovate or not as the consequence of not innovating is that any company regardless of its size or global origin can compete in the global marketplace and take away non-innovator's market share with a better product or service. As such, non-innovators cannot sustain the pressures of the global competition for prolonged periods of time (Ahram, 2017; Rubera and Kirca, 2012; Fallah and Lechler, 2008).

Understanding innovation effectiveness through an empirical example perhaps cloud be best observed through IT service companies, out of which a major fraction are software companies, as they are found to generate most of the innovation at an ever-increasing pace affecting every industry (Ahram, 2017; Rudra *et al.*, 2017; Edison *et al.*, 2013). OECD[2] (EC, 2015) estimates that investment in innovation, such is software and R&D in high growth economies accounts for 60-70% of labour growth. In 25 countries of EU the service sector was found to be one of the most important contributors to GDP (Petrescu, 2011). Service sector, with innovation in software as its major component was found globally to be a major contributor to GDP (Rudra *et al.*, 2017; Kung and Schmid, 2015; Burgess, 2011) and with a more accelerated economic growth compared to the manufacturing sector (Santacreu and Zhu, 2018). Nevertheless, it seems that a single software company can only do so much innovating by itself and competing in the global marketplace (McManus and Ardley, 2019). Majority of software products today are composed of components contributed by many providers. It is very unusual for a new software development to start from scratch as this would be economically unfeasible in terms of time, expertise, human resources and the investment standpoint. Instead, most of software developments starts by integrating reusable software components (Barros-Justo, 2019; Subramanyam *et al.*, 2012; Mohagheghi and Conradi, 2007) and building on top of the existing tools and readily available commercial, or open source software (Barros-Justo, 2019; Casadesus-Masanell and Llanes, 2015). There are examples of commercial enterprises such is Microsoft investing considerable amounts of free software to the open source domain as they believe such investment would propel others to build on top of it, in turn

[2] OECD - Organisation for Economic Co-operation and Development with 36-member countries

producing innovation that could not be attained by a single company only, even of such size (Casadesus-Masanell and Llanes, 2015). Reusing software components provides companies with a better predictability and planning of new development efforts (Mohagheghi and Conradi, 2007). Examples of important interorganizational collaboration between IT companies resulting in significant innovation is for example case of Microsoft and Intel partnering together and creating a joint "Wintel" platform consisting of Windows operating system running on Intel processors, in turn resulting in capturing 80% of the PC market at the beginning of this century (Casadesus-Masanell and Yoffie, 2007). In addition, Apple could have not created iPhone without strategic interorganizational partnerships with Qualcomm and Broadcom enabling features such are GSM/GPS/Wi-Fi/Bluetooth capabilities for the iPhone (Lashinsky, 2012). Since the year 2000 and onwards there has been an explosion of interorganizational partnerships with scholars only starting to understand this area (Davis, 2016; de Faria and Lima, 2012).

2.3 Significance of Innovation in SEE

Conducting an empirical field study on influence of KT and IOR to innovation outcomes is perhaps best suited and relevant on software companies in the region of SEE because this region is on a growth path fuelled predominantly by adoption of globally novel innovation and intensive knowledge transfer and collaboration between local firms and foreign providers of technology (Aggarwal and Madhavi, 2018; Edison *et al.*, 2013; Madsen *et al.*, 2010). Cooperation between SEE software firms and foreign companies able to transfer globally novel software technology and knowledge is necessary in order for companies in SEE to achieve a more successful and impactful innovation outcome novel in SEE through intensive knowledge transfer, combining and utilizing knowledge and other resources from external organizations and entities (Aggarwal and Madhavi, 2018; Park *et al.*, 2015; Fallah and Lechler, 2008; Mrinalini and Nath, 2008; Goyal and Pitt, 2007). There exist examples of global innovation being developed through multinational development centres present in satellite R&D offices, such is SEE (Blit, 2018). Most of the innovation activities and most of the dynamic changes are found to be in the software industry noting that these changes are affecting all other industries (Ahram, 2017; Rudra *et al.*, 2017). SEE is a relatively under-researched part of the world economy which is quite representative of middle-income economies (World Bank, 2013), which in turn has a key role in the world's economy.

2.4 Innovation Activity in Software Companies in SEE

The progress of science involves interaction between development of theory and application to the empirical world. This is why an empirical descriptive account of innovation activity in SEE and software industry is presented as this research is drawing learnings on innovation activities from this target group.

The geopolitical region of South-Eastern Europe (SEE) consists of the countries surrounding the Balkan Peninsula (Aspridis, 2012) consisting of Albania, Bosnia & Herzegovina, Bulgaria, Croatia, Greece, Montenegro, North Macedonia, Romania, Serbia and Slovenia (sorted alphabetically). The list of SEE countries along with the longitudinal 10-year range 2008-2018 on official number of patents granted is disclosed in Table 4 (WIPO[3], 2019). This information is relevant to innovation as innovation activity in a country is in a relationship with the number of patents generated (Panda *et al.*, 2020). It also needs to be noted that outside of the official patent registrations there also could exist many unobserved cases of innovation not officially registered \ patented in countries of SEE.

Patent data disclosed shows a breakdown of patents granted to resident versus non-resident companies. Residents represent companies registered and operating in a country of SEE, whereas non-residents represents an internationally registered companies registering a patent in the country of SEE for the purpose of foreign IP protection. It is important to differentiate patent activity between these two, as locally owned companies (residents) register patents for the purpose of introducing an innovation to the marketplace, versus non-residents who are rather leveraging an existing technology to build barriers of entry to protect from new competitors (Balycheva and Golichenko, 2014). As such, of interest to this study are residential patent grants in SEE indicating novel innovation activity.

[3] World Intellectual Property Organization, a United Nations organization

				World IPO (2019)																						
SEE country	EU Member	Population (million)	GDP (USD Billion)	**Patent Grants (residents and non-residents) in SEE**																						**Average annual patent grants (2008-2018)**
				2008		**2009**		**2010**		**2011**		**2012**		**2013**		**2014**		**2015**		**2016**		**2017**		**2018**		
				Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	Resident	Non-resident	
Bulgaria	Yes	7.49	56.83	99	173	138	109	124	130	69	67	62	44	72	58	63	16	35	9	47	6	91	8	189	10	74
Greece	Yes	11.36	200.3	453	19	448	18	483	12	-	-	317	5	301	11	325	14	277	7	303	7	289	9	276	11	179
Romania	Yes	21.49	211.8	600	96	575	110	423	27	408	24	372	15	432	21	344	16	300	14	368	6	409	11	365	7	225
Slovenia	Yes	2.03	48.77	228	12	267	7	274	9	350	10	-	-	-	-	-	-	-	-	-	-	-	-	299	10	147
Albania	No	3.2	13.04	-	-	-	-	-	-	1	20	-	-	3	7	3	2	9	1	5	-	-	-	9	3	6
Bosnia & Herzegovina	No	3.76	18.17	33	94	-	-	26	147	28	87	16	41	7	24	1	4				12	-	4	-	5	35
Croatia	No	4.4	54.85	54	97	44	125	23	69	16	173	20	146	25	141	13	84	15	36	16	24	11	15	15	12	53
North Macedonia	No	2.14	11.34	11	325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	168
Serbia	No	7.36	41.43	70	220	134	277	98	329	63	119	81	88	80	58	64	43	62	24	51	18	35	12	45	8	90
Montenegro	No	0.62	4.77	-	-	-	-	5	259	12	394	54	237	7	114	11	3	6	4	8	-	-	-	11	-	80
Sub-total count of resident vs. non-resident patent grants (2008-2018)				1,548	1,036	1,606	646	1,456	982	947	894	922	576	927	434	824	182	704	95	798	73	835	59	1,209	66	
Total count of patent grants (2008-2018)				2,584		2,252		2,438		1,841		1,498		1,361		1,006		799		871		894		1,275		

Table 4 – Parent and GDP data for SEE countries (WIPO, 2019)

Longitudinal summary of 10-year (2008-2018) patent grants for all countries of SEE with breakdown of residents vs. non-residents is shown in Table 5.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Averages
Resident patents in SEE	1,548	1,606	1,456	947	922	927	824	704	798	835	1,209	1,071 (avg. residents)
Non-resident patents in SEE	1,036	646	982	894	576	434	182	95	73	59	66	458 (avg. non-residents)
Both resident and non-resident patents in SEE	2,584	2,252	2,438	1,841	1,498	1,361	1,006	799	871	894	1,275	1,529 (avg. both resident and non-resident)

Table 5 - Longitudinal 10-year (2008-2018) summary of patent grants for residents and non-residents in SEE

For the purpose of analysis, the table also includes data on each country's GDP[4] (stated in billions of USD) indicating the country's overall economic activity and it also includes information if country is EU or non-EU member (EC, 2019).

The 10-year period 2008-2018 of patent activity in SEE reveals there existed 1,529 average annual patent grants, out of which 1,071 average annual grants for residents (companies registered and operating in SEE) and 458 average annual grants for non-residents (international companies seeking IP protection in SEE). Longitudinal data shows there exists a considerably larger growth trend for number of patents granted to resident companies in SEE in the past 10 years compared to non-resident companies, as illustrated in Figure 2. This observation is important as it indicates a healthy positive increase in the activity of resident companies in SEE introducing novelties to the marketplace, versus foreign companies building barriers of entry against the competition from SEE.

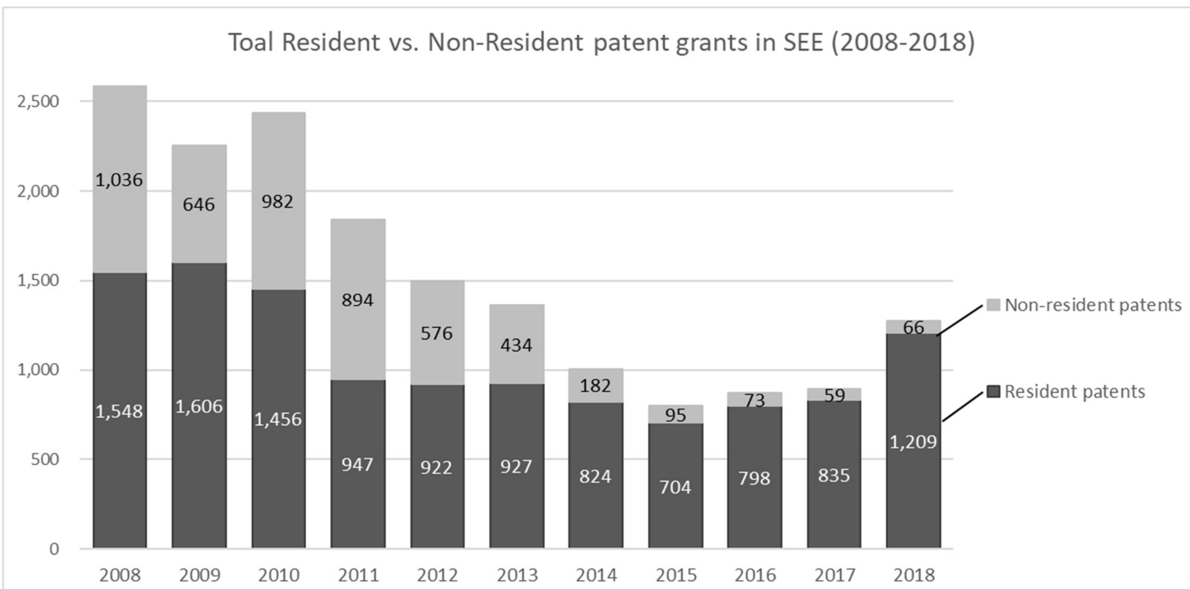

Figure 2 – Longitudinal annual patent grants frequency in SEE for 10 years period 2008-2018 (WIPO, 2019)

The figure also shows that the highest patent activity in SEE seems to be in EU member states (Romania, Greece and Bulgaria) versus non-EU states (other members of SEE). This is also in accordance with European Innovation Scoreboard (EC, 2019) indicating that non-EU countries are below the average innovation performance index for EU countries. On the other hand, the same report indicates a considerable increase in innovation performance for non-EU countries from 2011-2019, namely 19.9% innovation performance increase for Serbia and 5.5% for North Macedonia.

[4] GDP – Gross Domestic Product

Increase in innovation performance in non-EU countries seems to have an important impact to GDP, as OECD Western Balkans reports (OECD, 2019) consisting of Albania, Bosnia Herzegovina, Serbia incl. Kosovo, Montenegro and North Macedonia indicates that export of advanced technology products from this region skyrocketed from USD 8 billion in year 2000 to USD 46.9 billion in year 2016. The most of technology companies in SEE are software companies, also classified as ICT (Information and Communications Technology) companies as per GIZ[5] report South East Europe IT industry barometer (GIZ, 2015). In support, OECD Competitiveness Report in SEE (OECD, 2018) indicates that ICT sector in SEE countries had a considerably higher growth rate and attribution to GDP than the average growth rate of ICT sector in EU. In particular, North Macedonia's ICT sector generated in average 8.3% of GDP in the period 2010-2015, and 5.8% of GDP in Albania. The largest absolute-value contributor to GDP in the ICT sector was Serbia with 1.5 billion Euro in 2014 being 4.3% of GDP. The patent data, innovation reports and GDP analysis in SEE therefore indicate a healthy growth of innovation activities by resident companies fuelling the economic development of the region in the past 10-year period 2008-2018.

Most of the software companies operating in SEE can be classified in one of the following categories based on their activity (SEE ITIB 2015):

1. Startup software companies
2. Development and export of original software products
3. Outsourcing software companies
4. Development centres of large multinational companies

Startup companies denote new companies with innovative product idea that yet need to be made into a stable business. These types of companies are drivers of innovation taking a risk on a novel business idea and going through three distinct lifecycle phases: bootstrapping stage, seed stage and creation stage (Salamzadeh and Kawamorita, 2015). Following the creation stage, the next stage is growing into a profitable mature business (scale-up), and in the event that business has been sold or capitalized otherwise (e.g. through floating on a public stock exchange), this business is noted to execute an exit strategy (ABC Accelerator, 2018).

Existence of startups provides indication of novel innovation businesses in SEE. Report on startup activity in SEE (ABC Accelerator, 2018) indicted there exist 2315 start-up information technology companies formed within the last several years pursuing technology innovation and headquartered in SEE. The breakdown of startup companies existing per countries in SEE is shown in Table 6.

[5] GIZ - German Society for International Cooperation (GIZ)

Country	Startup companies (new companies)	Scale-ups (becoming mature)	International exists
Slovenia	439	8	3
Croatia	500	6	-
North Macedonia	189	5	-
Serbia	631	3	1
Kosovo	58	1	-
Montenegro	59	-	-
Bosnia and Herzegovina	279	1	1
Albania	160	5	-
Totals	**2315 startups**	**29 scale-ups**	**5 exits**

Table 6 – Start-up IT companies in SEE (ABC Accelerator, 2019)

This empirical report also indicates there have been 29 companies in 2018 in SEE who have reached a mature business stage (scale-ups) from its initial startup phase, and there has been 5 business who have executed international exists denoting these businesses have been sold to private or public international owners outside of SEE.

Companies producing original software packages and exporting them abroad represent either startups scaling up, or existing local ICT companies who have diversified into developing original software products for international markets. Outsourcing companies represent local software companies established in SEE who are selling local engineering talent typically as development work hours to international companies, who in turn are tapping into international talent pools and achieving cost effectiveness. While typically there exists a sentiment that outsourcing companies by not producing its own software packages are typically not innovative (OECD, 2018), on the other hand there have been strong examples in which international companies are outsourcing engineering work to develop innovative software products by local companies (Könning *et al.,* 2019; Susarla *et al.*, 2019). Finally, there are examples of key multinational players such are Microsoft, HP, SAP, IBM, Siemens, Cisco and similar opening its own development centres in SEE to primarily leverage the local engineering talent pool. These type of software companies are making long-term strategic investments with often many examples of global innovation being developed through multinational development centres in satellite R&D offices (Blit, 2018).

These empirical findings indicate existence of vibrant innovation activities in software companies in SEE and their considerable impact to the economic development of this region. Considering the longitudinal growth within the past decade, the fact that software companies in SEE contributed more to GDP growth than their counterparts in average in EU, existence of new software companies (startups) in SEE who grew to mature business, and multinationals who innovate in SEE for global markets, this provides support of sufficient innovation activity and the sample size to further pursue understanding the innovation phenomena in this region and at this time through this research.

2.5 Definition of Innovation

The first attempts to define innovation in the literature have observed innovation as an outcome - Joseph Schumpeter has first defined innovation as "*practical implementation of an invention*" through the Theory of Economic Development (Schumpeter, 1934). This theory argues that invention as a novelty cannot be considered an innovation if it is not practically applied in the realm of an organization – therefore invention is not an innovation unless applied. Modern theories expand this view arguing that in order to be considered an innovation, the applied novelty has to produce a positive and measurable benefit to an organization (De Bassi *et al.*, 2017; Ukko and Saunila, 2013; Narvekar and Jain, 2006; Goswami and Mathew, 2005; Rivas and Gobeli, 2005; Howitt, 2005). This is because applied novelty can also produce a neutral (no value) or even negative (unwanted) value to an organization (Rosenbusch *et al.*, 2011; Lloyd, 2006) due to which it cannot be considered an innovation. Some researchers extend definition of the positive benefit of innovation outcome with its impact \ magnitude to organization as means by which companies gain competitive advantage in the marketplace (Koc and Bozdag, 2017; Ukko and Saunila, 2013; Zawislak, *et al.*, 2008). Some researchers extend the view of innovation through a procedural view of how innovation occurs, arguing that the positive change innovation introduces occurs as an application of new or existing knowledge to generate technical or organizational changes (Albats *et al.*, 2019; Khosravi *et al.*, 2019; Kusiak, 2009; Zawislak *et al.* 2008). Researchers (Pedraza-Fariña, and Whalen, 2020) also extend the knowledge application beyond a single organization arguing that innovation involves knowledge search and recombination across knowledge networks. Some researchers (De Bassi *et al.*, 2017) insist more on the process rather that the outcome view of innovation, arguing that innovation is a process since invention until its dissemination to potential customers. These views of innovation are aligned with the academic literature observing innovation as multidimensional phenomenon (Khosravi *et al.*, 2019; Saunila, 2017b; Crossan and Apaydin, 2010; Van de Ven *et al.*, 2007), often viewed separately through different prisms.

Innovation definitions across the process and outcome views (De Bassi *et al.*, 2017; Ukko and Saunila, 2013; Madsen *et al.*, 2010; Dervitsiotis, 2010; Van de Ven *et al.*, 2007) agree that in order to be considered an innovation, an invention has to be applied to the realm of an organization in the form of technological or organizational change (Kusiak, 2009; Zawislak *et al.* 2008) to provide a positive change to the organization through application of new or existing knowledge (Kusiak, 2009; Zawislak *et al.* 2008) across knowledge networks (Pedraza-Fariña, and Whalen, 2020), resulting in the competitive advantage for the organization (Ukko and Saunila, 2013; Zawislak, *et al.*, 2008).

This study adopts a synthesised definition of innovation (Khosravi *et al.*, 2019; Saunila, 2017b Yang, 2011; Madsen *et al.*, 2010; Gunday *et al.*, 2011; Crossan and Apaydin, 2010), describing the innovation as:

Definition of innovation (adopted by this study)

Application of invention to the realm of an organization in the form of technological or organizational change to provide a positive change to the organization through application of new or existing knowledge across knowledge networks, resulting in the competitive advantage for the organization.

Providing a synthesised view of innovation is in line with researchers (Khosravi *et al.*, 2019; Saunila, 2017b; Crossan and Apaydin, 2010; Van de Ven *et al.*, 2007) arguing for consolidation of outcome and process view of innovation theories due to the multidimensional nature of innovation. On the other hand, researchers (Xu *et al.*, 2007) believe that most adequate approach to provide a multidimensional view of innovation is through a portfolio of separate theories. The polarization still exists in the literature with researchers (Khosravi *et al.*, 2019; Damanpour and Aravind, 2012; Saunila, 2017b) noting that the field of innovation is still lacking consolidation and further research directions.

2.6 Theories of Innovation

Innovation in the literature is observed to be of a multidimensional nature, and it is studied from the three main points of view:

1) **Outcome** view of innovation,
2) **Process** view of innovation, and
3) **Determinants** view of innovation.

Innovation as an **outcome** is observing the outputs of innovation produced (Lee *at al.*, 2019; Saridakis *et al.*, 2019; Keller *et al.*, 2018; Azar and Ciabuschi, 2017; Nieves, 2016; Eloranta and Turunen, 2016; Madsen *et al.*, 2010; Dervitsiotis, 2010), innovation as a **process** is observing the process of how innovation was produced (Pedraza-Fariña, and Whalen, 2020; Albats *et al.*, 2019; Njøs and Jens, 2019; Zhou *et al.*, 2019; Geissdoerfer *et al.*, 2016; Ford and Paladino, 2013; Dervitsiotis, 2011; Dervitsiotis, 2010; Desouza *et al.*, 2009; Fallah and Lechler, 2008; Hansen and Birkinshaw, 2007), and **determinants** of innovation describe factors influencing innovation outcome (Boukamel *et al.*, 2019; Khosravi *et al.*, 2019; Santa *et al.*, 2019; Wang and Lam, 2019; Zou *et al.*, 2018; Crossan and Apaydin, 2010; Dervitsiotis, 2011; Paladino, 2007).

Summary of the three-axis perspectives of innovation theories – outcome view of innovation, process view of innovation and determinants of innovation is shown in Table 7.

Determinants of innovation

Leadership:
- Abilities
- Motivation to produce innovation

Literature support:
Watts *et al.* (2020); Elrehail *et al.* (2018); Arda (2016); Ikeda and Marshall (2016); Zacher and Rosing (2015); Scase (2009); Ailin and Lindgren (2008); Sarros (2007); Yadav *et al.* (2007)

Managerial levers:
- Resources
- Organizational learning and knowledge management
- Organizational culture
- Mission
- Goals
- Structure
- Systems
- Strategy

Literature support:
Albats *et al.*, (2019); Boukamel *et al.* (2019); Khosravi *et al.*, (2019); Lee *et al.* (2019); Santa *et al.* (2019); Wang and Lam (2019); Zou *et al.* (2018); Saunila (2017a); Cerne *et al.*, (2016); Forés and Camisón (2016); Naranjo-Valencia *et al.*, (2016); Coltman *et al.*, (2015); Dolińska (2015); Anderson *et al.*, (2014); Klewitz and Hansen (2014); Turró *et al.*, (2014); Büschgens *et al.*, (2013); Ford and Paladino (2013); Aversano *et al.*, (2012); Alipour and Karimi (2011); Baker (2011); Svetlana and Jucevicius (2011); Duobiene and Pundziene (2007); Paladino (2007); Murray and O'Mahony (2007)

Business Processes:
- Initiation
- Decision making
- Portfolio management development and implementation
- Project management
- Commercialization

Literature support:
Albats *et al.* (2019); Geissdoerfer *et al.* (2016); Dervitsiotis (2011); Dervitsiotis (2010); Desouza *et al.* (2009); Gold (2009); Pollard (2009); Hansen and Birkinshaw (2007)

Process view of innovation ("how")

Nature:
Tacit and explicit

Literature support:
Keller *et al.* (2018); Denicolai *et al.* (2016); Bueno *et al.* (2010); Madsen *et al.* (2010); Crossan and Apaydin (2010); Bueno *et al.* (2010)

Direction:
Top-down, bottom-up

Literature support:
Njøs and Jens (2019); Zhou *et al.* (2019); Tushman, *et al.* (2010)

Drivers:
Internal (knowledge, resources) and external (market opportunity)

Literature support:
Albats *et al.* (2019); Boukamel *et al.* (2019); Santa *et al.* (2019); Wang and Lam (2019); Zou *et al.* (2018); Maria-Stock and Zacharias (2017); Saldanha (2017); Dolińska (2015); Janssen *et al.* (2011); Ford and Paladino (2013); Paladino (2007)

Level:
Individual, group or firm process

Literature support:
Khosravi *et al.* (2019); Saunila (2017b); Schippers *et al.* (2015); Andreson, (2014); West (2014); Somech and Drach-Zahavy (2013); Madrid (2012); Almeida (2011); De Dreu, *et al.* (2011); Hammond *et al.* (2011); Miron-spektor *et al.* (2011); Crossan and Apaydin (2010); Dervitsiotis (2010)

Locus:
Closed innovation process (firm only), open innovation process (network)

Literature support:
Pedraza-Fariña, and Whalen (2020); West and Bogers (2017); Felin *et al.* (2014); Chiaroniet *et al.*, (2010); Dervitsiotis (2010); Hansen and Birkinshaw (2007)

Source:
Invention (exploration), adoption (exploitation)

Literature support:
Lee *et al.* (2019); Teece (2018); Lemley and Feldman (2016); Blindenbach-Driessen and van den Ende (2014); Madsen *et al.* (2010); Sirkin *et al.*, (2007); Santos and Eisenhardt (2005)

Outcome view of innovation ("what")

Nature:
Tacit and explicit

Literature support:
Keller *et al.* (2018); Eloranta and Turunen (2016); Gunday *et al.* (2011); Crossan and Apaydin (2010); Madsen *et al.* (2010); Prajogo (2006); Tether (2005); Miles (2005)

Form:
Product innovation, organizational innovation, marketing innovation

Literature support:
Lee *at al*. (2019); Azar and Ciabuschi (2017); Nieves (2016); Damanpour and Aravind (2012); Gunday *et al.* (2011); Yang (2011); Crossan and Apaydin, (2010); Madsen *et al.* (2010); Adams and Hess (2010)

Magnitude:
Incremental, radical innovation

Literature support:
Azar and Ciabuschi (2017); Blind *et al.* (2017); Love *et al.* (2016); Van Beers and Zand (2014); O'Connor and Rice (2013); Sainio *et al.* (2012); Pavitt and Bessant (2011)

Referent:
Firm, market, industry (i.e. novelty of innovation)

Literature support:
Saridakis *et al.* (2019); Koc and Bozdag (2017); Madsen *et al.* (2010); Rivas and Gobeli (2005)

Type:
Technological, Non-technological (administrative)

Literature support:
Khosravi *et al.* (2019); Cerne *et al.* (2013); Damanpour and Aravind (2012); Yang (2011); Adams and Hess (2010); Miller *et al.* (2006)

Table 7 – Overview of organizational innovation theories

Observing the three-axis overview of innovation theories, it needs to be noted that innovation process and innovation outcome are dependent upon each other as process of how innovation is developed is related to the outcome of innovation – what was actually developed (Lee *et al.*, 2019; Saunila, 2017a; Janssen *et al.*, 2011; Crossan and Apaydin, 2010). Managerial lever theory introduces a system of innovation management (Khosravi *et al.*, 2019; Cerne *et al.*, 2016; Nieves, 2016; Desouza *et al.*, 2009) – a system organizations develop and maintain as means to manage the innovation process.

Although the academic literature on innovation is experiencing a rapid growth, researchers (Khosravi *et al.*, 2019; Saunila, 2017b; Damanpour and Aravind, 2012; Crossan and Apaydin, 2010; Xu *et al.*, 2007) argue the academic knowledge is still lacking a coherent theoretical basis – arguably as innovation was traditionally observed only from a single perspective as either outcome, process or determinants of innovation. Innovation theories support this view indicating that innovation is a complex and multidisciplinary phenomenon, as such requiring a multidimensional and integrated theoretical foundation observing innovation from multiple perspectives (Khosravi *et al.*, 2019; Saunila, 2017b; Crossan and Apaydin, 2010; Xu *et al.*, 2007; Van de Ven *et al.*, 2007).

Further literature review will review all three-exist of innovation theories: outcome, process and determinants. The review will start first with the outcome view of innovation describing what are the outputs of such activity. Next, literature review will focus on process how such innovation is developed. Finally, the literature review will review knowledge on determinants of innovation as regulators of innovation process. Review of the innovation theories will conclude the three-axis overview of innovation theories with integrated theoretical frameworks of innovation.

2.6.1 OUTCOME VIEW OF INNOVATION (INNOVATION OUTCOMES)

Outcome view of innovation theories address the output produced by an innovation activity. Academic literature describes the innovation outcome from the following viewpoints:

- **Nature of innovation**: tacit and explicit
- **Form of innovation**: Product innovation (including services), organizational innovation (business model, business process), marketing innovation
- **Magnitude of innovation**: incremental, radical innovation
- **Referent view of innovation**: firm, market, industry (i.e. novelty of innovation)
- **Type of innovation**: technological, non-technological (administrative)

Researchers view innovation outcome as tangible and intangible outputs taking form of products, services, business model and processes whose magnitude could be incremental and radical innovation with novelty levels at the firm, regional or global level (Khosravi *et al.*, 2019; Gunday *et al.*, 2011; Yang, 2011; Crossan and Apaydin, 2010; Madsen *et al.*, 2010). Khosravi *et al.* (2019) argue on importance to differentiate between technological and non-technological (also referred as administrative) innovation due to the different nature of the antecedents, process and outcomes. Synthesised view of innovation outcomes adopted by this study is provided as follows:

Definition of innovation outcomes (adopted by this study)

Innovation outcome in organizations can be viewed as tangible and intangible outputs taking form of technological innovation, product innovation, process innovation and marketing innovation whose magnitude could be incremental and radical innovation with novelty levels at the firm, regional or global level.

2.6.1.1 NATURE OF INNOVATION

Viewed as an outcome, innovation observed from its nature point of view (Keller *et al.*, 2018; Madsen *et al.*, 2010; Crossan and Apaydin, 2010; Gunday *et al.*, 2011; Prajogo, 2006; Tether, 2005) can be observed as:

- **Explicit** (tangible – i.e. products), and
- **Tacit** (intangible – i.e. services).

Typically, explicit (tangible) innovation is associated with manufacturing whereas tacit (intangible) innovation in associated to services – such is software. Some researchers (Eloranta and Turunen, 2016; Miles, 2005) found that innovation in manufacturing and services is complimentary one to another with examples of service driven manufacturing providing value-add compared to traditional manufacturing alone. This indicates that due to their interaction, researchers should view both explicit and tacit outcomes of innovation together.

2.6.1.2 FORM OF INNOVATION

Form of innovation represents the output of the innovation activity. Thinking about innovation outcome, most researchers (Lee *at al.,* 2019; Azar and Ciabuschi, 2017; Nieves, 2016; Damanpour and Aravind, 2012; Gunday *et al.*, 2011; Yang, 2011; Crossan and Apaydin, 2010; Madsen *et al.*, 2010; Adams and Hess, 2010) are referring to products or services, organizational innovation or marketing innovation. Most commonly referred definition of form of innovation found in literature is based on OECD Oslo Manual (2005) defining four different forms of innovation:

- **Product** innovation
- **Process** innovation
- **Marketing** innovation, and
- **Organizational** innovation.

Organizational innovation is referred as innovation in business processes and business models (Gunday *et al.*, 2011). Business process innovation refers to improvement of any organizational process, and it should not be confused with innovation process (Crossan and Apaydin, 2010). Some researchers (Yang, 2011; Adams and Hess, 2010) also argue that an additional form of innovation is social innovation affecting internal organizational or wider societal change. Although differences between forms of innovation exist, Lee *et al.* (2019) argue that all forms of innovation should be observed together in a single model. These researchers found that product innovation can be enhanced with process innovation, and the overall firms' performance increases with adding organizational and marketing innovation into the mix.

2.6.1.3 Magnitude of Innovation

Innovation does not necessarily need to be a new process or a product – it could also be an adaptation of already successful process or a product in a completely new way (Blind *et al.*, 2017; Love *et al.*, 2016; Van Beers and Zand, 2014; Pavitt and Bessant, 2011; Flynn, 2008; Goswami and Mathew 2005). Not all innovation is the same – innovations have a different value and impacts due to which is important to further classify innovation based on the magnitude of impact of a novelty. Researchers (Blind *et al.*, 2017; Love *et al.*, 2016; Van Beers and Zand, 2014; O'Connor and Rice, 2013; Sainio *et al.*, 2012; Pavitt and Bessant, 2011; Flynn, 2008; Laukkanen *et al.*, 2008; Oke *et al.*, 2007) agree that innovation magnitude can be classified by the degree of novelty impact as:

- **Incremental innovation** – introduction of innovations with a minor degree of novelty (i.e. improvements of the existing)
- **Radical innovation** (also known as **breakthrough** or **disruptive** innovation) – introduction of innovations with a major degree of novelty

These two types of innovation outputs are usually governed by their development trajectories; a frequent introduction of smaller changes would typically govern development trajectory of an incremental innovation, whereas a much longer development periods between innovations needed for the accumulation of efforts leading to major breakthroughs govern the development trajectory of a radical innovation (Azar and Ciabuschi, 2017; O'Connor and Rice, 2013; Sainio *et al.*, 2012; Flynn, 2008; Laukkanen *et al.*, 2008; Oke *et al.*, 2007).

Researchers (Azar and Ciabuschi, 2017; Zhou and Li, 2012; Chetty and Stangl, 2010) agree that radical innovation compared to incremental innovation has a stronger effect to innovation performance as it has a potential to create new markets and reshape competitive landscapes (Zhou and Li, 2012). Companies are more likely to increase their competitive advantages developing radical innovation (Azar and Ciabuschi, 2017). Further, companies introducing radical innovation are more likely to internationalize faster than companies introducing incremental innovation (Azar and Ciabuschi, 2017; Chetty and Stangl, 2010). On the other hand, as development of radical innovation is resource intensive, development of incremental innovation is more prevalent in small companies limited in resources (Martínez-Román and Romero, 2013; Tödtling and Kaufmann, 2001). Researchers (Forés and Camisón, 2016) found that organisation size has a positive effect on incremental innovation performance, and negative non-significant effect on radical innovation performance. These researchers, contrary to the separate views in literature on incremental and radical innovation, argue that survival of companies depends on their ability to introduce both radical and incremental innovation. Industrial example of this perhaps is introduction of a new Apple iPhone for the first time as radical innovation creating a completely new market opportunity, and thereafter continuous improvement throughout the years as incremental innovations (Lashinsky, 2012).

2.6.1.4 Referent View of Innovation

However, not all innovation is equally novel to an individual organization, as some organizations could have already experienced a particular novelty, whereas for others it can be the first time they are experiencing a novelty. As such researchers (Saridakis *et al.*, 2019; Rivas and Gobeli, 2005) suggested classification and evaluation of innovation in terms of the three levels of innovation novelty:

- Innovation **novel to an organization** (change novel to an individual organization only, and already known within the industry and globally)
- Innovation **novel to an industry or a country** (change novel to the industry or a region, and already known globally)
- **Globally novel** innovation (change novel to the world)

Madsen *et al.* (2010) argue that innovation novel to an organization only could indicate exploitation activity (also adoption or imitation) of an existing innovation, whereas innovation novel to an industry or globally novel innovation could indicate exploration activity of innovation development. Koc and Bozdag (2017) have focused more deeply on what innovation novelty means for a particular company, suggesting a customized scale to measure innovation impact to a company based on the well-known Porter's (2005) organization value chain. Researchers suggest that impact to each of the links in the Porter's organizational value chain needs to be measured to determine the impact of an innovation to organization's performance.

2.6.1.5 Type of Innovation

Researchers (Khosravi *et al.*, 2019; Damanpour and Aravind, 2012; Yang, 2011; Adams and Hess, 2010; Miller *et al.*, 2006) indicate that innovation type based on the outcome can be classified as:

- **Technological**, and
- **Non-technological** (administrative) innovation.

According to authors, technical innovation would denote advances in the technology sector, whereas non-technical innovation outcome would denote novelties in the areas of processes, social, administrative activities, *et sim.* Khosravi *et al.* (2019) argue in importance of differentiating between technological and non-technological forms of innovation in the literature. The distinction seems to be relevant as researchers (Khosravi *et al.*, 2019; Cerne *et al.*, 2013) found differences between these two types of innovation in terms of having different development process, antecedents and outcomes.

2.6.2 Process View of Innovation

The perceived value of innovation outcome presents challenges in measuring innovation value especially in the cases of intangible innovation outcome originating in the service sector. This is why some researchers view innovation as a process consisting of connected links, whereas in each link of the process innovation value-add created is observed (Albats *et al.*, 2019; Santa *et al.*, 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2010; Desouza *et al.*, 2009; Fallah and Lechler, 2008; Hansen and Birkinshaw, 2007). On the other hand, some researchers observe innovation creation as organizational capacity to develop innovation (Boukamel *et al.*, 2019; Lee et al 2019; Santa *et al.*, 2019; Zou *et al.*, 2018; Saunila, 2017a; Klewitz and Hansen, 2014). Process view of innovation is relevant to software companies in SEE from the perspective of how innovation is developed in these companies, as influenced by KT and IORs.

The following section shall elaborate on the outcome view of innovation from the following viewpoints addressed in the literature:

- **Nature**: tacit and explicit
- **Direction**: top-down, bottom-up
- **Drivers**: internal (knowledge, resources) and external (market opportunity)
- **Level**: individual, group or firm process
- **Locus**: closed process (firm only), open process (network)
- **Source**: Invention (exploration), adoption (exploitation)

2.6.2.1 Nature of Innovation (Process)

Nature of innovation (tangible and intangible) discussed earlier applies to both outcome and process views of innovation (Keller *et al.*, 2018; Madsen *et al.*, 2010; Crossan and Apaydin, 2010). This is a shared aspect in the literature of innovation arguing that innovation can be observed from its nature point of view as explicit (tangible – i.e. products) and tacit (intangible – i.e. services). From the process view of innovation the innovation literature is concerned with how innovation is produced - the process of producing tangible innovation – physical products, and process of producing intangible innovation – without physical presence. The intangible output of innovation in services is more difficult to observe as this might relate to company databases, software, tacit knowledge or intellectual capital in their employees and similar (Keller *et al.*, 2018). On the other hand, researchers (Bueno *et al.*, 2010) found that companies need a diverse portfolio of both tangible and intangible resources and capabilities in order to produce innovation value. Denicolai *et al.* (2016) found that exploitation of tangible and intangible assets are the necessary foundational building blocks composing the business model.

2.6.2.2 Direction of Innovation Process

Direction of innovation process in organizations is categorized as top-down and bottom-up indicating a direction through which an innovation is initiated, managed and executed (Njøs and Jens, 2019; Zhou *et al.*, 2019; Tushman, *et al.*, 2010). Top-down approach represents a manager centric approach through which innovation process is driven from managers to employees, and bottom-up represents an actor-based approach in which employees push an innovation process bottom up to managers (Njøs and Jens, 2019). Both directions of innovation process have its advantages and disadvantages. Top-down approach is more likely to be beneficial to business process improvements due to management's knowledge of administrative procedures, whereas bottom-up approach is more likely to be beneficial to product development due to a better employees' understanding of product space and technology compared to the management (Tushman, *et al.*, 2010). Both directions of innovation process - top-down and bottom up are important especially as knowledge driven organizations are becoming flatter (Tushman, *et al.*, 2010). While literature is divided between top-down or bottom-up direction of innovation process, researchers (Njøs and Jens, 2019; Zhou *et al.*, 2019) argue that in order to maximize benefit of innovation organizations should combine both directions in a balanced manner. Instead of observing manager driven or employee driven innovation process in a siloed manner, researchers (Zhou *et al.*, 2019) argue that managers and employees should collaborate together on innovation process for the best performance effects of innovation outcome. Researchers Zhou *et al.* (2019) introduce external network as a third direction of innovation process. Taking into consideration that organizations are increasingly innovating together with other external organizations, researchers recognize that direction of innovation process cloud flow from an external organization to the recipient organizations. In such constellation of networked organizations, top-down and bottom-up direction of innovation process is extended to networked organizations. As such, direction of innovation process could also be top-down from an organization managing an innovation in the network to participant organizations executing innovation, and bottom-up from participant organizations executing innovation to the organization managing the innovation (Njøs and Jens, 2019).

2.6.2.3 Drivers of Innovation Process

In understanding the innovation process in organizations, it is necessary first to examine drivers of such process. Innovation process in organizations is driven internally by the size of resources allowing companies to innovate, and externally by market demands (Santa *et al.*, 2019; Ford and Paladino, 2013). Observed internally through resource-based view (RBV[6]) of innovation, the innovation process is driven by the availability of resources within an organization (Albats *et al.*, 2019; Ford and Paladino, 2013; Paladino, 2007). Resources are of a great importance in driving the innovation, especially to organizations seeking to improve organizational capacity to innovate (Santa *et al.*, 2019) and who are focused on new product development and in pursuit of a radical innovation - hence more significant resources are required for very long development cycles and for radical innovation. Resources positively affect quality of products and financial performance – innovation performance in organizations seems to be in a positive relationship with availability of physical and financial resources to an organization (Ford and Paladino, 2013; Paladino, 2007; Atuahene-Gima *et al.*, 2005). Organizational size plays an important role to the size of resources available for innovation

[6] RBV – Resource Based View

and in turn has a positive effect on innovation performance (Forés and Camisón, 2016). In addition, to the resources, companies need to develop organizational capacity to innovate (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Santa *et al.*, 2019; Zou *et al.*, 2018; Saunila, 2017a; Klewitz and Hansen, 2014). Resources and organizational capacity to innovate are closely interlinked to each other and appear critical for the success of innovation in organizations (Albats *et al.*, 2019; Sok and O'Cass, 2011).

On the other hand, market-based view of innovation is an external driver of innovation process representing a market demand for products and services, therefore market opportunity is a driver of innovation development (Albats *et al.*, 2019; Ford and Paladino, 2013; Janssen *et al.*, 2011). Companies practicing market-based view of innovation are reacting on customer demand (market pressure) and trying to understand the way customers use products and/or services. Close co-development relationship between companies and customers with an active customer involvement was found to result in an accelerated pace of innovation development (Maria-Stock and Zacharias, 2017; Saldanha, 2017). In customer co-development of innovation, technology and especially software and web services seem to play an important role in understanding the ways customers are using products and services (Saldanha, 2017). Research also suggests that innovation growth through customer co-development is not infinite and that it is effective only to a certain point (Maria-Stock and Zacharias, 2017; Knudsen, 2007).

Organizations in which innovation is driven by market opportunities are more likely to enhance existing products (i.e. practice incremental innovation) and as such focus on increasing the customer value (Ford and Paladino, 2013; Chang *et al.*, 2014; Nylund, 2008), although this is not exclusive as pursuing market opportunities could also result in radical innovation (Chang *et al.*, 2014). Organizations should understand differences between focusing on resource-based view of innovation and focusing on market opportunities as each could have a different impact to innovation outcome. Performance of innovation in services is most likely to benefit from the market orientation, whereas performance of innovation in new product development is most likely to benefit organizations from the resource-based approach (Albats *et al.*, 2019; Ford and Paladino, 2013; Paladino, 2007). However, companies should consider practicing both resource and market innovation as ambidextrous view of innovation provides arguments that companies who practice both types of innovation are likely to achieve a better innovation performance (Lee *et al.*, 2019; Ford and Paladino, 2013). Model suggested by Ford and Paladino (2013) is illustrated in Figure 3 suggesting that market orientation of innovation is moderated by available resource in the organization. Researchers have found that market orientation has a highly significant positive performance to organizations' financial performance, and it contributes to creating a superior customer value, which is in line with previous research (Albats *et al.*, 2019; Janssen *et al.*, 2011; Nylund, 2008). Resource orientation of innovation also had a positive financial performance to organization, however only moderate. This means that while companies are market oriented towards innovation, they can leverage resource orientation as a moderator of innovation performance.

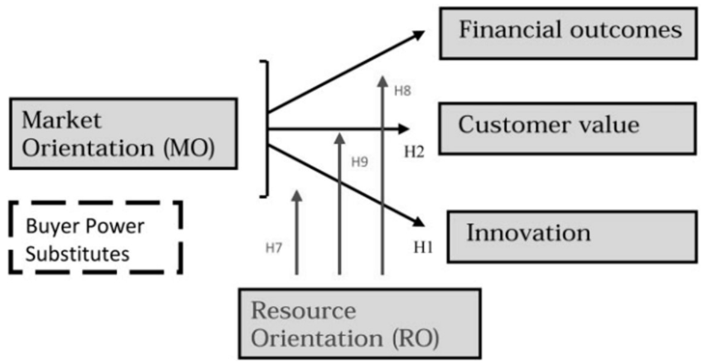

Figure 3 –RBV and Market view of innovation (Ford and Paladino, 2013)

Ford and Paladino (2013) however warn that researchers and practitioners should be cautioned on what resources actually mean as enabler of market-oriented innovation. Traditionally resources are observed as material and financial assets, however it seems that intangible resources such are knowledge and intellectual property (IP) have a greater value as resources to innovation performance (Keller *et al.*, 2018; Denicolai *et al.*, 2016; Almeida, 2011). Intangible resources in organization however might be more difficult to observe as they can relate to company databases, software, tacit knowledge, intellectual capital and similar (Keller *et al.*, 2018).

2.6.2.4 Level of Innovation Process

Innovation process can be observed at the level of an individual innovation, group and organization process (Saunila 2017b; Crossan and Apaydin, 2010). Individual innovation process relates to a process individual performs in order to produce innovation, whereas group and organizational process relates to process groups and organizations execute in order to produce innovation, as illustrated with Figure 4 (Madrid, 2012).

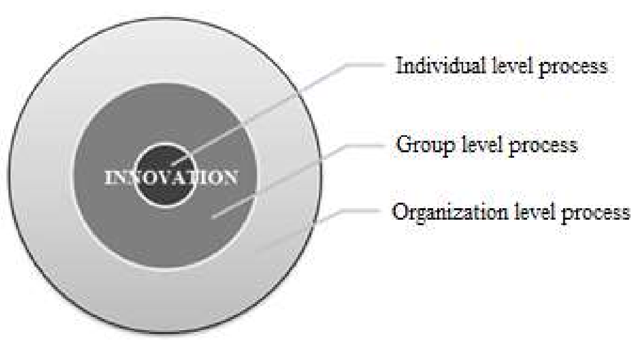

Figure 4 – Levels of innovation process (Madrid, 2012)

Majority of academic literature observes innovation process at the organizational level (Saunila 2017b; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007; O'Connor and DeMartino, 2006), while the group and individual level of innovation seem to be underdeveloped in the literature (Khosravi *et al.*, 2019; Saunila 2017b; Crossan and Apaydin; 2010).

2.6.2.4.1 INDIVIDUAL PROCESSES

Individual level contribution to innovation performance is researched from individual, job and contextual factors (Andreson, 2014; Almeida, 2011) and their influence to the innovation process, described as ideation and implementation phase (Almeida, 2011), as shown in Figure 5. From all individual factors argued to contribute to innovation performance (personality, creativity, education, tenure and motivation), the core of individual contribution to oragnizations' innovation performance was isolated suggesting that individual level contribution was in individual's ability. This individual ability is linked to fostering knowledge transfer and collaboration (Almeida, 2011), being one of the fundamental drivers of innovation performance (Khosravi *et al.*, 2019; Saunila, 2017a; Cerne *et al.*, 2016; Crossan and Apaydin, 2010; Alipour and Karimi, 2011).

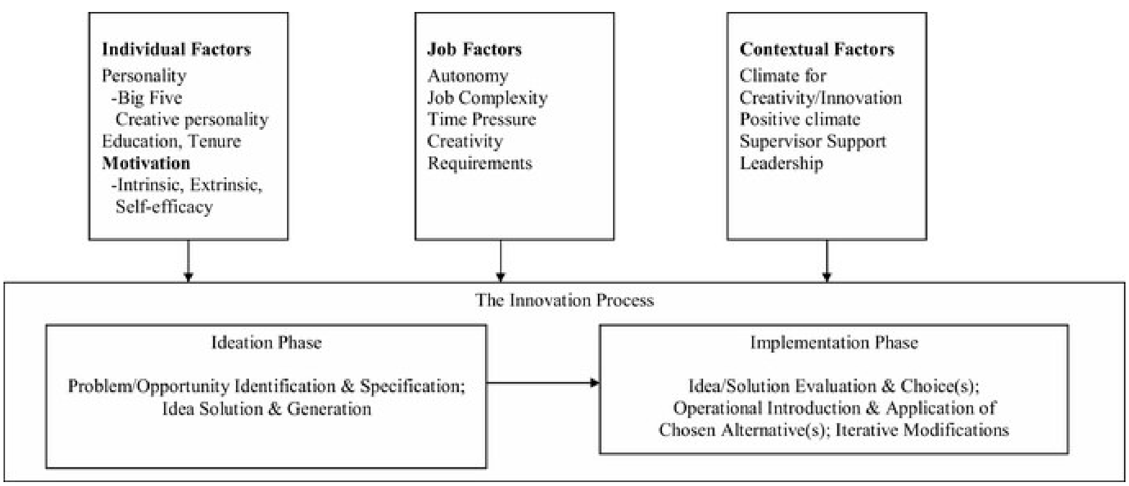

Figure 5 – Individual level contribution to innovation process (Almeida, 2011)

The key individual contribution was to increase the level of knowledge transferred through individual contribution, and hence increasing the intellectual capital of the company (Almeida, 2011). The higher individuals' ability is better individuals' contribution is to enhance the knowledge and increase organizations' intellectual capital. Researchers also argue that individuals are major vehicles of collaborating with other individuals with trust-building amongst individual being its major moderator (Almeida, 2011). On the other hand, research (Hammond *et al.*, 2011) suggests that individual creativity had a small relationship as a predictor of organizations' innovation performance. While individual creativity does not seem to directly influence innovation performance, researchers (Baron and Tang, 2011; Hammond *et al.*, 2011) argue that creativity has a moderating effect to innovation performance. Motivation was linked to have a positive relationship to creativity and innovation performance, and leadership was found to be supportive and motivating to boost individual level creativity and innovation performance (Hammond *et al.*, 2011). On the other hand, complex jobs seem to promote creativity and innovation. Complex jobs whose goals were designed to support innovation activities are related to a better individual support to innovation, suggesting that organizations should define jobs such that they contain a component of innovation as expectation of individual performance to stimulate innovation performance. Extrinsic motivation was also related positively to innovation performance, however in a smaller magnitude. Education or tenure at a firm do not seem to have a positive relationship to innovation performance (Hammond *et al.*, 2011).

2.6.2.4.2 Group Processes

Group level innovation process denotes a group innovating within a larger context of an organization. Researchers have typically tried to understand the group level innovation by observing inputs, process and outputs of a group working on innovation (Janssen *et al.*, 2004). Important distinction of a group level innovation is that group needs to share a common goal and values providing the team cohesion (West, 2014; Naranjo-Valencia *et al.*, 2011). Similar to the individual level process, knowledge transfer plays an important role to innovation performance as individual knowledge is integrated at the group level. When individuals in a group approach the knowledge process in a systematic and organized manner, attention is given to new knowledge, additional information is searched and integrated in a deliberate manner. Group level creativity is an aggregate of individual creativities and performances, as such groups are expected to be more creative and performant than individuals (De Dreu, *et al.* 2011). In the group context, innovation process of a group activity produces costs and benefits to innovation (Janssen *et al.*, 2004). Benefits of group level innovation process are identified as success of innovation, often resulting in group cohesion, group potency, group effectiveness and group openness to further innovation. As innovation requires a change, the group is required to align around clear objectives and to have a clear leadership. For example, if a group member suggests an idea that is not supported by the leader, it might case a friction within the group and inefficiency. Some group friction is expected as innovation is very likely to expose conflicts within the group. To improve group innovation performance, research (Schippers *et al.*, 2015) indicates that group reflection upon the previous innovation experiences is linked to increasing group innovation performance. Research (Somech and Drach-Zahavy, 2013; Miron-spektor *et al.*, 2011) also indicates that group composition consisting of aggregate personality traits, and group cohesion promote innovation performance. This indicates that well fitted and coherent team members working together are more likely to provide an aggregate of their creativity in turn positively affecting innovation performance. In support, researchers (Miron-spektor *et al.*, 2011) argue that creative and conformist members in a group are more likely to produce radical innovation, whereas group members attentive to detail are likely to hinder innovation performance. On the dark side of group innovation, unsuccessful group innovation leading to failure is often a result of lowered group cohesion and ineffectiveness, likely leading to resistance of future innovation. In such constellation unclear leadership and unclear objectives seem to be negative costs of the innovation process (Janssen *et al.*, 2004).

2.6.2.4.3 ORGANIZATIONAL PROCESSES

Observing innovation as an organizational process is perhaps one of the most studies viewpoints in the academic literature (Saunila 2017b; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007; O'Connor and DeMartino, 2006). Organizational business processes governing innovation are viewed as **innovation management**. This represents a procedural system that organizations need to implement and manage for the purpose of continuous and systematic delivery of innovative products and services to the marketplace (Khosravi *et al.*, 2019; Cerne *et al.*, 2016; Nieves, 2016; Desouza *et al.*, 2009; Gold, 2009; Pollard, 2009). Innovation process in organizations consists of value adding transformations between components of the innovation system (Albats *et al.*, 2019; Boukamel *et al.,* 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007; Sirkin, 2007; O'Connor and DeMartino, 2006; Stalk 2006) – representing the *innovation value chain*, comprised of the following individual links:

1) **Idea generation and capture** (search, discovery, creation, capture)
2) **Project selection** (conversion of ideas to projects)
3) **Innovation development** (project development and implementation)
4) **Taking to markets** (diffusion - dissemination and commercialization of innovative products and services in the marketplace; capturing economic benefits)

Each link in the innovation process adds innovation value into the system until the final outcome of innovation and its recognized value to the organization is captured (Albats *et al.*, 2019; Boukamel *et al.,* 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007). To evaluate a capacity of an organization to innovate, the innovation value adding capacity of each link within the innovation value chain should be evaluated in order to understand the strongest and weakest links. By focusing on improving the weakest link within the innovation value chain the organization's capacity to innovate is most likely to increase (Santa *et al.*, 2019).

Geissdoerfer *et al.* (2016) expand the innovation process by detailing the ideation link to concept design and detailing the conversion link to detailed design. Concept design has two sub-categories: concept design and virtual prototyping with the goal of rapid prototyping and a fast delivery of proof of concept. Detailed design has three sub-categories: experimenting, detailed design and piloting with the purpose of developing an innovation in an agile manner and piloting it in the marketplace as soon as possible. This approach is aligned with the modern software development methodologies based on agile software delivery with short development lifecycles based on rapid prototyping and validating models before investing further in development (Scrum.org, 2017; Stray *et al.*, 2016). This approach is believed to be more effective in saving time and investments as with a working prototype early on and testing it in the marketplace, a quicker feedback on the product adoption by the market and any needs to adjust the product is obtained before deciding to invest in a full-scale product.

2.6.2.5 Locus of Innovation

Academic research typically observes the locus of innovation process as a closed process within a single firm (Felin *et al.*, 2014; Chiaroniet *et al.*, 2010; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007; O'Connor and DeMartino, 2006). In case of the closed innovation process, a novelty is developed within a firm only (e.g. firm internal product or service development). On the other hand, in the case of open innovation process, innovation is fostered though a close interaction of organization with its environment and external organizations (West and Bogers, 2017; Felin *et al.*, 2014; Chiaroniet *et al.*, 2010; Santos and Eisenhardt, 2005). In such case, interaction between a company and its environment can take multiple directions – inbound and \ or outbound flows and exchanges of inputs and outputs related to innovation activities (Lichtenthaler, 2011). Researchers (Felin *et al.*, 2014) argue that certain types of innovation problems are best addressed by different types of governance - either closed or open innovation. The optimal type of governance is dependent on the nature of innovation problem to be solved. In case that the innovation problem requires access to a wider network of knowledge and resources, and especially in case of customer or community driven innovation, open innovation is recommended as innovation governance type.

2.6.2.5.1 Open Locus (Open Innovation)

Open locus of innovation, or open innovation represents a concept in which organizations form close interactions with its environment and external organizations in order to freely exchange knowledge amongst other organizations in an open process (West and Bogers, 2017; Felin *et al.*, 2014; Chiaroni *et al.*, 2010; Almeida *et al.*, 2011; Santos and Eisenhardt, 2005). Open innovation is how organizations expand their innovation efforts outside of their boundaries (West and Bogers, 2017). Open innovation effectively denotes sourcing markets (customer, community, partners), rather than internal organizational hierarchies to source and develop innovation (Felin *et al.*, 2014). The concept of open innovation is therefore relevant in understanding interorganizational knowledge transfer to innovation outcome. Adopted synthesised (West and Bogers, 2017; Felin *et al.*, 2014; Lichtenthaler, 2011) view of open innovation is defined as follows:

Definition of open innovation (adopted by this study)

Open innovation is a systematic exploration and exploitation process of freely exchanging knowledge outside boundaries of organization involving sourcing markets rather than internal organizational hierarchies to source and develop innovation.

Participating organizations freely contribute their knowledge, although such knowledge can be organization's proprietary IP[7]. Organizations enter into a free exchange of knowledge as they believe that knowledge generated jointly in a group will have a much larger benefit to the innovation outcome to its members, compared to protecting and using the knowledge just for themselves (Almeida *et al.*, 2011; Almirall and Casadesus-Masanell, 2010). Researchers argue that larger number of strategic alliances between an organization and external entities positively affects innovation performance (Almeida *et al.*, 2011). Such strategic alliances provide access to knowledge otherwise not available to the organization and enhance innovation performance. In the open innovation process, interaction between a company and its environment can take multiple directions – inbound and \ or outbound flows and exchanges of inputs and outputs related to innovation activities (West and Bogers, 2017; Lichtenthaler, 2011). An example of inbound process of open innovation would be a company importing technology that will be used for development of its own novel products. Similarly, example of outbound process of open innovation is when a company supplies knowledge, resources, technology *et sim.* to other companies, in relationship with its own innovation processes. The relationship can be simultaneous, allowing for organizations to practice inbound and outbound exchange of inputs and outputs related to innovation activities. An example of this could perhaps be a two-way exchange of knowledge, a joint cooperation on an innovation project with other companies, *et sim.* Researchers (Felin *et al.*, 2014; Almirall and Casadesus-Masanell, 2010) argue that if a large network of external partners is available to a company, it is most likely better for the company to pursue the strategy of open innovation. In addition, researchers indicate that companies must have a capability to handle their external relationships in order to be able to benefit from open innovation as without this companies will not be able to tap into the potential of open innovation.

[7] IP – Intellectual Property

This is in line with knowledge absorption (Zou *et al.*, 2018; Kim *et al.*,2016; Burkhart and Piller, 2010; Madsen *et al.*, 2010; Keller, 2002) and desorption (Najafi-Tavani *et al.*, 2012; Lichtenthaler *et al.*, 2010; Oppat, 2007) theories arguing that organization from which knowledge originates needs to have developed desorption capacity in order to be able to disseminate knowledge, whereas the organization receiving knowledge needs to have an adequate knowledge absorption capacity in order to support a successful knowledge transfer.

2.6.2.6 Source of Innovation

Source of invention is important view of innovation as it addresses the aspect that innovation can be exploration – production of a novelty, and also exploitation – adoption of an existing innovation (Lee *et al.*, 2019; Blindenbach-Driessen and van den Ende, 2014). Organizations can utilize method of licensing to adapt inventions from others they could further use as a basis to produce an innovation of their own (Zou and Chen, 2019; Teece, 2018; Lemley and Feldman, 2016). Researchers (West and Bogers, 2017; Felin *et al.*, 2014; Chiaroni *et al.*, 2010; Santos & Eisenhardt, 2005) argue that open innovation – a free exchange of proprietary knowledge amongst organizations – is a process that strongly stimulates exploration – development of novelties. Strong R&D activity in organizations is usually related to exploration of innovations, whereas with lack of knowledge and R&D capacities, organizations are most likely to pursue adaption of existing innovations (Madsen *et al.*, 2010).

2.6.3 Determinants of Innovation

In attempting to understand factors influencing innovation performance, the third perspective found in the academic literature addresses determinants of innovation - individual factors that can be examined and regarded as predictors of the process and outcome views of innovation. Innovation performance is influenced through determinants of innovation – factors affecting the innovation outcome. Determinants of innovation are according to the academic research (Crossan and Apaydin, 2010; Smith, 2008) classified in the following three major categories:

- **Leadership**
- **Managerial Levers**
- **Business Processes**

Crossan and Apaydin (2010) argue that evaluating these three categories of innovation determinants will result in understanding the influence to two main dimensions of innovation – innovation process, and outcome of innovation as a result of the innovation developed through the process.

2.6.3.1 Leadership

Leadership is a significant determinant of innovation performance, as leaders help foster and carry through innovation in organizations (Watts *et al.*, 2020; Elrehail *et al.*, 2018; Ikeda and Marshall, 2016; Zacher and Rosing, 2015; Scase, 2009; Ailin and Lindgren, 2008). Authors argue that ability to manage innovation and to motivate employees are fundamental leadership characteristics in fostering innovation performance (Watts *et al.*, 2020; Ikeda and Marshall, 2016; Zacher and Rosing, 2015; Almeida, 2011). To support following behaviours, researchers (Arda, 2016) argue that authentic leadership build their legitimacy based on ethical foundations, respect and honest relationships. On the other hand, being an authentic leader does not necessarily seem to have an effect on innovation performance (Elrehail *et al.*, 2018). Organizations who have outperforming innovation outcome have leaders who place innovation as the central business objective (Ikeda and Marshall, 2016). It also seems that involvement of the top management (Zacher and Rosing, 2015; Scase, 2009; Yadav *et al.*, 2007), along with fostering creativity in organizations has a positive influence to innovation performance (Almeida, 2011; De Dreu *et al.*, 2011). Transformational leadership is argued to perhaps be the best suited for innovation performance (Watts *et al.*, 2020; Elrehail *et al.*, 2018) as innovation requires dynamic organizational change. As such, transformational leaders work with their teams to recognize changes needed for innovation success, and they work with their teams to transform the organization in a new direction believed to provide a better support for innovation outcomes. On the other hand, researchers (Zacher and Rosing, 2015) argue that instead of a single leadership approach, leaders should utilize ambidextrous leadership style of combining both open and closed leadership behaviours at the same time to positively influence innovation performance. In this context, open leadership are leadership behaviours are supporting follower behaviours stimulating the change. On the other hand, closed leadership behaviours reduce follower behaviours by taking corrective actions and specific measures.

2.6.3.2 Managerial Levers

Managerial levers represent enabling mechanisms managers use to implement and manage innovation processes in organizations; this is a dynamic process that transforms inputs to outputs and in accordance with the organizational innovation strategy. Academic literature on managerial levers and innovation indicates the following mechanisms utilized to manage innovation in organizations (Crossan and Apaydin, 2010):

- Mission, goals, strategy
- Knowledge management
- Organizational learning

- Organizational culture
- Structure and systems
- Resource allocation

Enablement of innovation processes in organizations starts with a design of innovation mission, goals and strategy – this enables managers to focus on designing and managing innovation process that will meet and execute their innovation and strategic objectives (Coltman *et al.*, 2015; Aversano *et al.*, 2012; Baker, 2011). Structure and systems levers represent organizational structure and design of systems for implementation of innovation in organizations (Anderson *et al.*, 2014). Resource allocation (Albats *et al.*, 2019; Anderson *et al.*, 2014; Ford and Paladino, 2013; Paladino, 2007) is an resource-based view of innovation, in the relationship of a management lever represents managerial process for allocation of resources to innovation project, as discussed earlier in this chapter. Researchers argue that company size (Khosravi *et al.*, 2019; Forés and Camisón, 2016) and structure (Anderson *et al.*, 2014), that is wealth of resources available to organization, is perhaps one of the most important levers affecting innovation performance. Careful utilization and optimization of resource allocation is linked to innovation performance in organizations (Ford and Paladino, 2013; Paladino, 2007). On the other hand, poor resource allocation and management of resources in organizations can lead to suboptimal innovation performance (Albats *et al.*, 2019; Ford and Paladino, 2013; Atuahene-Gima *et al.*, 2005). Perhaps one of the most important management levers affecting innovation performance is organizational learning and knowledge management (Khosravi *et al.*, 2019; Saunila, 2017a; Cerne *et al.*, 2016; Crossan and Apaydin, 2010; Alipour and Karimi, 2011; Murray and O'Mahony, 2007) – managers can implement different processes to foster knowledge creation, accumulation, recombination and reuse in order to enable innovation processes in organizations. Organizational culture represents a set of shared organizational values and beliefs amongst organizations' members that builds innovation culture (Aksoy, 2017). Shaping the organizational culture as influenced by management is yet another critical managerial lever in enabling innovation. Studies indicate that innovative organizational cultures positively impact innovation outcome (Aksoy, 2017; Naranjo-Valencia *et al.*, 2016; Turró *et al.*, 2014; Büschgens *et al.*, 2013; Svetlana and Jucevicius, 2011). Flexible (also known as adhocracy) innovation culture associated with traits such are creativity, freedom, and a risk-taking attitude is a culture with low resistance to change and was found to have a positive relationship to innovation performance (Aksoy, 2017; Naranjo-Valencia *et al.*, 2016). On the other hand, hierarchical culture associated with centralized decision making and a high degree of formalization is negatively associated with innovation performance (Naranjo-Valencia *et al.*, 2016; Büschgens *et al.*, 2013). Research also indicated that supporting entrepreneurship (also known as intrapreneurship) culture on organizations in which individuals are empowered as business owners of its innovative projects positively support innovation performance (Turró *et al.*, 2014). In that respect, managers should foster development of corporate cultures positively affecting innovation performance – generation of new ideas, collaboration, effective communication, supporting failure as a learning experience, creating a creative and stimulating work environment, *et sim.*

2.6.3.3 Business Processes

Business management processes (discussed earlier in the outcome view of innovations section) relate to managing processes in organization leading to innovation outcome, also known as *innovation management* (Khosravi *et al.*, 2019; Cerne *et al.*, 2016; Nieves, 2016; Crossan and Apaydin, 2010; Desouza *et al.*, 2009; Gold, 2009; Pollard, 2009). The innovation management processes in organizations relate to the following process activities:

- Project initiation,
- Decision making,
- Portfolio management,
- Development and implementation,
- Project management, and
- Commercialization.

Researchers (Albats *et al.*, 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007; Sirkin, 2007; O'Connor and DeMartino, 2006; Stalk 2006) agree that business processes in organizations need to be evaluated from the standpoint of innovation value chain – each of the procedural activities needs to be evaluated for its contribution to value added in producing an innovation. On the other hand, researchers (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Santa *et al.*, 2019; Zou *et al.*, 2018; Saunila, 2017a; Klewitz and Hansen, 2014) argue that a business management process rather needs to be observed from organizations' capacity to innovate in each link of the innovation value chain to increase innovation performance.

2.6.4 Integrated Frameworks of Innovation

Academic knowledge on innovation is fragmented in observing innovation through multiple facets without a consolidated view and lacking further theoretical direction (Khosravi *et al.*, 2019; Saunila, 2017a; Cerne *et al.*, 2016; Crossan and Apaydin, 2010; Xu *et al.*, 2007). Integrated frameworks of innovation found in the literature largely observe innovation as internal organizational process consisting of value-add chains (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Geissdoerfer *et al.,* 2016;

Dervitsiotis, 2011; Hansen and Birkinshaw, 2007) with various levels of details, in some cases including moderating factors as well.

Albats *et al.* (2019) view innovation process research innovation through four stages of innovation process consisting of: search (for an opportunity), selection (of projects), implementation and capture (commercialization), as shown in Figure 6. Researchers connect the first stage of search for an opportunity with triggers arguing there has exist a trigger initiating the innovation process. They argue these triggers can be either internal – team's ideas, intelligence, entrepreneurial ideas and external – market demand, market opportunities, and market turbulence. Both internal and external triggers of innovation are connected with knowledge exchange, either internal or external required as an input to the innovation process. This is aligned with market-oriented and resource-oriented view of innovation (Albats *et al.*, 2019; Chang *et al.*, 2014; Ford and Paladino, 2013; Janssen *et al.*, 2011; Nylund, 2008; Palmatier *et al.*, 2007) and knowledge transfer as one of the main drivers of innovation (Wang and Lam, 2019; Dolińska, 2015; Alipour and Karimi, 2011). Once innovation process has been triggered, companies are selecting which projects to work on and proceed with concept development in an agile manner. This approach is aligned with the modern software development methodologies based on agile software delivery with short development lifecycles based on rapid prototyping and validating models before investing further in development (Scrum.org, 2017; Stray *et al.*, 2016). In this phase as well, knowledge transfer as one of the main drivers of innovation is important for the process required for concept development. Researchers (Albats *et al.*, 2019) extend the knowledge-based approach in implementation and capturing commercial benefits with external expertise and resources obtained through a network of companies the innovative company is collaborating with. This is in line with theories of interorganizational knowledge transfer (Wang and Lam, 2019; Dolińska, 2015; Lichtenthaler *et al.*, 2010) and interorganizational relationships as drivers of innovation performance (Davis, 2016; de Faria and Lima, 2012).

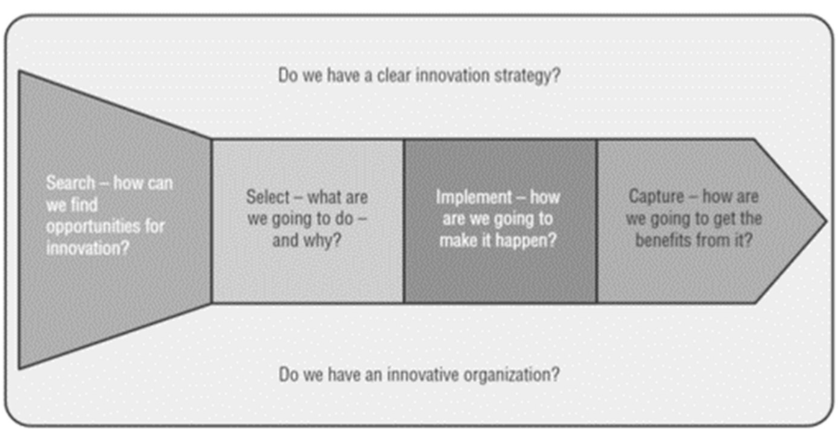

Figure 6 - Innovation process (Albats *et al.*, 2019)

Comparing Albats *et al.* (2019) model with an older model of innovation value chain Hansen and Birkinshaw (2007) shown in Figure 7, we can note a difference that conversion of ideas for development has been instead being a single chain Conversion is in newer models divided into two separate chains selection and implementation providing additional details for these two value-adding activities. While Hansen and Birkinshaw (2007) recognize importance of external knowledge transfer and collaboration (KT and IOR), it can be noted that newer model of Albats *et al.* (2019) extends influence of KT and IOR not only one chain, but all chains in the process, as moderators of the innovation process.

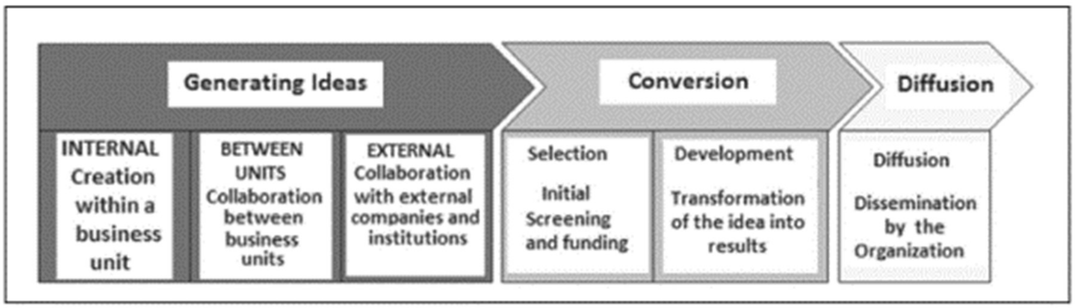

Figure 7 - Innovation value chain (Hansen and Birkinshaw, 2007)

Perhaps one of the rare attempts in the literature to connect all facets of innovation theories - process, outcome and determinants view and regulating moderators is shown with Dervitsiotis (2010) model in Figure 8.

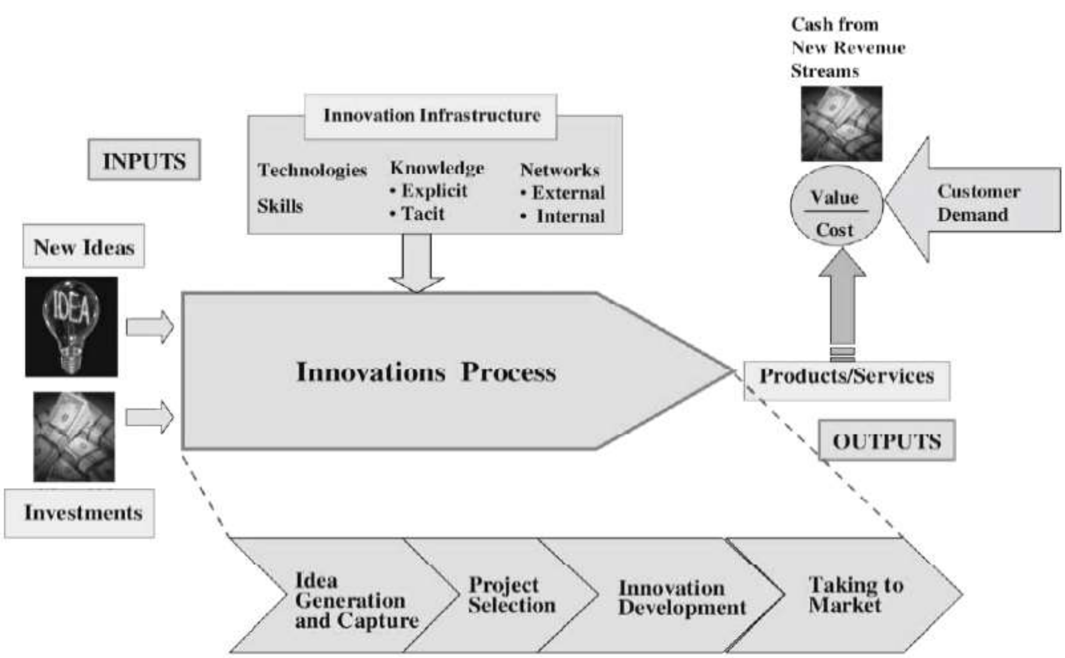

Figure 8 – Innovation System (Dervitsiotis, 2010)

This model describes the internal process of innovation development consisting of idea generation and capture, project selection, innovation development and taking innovation to the market. Outcome view of innovation is shown with outputs (products/services) and business value consisting of value and cost. The model also integrates a market-based view of innovation feeding customer demand as a regulator of innovation's performance. Determinants and regulating moderators of innovation process shown in Dervitsiotis (2010) model are shown as innovation infrastructure – resources needed (technologies and skills), knowledge (tacit and explicit - KT), access to networks (internal and external - IORs) and open and closed locus of the innovation process.

In its subsequent work Dervitsiotis (2011) extents its innovation model with antecedents of all four chains (idea generation, project selection, innovation development and market commercialization) of the innovation process as shown in Figure 9. Researcher argues that antecedents of idea generation phase of the innovation process are skills, education, knowledge and cultural background. Further, project selection antecedents are based on new opportunities, business strategy, business strategy and awards - denoting a market-based view to innovation and importance of knowledge transfer as main drivers of innovation performance (Wang and Lam, 2019; Dolińska, 2015; Alipour and Karimi, 2011; Lichtenthaler *et al.*, 2010). In the innovation development phase resources, prototyping, removal of bottlenecks, increase of process bandwidth and parallelization of operations are in line with agile software development (Scrum.org, 2017; Stray *et al.*, 2016) and process optimization theories. While other theoretical models of innovation process view it as a liner process, interesting different view of (2011) compared to other models is notion of parallelization of the process whereas activities can be executed simultaneously. In the final phase of the commercialization of innovation (taking to market), researchers include theories of marketing as in marketing the innovation to segmented and profiled customers, it plans for marketing investment and advertising promotion. In its model Dervitsiotis (2011) extends the typical model of innovation process with process optimization through parallelization and business marketing activities which are not expanded as such in other models.

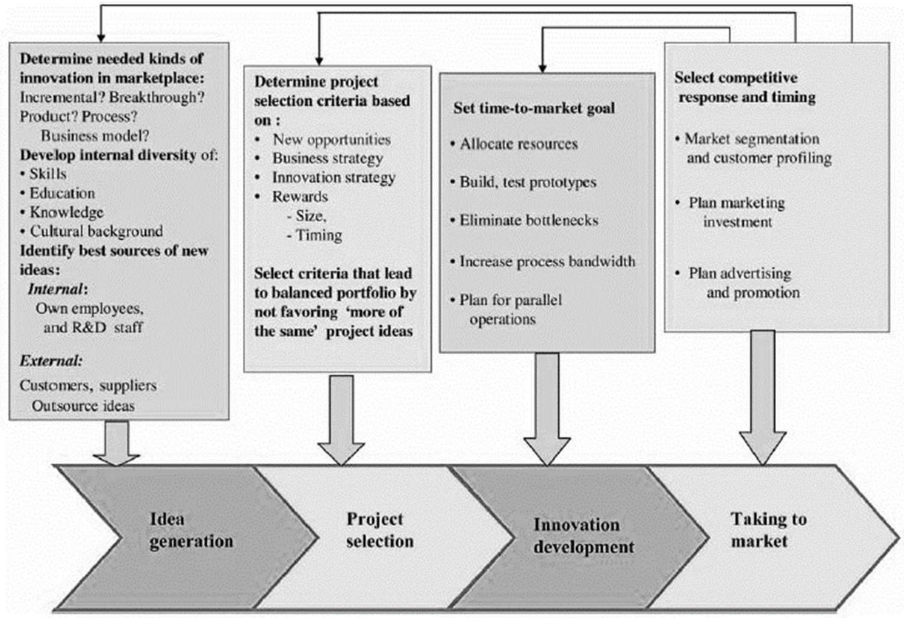

Figure 9 - Components of an innovation system (Dervitsiotis, 2011)

Geissdoerfer *et al.* (2016) revisit the models of innovation process by integrating several earlier models into a Cambridge Business Model Innovation process. The main change in this process is breaking down ideation into concept design and detailed design phases essentially further expanding in agile approach to software development in details as shown in Figure 10. Through proposed concept design, virtual prototyping and experimenting before actually investing into detailed design and piloting a project, researchers are applying an optimization model of agile development with fast iterative cycles whose main purpose is to quickly develop prototypes and test them in the market for two reasons – cost optimization and faster course correction. Through prototyping and piloting projects quickly and obtaining market feedback, companies can quickly react to the feedback and make course correction to their projects. This is in line with research (Ikeda and Marshall, 2016) arguing that outperforming companies are more agile in sustaining innovation momentum.

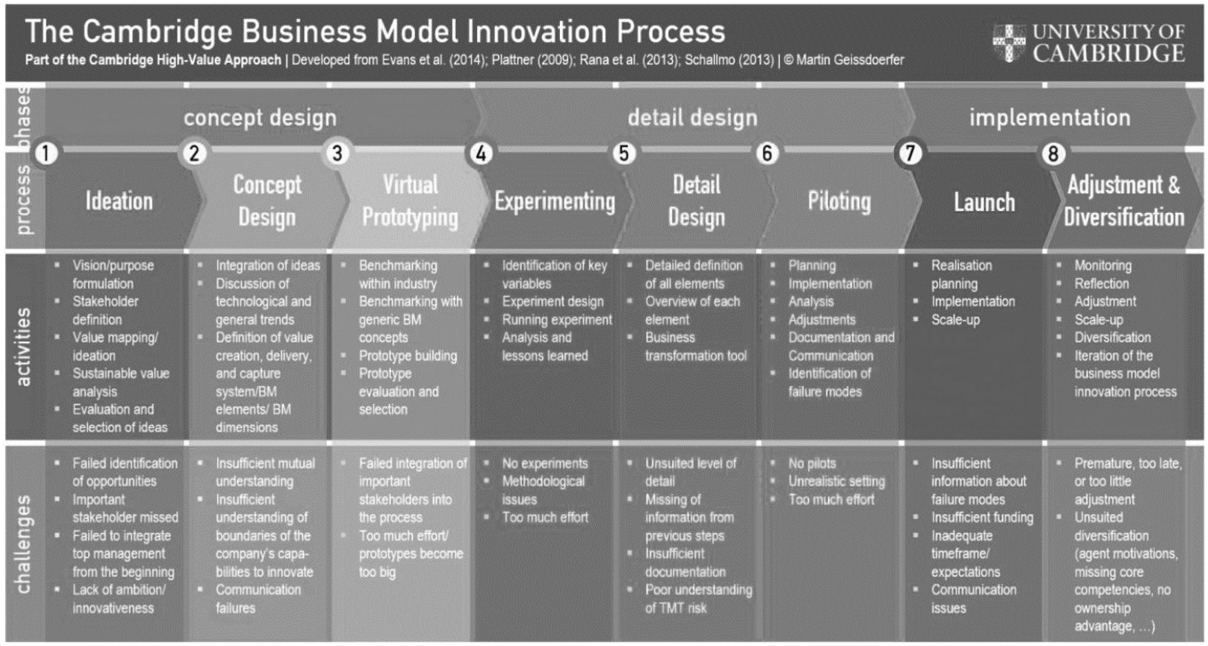

Figure 10 - The Cambridge Business Model Innovation process (Geissdoerfer *et al.*, 2016)

Researchers (Boukamel *et al.*, 2019; Santa *et al.*, 2019; Zou *et al.*, 2018) expand the traditional view of innovation process in organizations with factors attributing to development of innovation capacity. Boukamel *et al.* (2019) provide an integrated framework of innovation capacity based on the innovation process consisting of: definition, idea generation, idea selection, implementation and routinization which is in line with previously reviewed processes. These researchers argue that learning (KT – absorbing and creating knowledge), connecting (IOR – with internal and external actors), ambidexterity (balancing skills and resource between exploitation and exploration activities), risks (taking and supporting risks), leadership (motivating, empowering) and technology (transferring and adopting technology) are the main moderators of organizational innovation capacity. This research notes existence of individual and collective innovation capacities, while also recognizing importance of routinization – implementing behaviours improving innovation capacity as a regular process in organizations. This is in contrast with Albats *et al.* (2019) model implying that innovation is not a routine process but initiated by various internal (managers and teams' ideas, intelligence) and external triggers (market demand, market pressure).

Innovation process models (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Geissdoerfer *et al.,* 2016) discussed observe innovation as an internal organizational process connecting them with determinants and regulating moderators, however without clearly connecting them with outcome view of innovation. Understanding connection between the innovation process governing internal organizational dynamics and innovation outcomes is important as they are dependent upon each other – the process of how innovation is developed is related to the outcome of innovation (Lee *et al.*, 2019; Saunila, 2017a; Janssen *et al.*, 2011; Crossan and Apaydin, 2010). It seems that Dervitsiotis

(2010) innovation model is perhaps one of the most comprehensive models in the literature connecting various theoretical facets, and outcome with process view of innovation.

2.6.5 INNOVATION PERFORMANCE

Academic literature on measuring innovation effectiveness seems to be siloed into measuring inputs, processes, outputs and outcomes (Janssen *et al.*, 2011), and it is lacking a consolidated view and a research direction (Khosravi *et al.*, 2019; Saunila, 2017b). Fragmented view of innovation effectiveness suggests that some researchers view innovation performance as internal processes (Geissdoerfer *et al.,* 2016; Crossan and Apaydin, 2010; Smith, 2008; Paulson *et al.*, 2007; Adams *et al.*, 2006), while others (Janssen *et al.*, 2011; Dervitsiotis, 2010) view innovation performance externally as a set of inputs, outputs and outcomes noting that it is not always possible to observe and understand complexities of an individual organization.

Knowledge management seems to be at the core innovation theories as one of the most critical and major drivers of new knowledge generation and hence innovation (Khosravi *et al.*, 2019; Khosravi *et al.*, 2019; Saunila, 2017b; Cerne *et al.*, 2016; Alipour and Karimi, 2011; Crossan and Apaydin, 2010). Innovation activities seem to be supported throughout by corporate culture – a set of organizational values and beliefs fostering innovation environment and innovation output in organizations (Aksoy, 2017; Naranjo-Valencia *et al.*, 2016; Turró *et al.*, 2014; Büschgens *et al.*, 2013; Svetlana and Jucevicius, 2011). On the other hand, as it seems difficult to define and measure innovation from within organizations, some argue that organization's capability to innovate, i.e. *innovation capacity*, should be measured instead (Albats *et al.*, 2019; Santa *et al.*, 2019; Saunila, 2017a; Klewitz and Hansen, 2014; Dervitsiotis, 2010; Desouza *et al.*, 2009) as perhaps a better indicator if internal dynamics influencing innovation performance.

External view of innovation performance regards organization as a "black box" and suggests evaluating innovation performance through measuring inputs entering into the organization: resources – human resources, investments, *et sim.* in relationship with outputs gained – novel products, services, patents generated and outcomes in terms of revenue, profit, market share and customer satisfaction attained from innovation activities. While academic literature does not seem to indicate a consolidated view on how to externally measure innovation effectiveness, it seems that observing innovation performance in terms of revenue made from innovative products and services seem a common view (Zizlavsky, 2016; Janssen *et al,* 2011; Dervitsiotis, 2010) with some agreeing that customer satisfaction is also an important measure innovation performance (Zizlavsky, 2016;

Janssen *et al,* 2011). Dervitsiotis (2010) suggests a more comprehensive list of metrics that should be used for external evaluation of innovation performance:

- *"Speed to market (effectiveness of innovation value chain)*
- *Revenue captured versus revenue achieved from innovations*
- *Percentage of current revenue from innovations of the last two to three years*
- *Level of innovation project risk*
- *Risk versus return ratios*
- *Knowledge gained and retained"*

Some suggest that measuring number of new customers attained as a result of selling innovative products and services should be included (Zizlavsky, 2016), and some suggest that market share should be measured as well (Janssen *et al.*, 2011). It seems that external measures of innovation outcomes indicate measuring market-based success of innovation (Janssen *et al.*, 2011) which is in line with innovation theories supporting marked-based view of innovation (Albats *et al.*, 2019; Chang *et al.*, 2014; Ford and Paladino, 2013; Janssen *et al.*, 2011; Nylund, 2008; Palmatier *et al.*, 2007), typically supportive of service industries.

Researchers (Saunila, 2017b; Saunila and Ukko's, 2012) suggests that siloed measures of innovation effectiveness through the facets of inputs, processes, outputs and outcomes cannot be separated from one another and that they need to be integrated with the overall business performance measures to improve our observation of innovation performance in organizations. Attempt of such integration was proposed by Lee *et al.* (2019) suggesting synergies between product innovation, process innovation, organizational and marketing innovation to the firms' performance, see Figure 11.

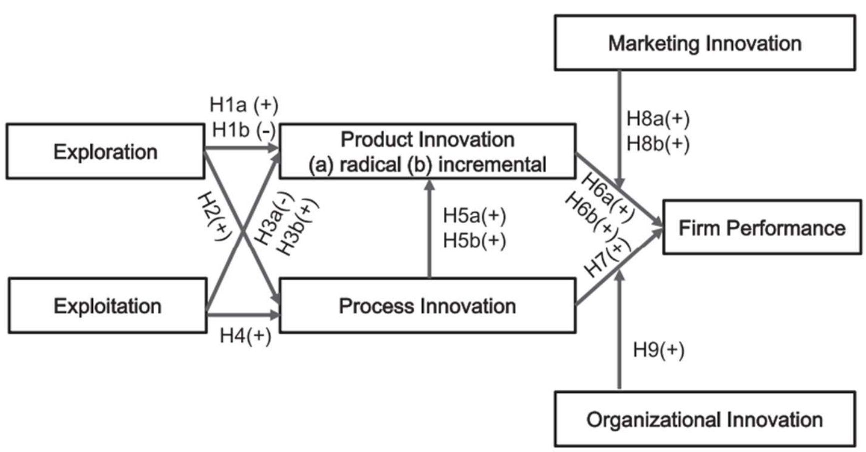

Figure 11 – Conceptual model of synergy effects of innovation on firm performance (Lee *et al.*, 2019)

Lee *et al.* (2019) argue that all forms of innovation (product, process, marketing and organizational innovation) should be observed together in a single model. These researchers found that technological product innovation can be enhanced with process innovation. Findings indicate that process innovation improvements are more likely to support development of radical innovation. They found a positive influence of ambidextrous approach in using both exploration and exploitation in a balanced manner for product and process innovation. Combined with marketing innovation and organizational innovation, researchers found stronger positive influence to organizations' performance. This especially seems to be the case for high technology companies whose firms' performance seemed to have the most impact from innovations in marketing.

2.6.6 Duality View of Innovation

Although underdeveloped topic in innovation literature, there exist evidence on existence of duality views of innovation through various aspects. Garud and Turunen (2017) recognize duality of innovation in the form of process and outcome, suggesting that one should not be observed without the other. Witell *et al.* (2015) recognize innovation as multidimensional on the level of involvement between individual, organization and society, and between duality of success or failure outcome of innovation. Li *et al.* (2018) recognize dual influence of both positive and negative influence of political and economic factors to innovation performance. Innovation theories also recognize ambidextrous (dual) view of innovation suggesting that companies can practice both market-view (exploration) and resource-based (exploitation) view of innovation at the same time (Lee *et al.*, 2019; Ford and Paladino, 2013; Lavie *et al.*, 2010).

Observed through the lens of traits and individual behaviours, trust was found to have a dual property, as it can be both positive (functional) and negative (dysfunctional) in interorganizational relationships and co-existing at the same time as two parallel processes (McEvily *et al.*, 2017; Thorgren and Wincent, 2011). Similarly, researchers (Zacher and Rosing, 2015) argue that instead of a single leadership approach, leaders should utilize ambidextrous (dual) leadership style of combining both open and closed leadership behaviours at the same time to positively influence innovation performance. In this context, open leadership are leadership behaviours supporting follower behaviours stimulating the change. On the other hand, closed leadership behaviours reduce follower behaviours by taking corrective actions and specific measures.

2.6.7 INNOVATION IN DEVELOPING COUNTRIES

In developing economies, such is SEE, economic growth seems to be fuelled by imitation of globally novel innovation – adopted innovation novel only at the industry or a national level (Madsen *et al.*, 2010). Research also indicates that the source of innovation in developing countries is typically a transfer of technology from developed and its adaptation in developing countries (Aggarwal and Madhavi, 2018; Edison *et al.*, 2013; Rivas and Gobeli, 2005). Regional and national level of innovation novelty seems to be a sufficient stimulus to the national productivity and growth in developing countries (Rivas and Gobeli, 2005). As such, developing countries require technology transfer primarily in stimulating their growth, rather than being at the cutting edge of globally novel innovation (Madsen *et al.*, 2010). On the other hand, there exist examples of global innovation being developed through multinational development centres present in satellite R&D offices (Blit, 2018). The aspect of development of globally novel innovation in developing countries is underdeveloped in the academic literature.

Investment in R&D activities in IT service sector in SEE is very low (less than 1% of GDP) according to the research of European Commission (EC, 2013). Due to the low R&D intensity, which is typically responsible for globally novel innovation, i.e. offensive and defensive innovation strategies, innovation that is expected to be typically found in the software companies in SEE is expected to be based on the imitation and dependant strategies. Research suggests that imitation strategy represents a strategy in which an existing innovation from developed countries is replicated in developing countries with some advantages, such is typically the cost-saving advantage (Aggarwal and Madhavi, 2018; Edison *et al.*, 2013; Freeman, 1989). In addition, this author argues that dependent innovation strategy relates to dependence on technology from developing countries and denotes importation of technology and adopting\customizing them for utilization in the local environment. Source of invention is important view of innovation as it addresses the aspect that can be exploration – production of a novelty never introduced before – typically production of global novelties, and also exploitation – adoption of an existing innovation – such is the case of innovation typical to developing countries (Lavie *et al.*, 2010). Strong R&D activity in organizations is usually related to exploration of innovations, whereas with lack of knowledge and R&D capacities, organizations are most likely to pursue adoption of existing innovations (Madsen *et al.*, 2010).

In developing countries, organizations can utilize method of licensing to adopt inventions that they could further use as a basis, or a component to produce an innovation of their own (Zou and Chen, 2019; Teece, 2018; Lemley and Feldman, 2016). Research (Kim *et al.*, 2016; Van Wijk *et al.*, 2008) indicates that knowledge transfer has to undergo transformation and adaptation. Kim *et al.* (2016)

note that “*innovation involves leveraging something old to create something new*” indicating that every change is an innovation. This supports a notion that knowledge transfer from developing to developed countries has to undergo transformation and adaptation representing a regional or country level innovation in developing countries.

Intensity of research, educational level and capacity to absorb foreign technology stimulate innovation activities and seem to have a profound effect on productivity growth of a developing country (Madsen *et al.*, 2010). The research was performed on a sample of 55 countries globally (out of which 23 OECD[8] and 32 developing countries) as a longitudinal study on data from 1970-2004 in pursuit of understanding the growth differences between various countries. Authors argue that developed countries, especially the OECD group, have achieved a significant productivity growth through R&D and innovation driven activities, whereas on the other hand countries of the developing world were achieving growth through imitation – transfer and adoption of foreign technology. In support, OECD Western Balkans reports (OECD, 2019) states that increase in innovation performance in non-EU countries seems to have an important impact to their GDP growing from only USD 8 billion in year 2000 to USD 46.9 billion in year 2016. In addition, OECD Competitiveness Report in SEE (OECD, 2018) indicates that ICT sector in SEE countries had a considerably higher growth rate and attribution to GDP than the average growth rate of ICT sector in EU.

Interaction between education level and technological frontier attainment is a significant factor decisively affecting outcome of growth in the overall sample. This is in relationship with research arguing that level of education of workforce is an important factor affecting the capacity to absorb technology – more complex technologies require more knowledge to adapt them (Santa *et al.*, 2019; Howitt, 2005). Developing countries have a great potential for growth through attainment of knowledge and investments in R&D, as further away the country is from the cutting edge innovation frontier (typically found in the developed countries), there is more for a country to learn, and as long as the country keeps investing in knowledge and intensifies R&D activities, the growth will be steady in bridging the gap towards the innovation frontiers (Madsen *et al.*, 2010). As developing countries come closer to the cutting edge of the innovation frontier – hence they’ve accumulated sufficient knowledge and R&D capacity, the factor of R&D intensity alone takes over and it is a predominant driver of growth in developed countries. This indicates that farther away developing countries are from the frontier of innovation they can achieve growth through transfer of foreign technology, adoption and imitation of such technology as a novelty on the regional\country level. However, as

[8] OECD - Organisation for Economic Co-operation and Development (OECD, 2011)

developing countries come closer to the frontier of innovation, they are on their way of transformation to developed countries in which R&D and globally novel innovations fuel the economic growth (Madsen *et al.*, 2010).

On the other hand, Nasrolahi *et al.* (2010) in their longitudinal research on factors influencing R&D activity in 40 developing countries from 1999-2008 argue that FDI[9] positively influences expenditure in R&D, and that technology importation negatively affects host country's R&D activities. Authors argue that one of the main channels of technology transfers from developed world to developing countries are through FDIs (foreign companies investing in a host country and transferring technology) and technology acquisitions from abroad (companies in developing countries purchasing technology from developed world). Positive influence of FDIs to R&D expenditure seems to be governed by increase in investments and technology transfer from developed countries to host countries in the developing world. On the other hand, it seems that acquisition of technology from developed countries negatively impacts development of own technologies in developing world. Authors have also found that amongst developing countries, Eastern European countries have a lower independent R&D compared to developing countries in Asia.

2.6.8 DARK SIDES OF INNOVATION

Research on the dark side of innovation has been underdeveloped in the literature (Anderson *et al.*, 2014). While innovation outcome is typically perceived from its positive benefits, innovation outcome can also be negative with unwanted consequences to organizations (Rosenbusch *et al.*, 2011; Lloyd, 2006), including high costs and negative financial performance (Janssen *et al.*, 2004). Dark side of innovation indicates that some events, such are negative work role evaluations and moods, and also experiences of conflict could provoke innovation attempts (Bledow *et al.*, 2013; Binnewies and Wörnlein, 2011; Janssen *et al.*, 2004). This could perhaps indicate that negative experiences provoke a need for innovation. Such changes are likely to cause psychological stress in employees as they require changes in job approaches, methods, job design, changes in employee expectations (Janssen *et al.*, 2004). Indeed, researchers (Hammond *et al.*, 2011) indicate that job description including innovation as an objective is likely to have a positive effect to innovation performance. On the other hand, researchers (Binnewies and Wörnlein, 2011) find a relationship between perceived job control and job stressors to have a negative influence to innovation performance. Innovative employees are also at risk of conflict with actors preventing changes required by innovation, and taking initiative can cause frustration, antagonism and animosity (Janssen *et al.*, 2004). Unsuccessful

[9] FDI – Foreign Direct Investment

group innovation leading to failure is often a result of lowered group cohesion, group ineffectiveness and resistance to future innovation. In such constellation unclear leadership and unclear objectives are negative costs of the innovation process (Janssen *et al.*, 2004).

Academic literature is scarce on observing innovation effectiveness through negative views, rather majority of literature focuses on positive outcomes of innovation effectiveness (Witell *et al.*, 2015). The lack of research in this area warrants further research in modelling both positive and negative sides to innovation with models including innovation processes, outcomes and determinants of innovation (Anderson *et al.*, 2014). The research on dark sides of innovation is not clear why some employees positively benefit from taking an innovative approach, and why some employees pay the costs of such actions (Janssen *et al.*, 2004).

While organizational culture is one of key determinants of innovation effectiveness, it can also be a barrier against innovation. In particular researchers (Naranjo-Valencia *et al.*, 2016; Büschgens *et al.*, 2013) found that hierarchy cultures with traits such are centralized decision making and a high degree of formalization, are negatively associated with innovation. Organizations whose culture supports stability in their thought or action have been associated with negative innovation effectiveness (Büschgens *et al.*, 2013). On the other hand, flexible (adhocracy) cultures with traits of creativity, freedom, and a risk-taking attitude is positively related to innovation performance.

Despite intellectual property positively affecting innovation performance, organizations who heavily rely and form their business models on capitalizing from intellectual property are found to negatively affect innovation performance. In particular, companies (aka patent trolls) who focus on build portfolios of patents for sale (or re-sale) of licenses as a business model, and do not focus on creating customer value are obstructing innovation and new knowledge generation through high licencing fees or blocking access to license technology (Teece, 2018). This in particular makes sense observing that Zou and Chen (2019) argue that more than 50% of products license various technologies across industries.

Rapid pace of innovation also seems to generate considerable waste. Witnessing larger than ever creation of various systems and technologies, it is questionable however if various systems are interoperable and can be integrated one with the other. Inability of technology to integrate with other systems results in diminishing returns and throwaway technologies (Teece, 2018). This has resulted in the convergence of several industries across common platforms, such are for example interoperable music and photo platforms attempting to address this issue.

2.7 THEORIES OF KNOWLEDGE MANAGEMENT

Organizational knowledge and organizational learning are one of the most crucial factors attributable to innovation performance as one of its major determinants from the managerial levers perspective of innovation theories (Khosravi *et al.*, 2019; Saunila, 2017b; Alipour and Karimi, 2011; Crossan and Apaydin, 2010; Madsen *et al.*, 2010; Lichtenthaler, 2011; Zhang *et al.*, 2010; Flynn, 2008; Liao *et al.*, 2007; Murray and O'Mahony, 2007; Prajogo, 2006; Tether, 2005; Nonaka *et al.*, 2001). Knowledge management (KM) represents a system for managing organization's collective knowledge (i.e. organizational knowledge) – design and implementation of a system that helps organizations identify, collect, accumulate, organize, adapt, apply, recombine and reuse knowledge – an activity resulting in creation of new knowledge (Ramani and Joy, 2011; Zhang *et al.*, 2010). Fibuch and Van Way (2011) define KM process in organizations as a process consisting of acting, monitoring, evaluating, planning and decision making, with the function of utilizing and transferring the knowledge in the organization by its employees. In order to study and better understand innovation one should observe how information and new knowledge is created and transferred in organizations (Nonaka, 1994). Organizational capacity to learn and generate new knowledge is fundamental to the organizational learning, performance and innovation (Khosravi *et al.*, 2019; Santa *et al.*, 2019; Camison and Villar-Lopez, 2014; Alipour and Karimi, 2011; Ramirez *et al.*, 2011; Nonaka *et al.*, 2000; Nonaka and Konno, 1998). In describing components of a knowledge management system, researchers (Nonaka, 2008; Spender and Scherer; 2007; Lee, 2000; Gold and Segars, 2001; Liebowitz, 1999) define KM system to consist of the following components:

- People
- Processes
- Technology
- Culture
- Structure

The most important component of a KM system are **people** who will be creating new knowledge (Girdauskiene and Savaneviciene, 2007; Spender and Scherer, 2007; Nonaka *et al.*, 2000; Nonaka, 1994). As such Nonaka (2008, 2001, 1994) argues on the importance of social interactions to knowledge creation. Knowledge creation process also plays a strong role in KM in organizations as the process governs creation and management of organizational knowledge (Fibuch and Van Way, 2011; Nonaka *et al.*, 2000; Nonaka *et al.*, 2008; Spender and Scherer, 2007). In order to support knowledge management system an information technology needs to be utilized to assist with storing, processing and retrieving knowledge (Ciabuschi *et al.*, 2011; Wu, 2010). As a factor ensuring successful KM in organizations, corporate culture supporting knowledge sharing has to be developed in organizations (Aksoy, 2017; Naranjo-Valencia *et al.*, 2016; Turró *et al.*, 2014; Büschgens *et al.*, 2013; Svetlana and Jucevicius, 2011; Yi and Begley, 2011; Nonaka *et al.*, 2008; Girdauskiene and Savaneviciene, 2007). Researchers (Van Wijk *et al.*, 2008; Nonaka *et al.*, 2008; Spender and Scherer, 2007) also argue there has to exist an appropriate organizational structure through which KM system shall be supported.

2.7.1 Organizational Knowledge

In explaining what knowledge is, the philosophical stance of epistemology defines knowledge as a *justified true belief*[10] (Moser, 2012; Bryman, 2012; Saunders, 2009; Hendricks, 2006). Researchers (Van Wijk *et al.*, 2008; Bhatt, 2002; Nonaka and Takeuchi, 1995) make a differentiation between individual and organizational knowledge – individual knowledge is known to an individual only whereas organizational knowledge is known to a certain group (e.g. organization). In order to understand the organizational knowledge, it has to be observed as a whole, rather than through individual knowledge pieces (Sherwat and Fallah, 2005). Nonaka (1994) in his Dynamic Theory of Organizational Knowledge Creation, which is perhaps one of the most regarded[11] organizational knowledge creation theories in the academic community, describes that knowledge starts with the information flow. Information by itself cannot be considered knowledge and Nonaka (1994) defines information as messages being relayed in an organization. According to the Knowledge Creation Theory, the nature of information can be syntactic and semantic; while syntactic denotes a particular value, semantic denotes a meaning and importance of a message and as such is important to the new knowledge creation. It is this type of information that is processed by individuals and through combining and analysing of such information an individual creates *new justified true beliefs*, hence new knowledge. This denotes that an individual **action** plays an important role in new knowledge creation. This view was further developed by Nonaka and Takeuchi (1995) defining organizational knowledge as: "*a dynamic human process of justifying personal belief towards the truth*". Multiple employees in an organization through interaction and exchange of information (i.e. Communities of Interaction or Communities of Practice) amplify this effect of new knowledge creation through **social interactions**, in turn creating organizational knowledge. This is also known as the ontological dimension of knowledge creation. Nonaka's (1994) theory further argues that it is this interaction between epistemological and ontological dimensions of knowledge creation that is responsible for new knowledge creation. Unlike the traditional Western epistemological view of the theory of knowledge[12] (Bryman, 2012; Audi, 2011) viewing knowledge as something "static", Nonaka *et al.*

[10] Philosophical stances of epistemological and ontological knowledge creation are discussed in methodology section of this thesis

[11] Cited over 24,000 times on Google Scholar – Feb-2020

[12] Epistemological philosophical stance creating, understanding and utilizing knowledge (Bryman, 2012; Audi, 2011)

(2000) consider knowledge to be context specific, relational, dynamic and human – believing that knowledge is made by people and interactions amongst people – providing a combined epistemological and ontological view at the knowledge creation.

The organizational knowledge creation process was further elaborated in Nonaka and Takeuchi's (1995) SECI[13] process model of organizational knowledge creation – illustrated with the Figure 12.

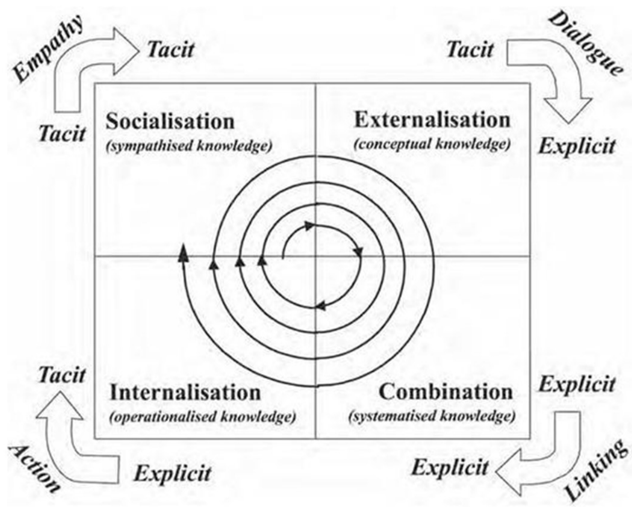

Figure 12 – The Knowledge Spiral – SECI process of knowledge creation (Nonaka and Takeuchi, 1995)

The premise of Nonaka and Takeuchi's (1995) SECI model is in attributing epistemological dimension of knowledge creation to explicit and attributing ontological dimension of knowledge to tacit knowledge. They explain that new knowledge is created through transformation of knowledge between tacit and explicit dimensions of knowledge. Tacit knowledge represents a knowledge that exists in one person's mind, knowledge that is specific to an individual cognitive process and its ability to process information. This is knowledge that is not formulated externally and that is difficult to transmit (Sherwat and Fallah, 2005; Nonaka and Takeuchi, 1995; Nonaka, 1991). Examples of tacit knowledge can be – individual skill sets, an idea or a formula that was thought of however not detailed or recorded. Due to its nature of not being completely formulated, codified and recorded, tacit knowledge is easy to lose, and it is very hard to understand or transmit over distances. When thoughts are written down and elaborated in an organized manner in a document, this process represents codifying tacit knowledge into external knowledge (Sherwat and Fallah, 2005; Nonaka and Takeuchi, 1995). Such codified and externalized knowledge when refined periodically can become a routine knowledge – for example a guide, a process, or a common knowledge. Nonaka and Takeuchi (1995) recognize that new knowledge is created through transformation of tacit to explicit knowledge and back to tacit knowledge for the new knowledge creation lifecycle – known as the

[13] SECI - Socialization, Externalization, Combination, Internalization

Knowledge Spiral. Each new knowledge cycle starts with a new high – it is based on the previous accumulated knowledge, allowing for the new knowledge to be created and grow on top of the existing organizational knowledge. These authors explain the knowledge generation model arguing that organizational knowledge exists as a tacit knowledge in minds of its employees. In order to become useful explicit knowledge that can be shared and applied in an organization, there has to be a conversion between tacit knowledge in employees to explicit knowledge. This process starts first with "socialization" – employees socializing, exchanging thoughts and ideas, which results in new thoughts and ideas – recognized as tacit to tacit knowledge transfer. In order for the tacit knowledge to be recorded and formalized, a process of "externalization" is recognized in which employees record the tacit knowledge, previously only known to them, into explicit knowledge (e.g. a document – known as conceptual knowledge). When the explicit knowledge recorded throughout the organization is compiled into a new document (e.g. a financial report consisting of information collected throughout the organization), then new knowledge is created through the process of "combination" – linking of tacit to explicit knowledge (known as systematized knowledge).

It is this type of knowledge that is useful to organizations as it can be applied and utilized – a collection of individual employee knowledge, first conceptualized, then systematized and operationalized for organization's routine use – i.e. new organizational knowledge (Alipour *et al.*, 2011; Sherwat and Fallah, 2005; Nonaka and Takeuchi, 1995; Nonaka, 1991). As the last step in the knowledge creation process, Nonaka and Takeuchi (1995) argue that operationalized explicit knowledge now routinely used in organizations adds to the existing employee knowledge and is internalized in employees into a new tacit knowledge, producing new thoughts and ideas. It is this transfer of the explicit organizational knowledge back to individual tacit knowledge that enables organizations to start the new knowledge cycle, and to build new knowledge upon the existing knowledge (a.k.a., the Knowledge Spiral).

The results of organizational knowledge creation are organizational knowledge assets representing its knowledge capital. One of the purposes of the KM is accumulation of knowledge assets in organizations for the purpose of generating an economic value from such knowledge assets (Gold and Segars, 2001). Such organizational knowledge assets are defined in four categories: experiential, conceptual, routine and systemic knowledge assets – being in line with the organizational knowledge creation process (Nonaka, *et al.*, 2000) – illustrated with the Figure 13.

Experiential Knowledge Assets	Conceptual Knowledge Assets
Tacit knowledge shared through common experiences • Skills and know-how of individuals • Care, love, trust, and security • Energy, passion, and tension	Explicit knowledge articulated through images, symbols, and language • Product concepts • Design • Brand equity
Routine Knowledge Assets Tacit knowledge routinized and embedded in actions and practices • Know-how in daily operations • Organizational routines • Organizational culture	**Systemic Knowledge Assets** Systemized and packaged explicit knowledge • Documents, specifications, manuals • Database • Patents and licenses

Figure 13 – Organizational knowledge assets (Nonaka *et al.*, 2000)

Nonaka *et al.* (2000) argue that experiential and routine knowledge assets are based on the tacit knowledge, whereas conceptual and systemic knowledge assets are based on the explicit knowledge. These researchers explain that experiential knowledge assets comprise of "experiences" – a tacit knowledge that is commonly shared amongst employees in an organization; these can be skills, know-how, trust, security, *et sim*. Routine knowledge assets represent tacit knowledge that is routinely embedded in daily employee activities. These can be daily operations know-how, organizational routine operations, and organizational culture. Conceptual knowledge assets are explained to denote knowledge explicitly articulated through language, symbols and images. These can be product concepts, designs and brands. The fourth category are the systemic knowledge assets denoting systematically organized explicit knowledge – these can be documents, specifications, databases, licenses, *et sim.* It should be noted that through Nonaka's (1994) theory of organizational knowledge creation and the knowledge spiral, the flow of organizational knowledge transfer changes forms between tacit and explicit, therefore denoting that organizational knowledge assets start with tacit knowledge assets – experiential and routine knowledge, and when converted to explicit knowledge they represent first the forms of conceptual and then systemic knowledge assets. It is the systemic knowledge assets that represent the end-goal of this process building and expanding the "mature" organizational knowledge assets from which new knowledge creation lifecycle can start with new tacit knowledge assets.

Numerous researchers (Alipour *et al.*, 2011; Soosay and Hyland, 2008; Murray and O'Mahony, 2007; Sherwat and Fallah, 2005) have supported and successfully tested Nonaka's and Tekeuchi's (1995) knowledge creation model confirming that knowledge is generated through transformation from tacit to explicit (externalization) and transfer from explicit (internalization) for the new cycle of knowledge creation. Alipour *et al.* (2011) agree with the original Nonaka and Takeuchi's (1995) research finding support that explicit knowledge is very important and useful for organizations, whereas the actual process of transformation of tacit to explicit knowledge is perhaps one of the most difficult tasks in the knowledge creation process. As such these researchers confirm that if an organization is poor in transferring tacit to explicit knowledge, it might very seriously impact ability of such organization to create new knowledge.

2.7.2 Knowledge Transfer

Knowledge transfer – of either tacit or explicit knowledge – plays a very significant role in creation of new knowledge – within a single organization through knowledge transfer between employees or departments of an organization (Van Wijk *et al.*, 2008; Bhatt, 2002; Nonaka and Takeuchi, 1995), and also external to the organization through interorganizational knowledge transfer between an organization and external entities such are partners, suppliers, customers and others (Zhou *et al.*, 2019; Kim *et al.*, 2016; Chen *et al.*, 2014; Van Wijk *et al.*, 2008). The knowledge transfer process consists of the sender of knowledge, recipient of the knowledge, and knowledge broker through which the knowledge is transmitted (i.e. brokered) from the sender to the recipient. Davenport and Prusak (2000) argue that the knowledge transfer process is an interaction between parties involved in the knowledge transfer. Knowledge brokers are entities that transfer knowledge from the sender to recipient and act as regulators of the transfer.

Fundamental aspect of innovation is "*making novel linkages and associations*" in creating new knowledge and further extending such linkages to transcend boundaries of a single organization (Kim *et al.*, 2016). Academic literature increasingly is recognizing that successful innovation performance relies on making links with external source of knowledge, transferring and using such knowledge for innovation purpose through Interorganizational knowledge transfer, and perhaps continuing cooperation with external sources of knowledge. Interorganizational knowledge transfer represents a concept of organizations seeking expertise beyond their corporate boundaries, even outside of national or regional boundaries, as such it is very important for innovation and competitive advantage (Zhou *et al.*, 2019; Kim *et al.*, 2016; Chen *et al.*, 2014; Lichtenthaler *et al.*, 2010; Huggins and Johnston, 2009). Theories of interorganizational relationships argue that organizations form relationships with other organizations for economic benefit or when they are missing a certain capability on their own (Parmigiani and Rivera-Santos, 2011; Bergman and Maier, 2009). This is in line with innovation theories that companies form relationships with other organizations for the benefit of access to external knowledge, achieving cost effectiveness and access to human resources (Santa *et al.*, 2019; Wang and Lam, 2019; Dolińska, 2015). Interorganizational relationship forming for the benefit of innovation is also in line with the RBV view of innovation (Albats *et al.*, 2019; Ford and Paladino, 2013; Paladino, 2007) as access to knowledge, human resources and inputs required relates to a relationship driven by the need for additional resources. In this context, knowledge can also be considered a resource exchanged amongst organizations. Such exchange of knowledge amongst organizations for the benefit of innovation is in line with the innovation theories of organizational knowledge creation (Alipour and Karimi, 2011; Lichtenthaler, 2011; Crossan and Apaydin, 2010; Madsen *et al.*, 2010; Zhang *et al.*, 2010) arguing that knowledge transfer, its adaptation and reuse is one of the most important contributors to the new knowledge creation. Interorganizational knowledge transfer enables access to a wider knowledgebase (i.e. knowledge of external organizations) and is needed by the organization in order to be able to meet the challenges of the increasing pace of global competition (Wang and Lam, 2019; Zhou *et al.*, 2019; Dolińska, 2015; Chen *et al.*, 2014; Hohberger *et al.*, 2015; Easterby-Smith *et al.*, 2008).

Companies who seek knowledge outside of the organizational boundaries are more likely to have a much broader knowledge base compared to companies who seek knowledge only within its organizational boundaries (Easterby-Smith *et al.*, 2008; Drejer, 2008). Access to a broader knowledgebase and collaborative interorganizational relationships with external entities result in increased innovation performance (Wang and Lam, 2019; Dolińska, 2015; Hohberger *et al.*, 2015; Lichtenthaler *et al.*, 2010; Palmatier *et al.*, 2007). Synthesized definition (Chen *et al.*, 2014; Easterby-Smith *et al.*, 2008) of **interorganizational knowledge transfer** is defined as:

Definition of interorganizational knowledge transfer (adopted by this study)

Knowledge sharing in which organization leverages information assets from various external organizations and learns from the experience of other organizations.

Van Wijk *et al.* (2008) argue that intra-organizational knowledge transfer contributes predominantly to organizational performance, whereas interorganizational knowledge transfer contributes predominantly to innovation performance denoting importance of IORs to innovation. This seems to be especially pronounced in a network relationship, as Phelps (2010) believes that interorganizational relationships are fundamental to the performance of organizational network as intensive knowledge sharing contributes to the increased innovation network performance.

2.7.3 Direction of Knowledge Transfer

Interorganizational knowledge transfer can take a form of one-way (unidirectional) transfer consisting only of a pair of organizations – knowledge being sent from the sender organization to the receiver organization (Bhatt, 2002), and also the form of two-way (bidirectional sharing) between the two, or multiple organizations in a network in which organizations act as both receiver and senders of knowledge, hence denoting a collaborative relationship (Lichtenthaler *et al.*, 2010). The inbound technology transfer denotes that organization is receiving knowledge from an external source, whereas outbound technology transfer denotes that organization is transmitting knowledge to an external recipient. Lichtenthaler *et al.* (2010) argue that outbound technology transfer typically takes a form of technology licensing, citing an example of P&G[14] accounting for over 50% of its innovation related revenue to outbound technology transfer. Authors note that companies are less likely to transfer technology within its own industry, describing such behaviour as a fear of losing competitive advantage due to the transfer of proprietary knowledge to their direct competitors. However, the research indicates that companies are more likely to transfer technology to organizations in other industries, as they believe that there is no threat of a direct competition. Interorganizational knowledge transfer influences knowledge creation in the same manner as described with the SECI model (Chen *et al.*, 2014; Sherwat and Fallah, 2005), indicating transformation of knowledge from tacit to explicit and also internalizing knowledge from explicit to tacit to start the new knowledge creation cycle. Similar to Nonaka's (1994) theory of organizational knowledge creation, Sherwat and Fallah (2005) have observed a difference between individual tacit knowledge (i.e. employee knowledge) and organizational knowledge in interorganizational knowledge transfer. However, it should also be noted that interorganizational knowledge transfer is difficult to manage as only a part of the knowledge is internal to organizations – the tacit knowledge related to implicit experiences is retained within a group of individuals, as such posing challenges to organizations on how to effectively manage and interorganizational knowledge transfer (Chen *et al.*, 2014; Borgatti and Foster, 2003).

2.7.4 MOTIVATING FACTORS OF KNOWLEDGE TRANSFER

Zonooz *et al.* (2011) argue that successful knowledge transfers along with the knowledge combinative capacity – a capacity to combine new and existing knowledge into new knowledge are main attributes fostering organizational knowledge creation and therefore positively influence innovation outcome. Researchers further argue that this capacity is a function of motivation, opportunity and ability to share knowledge. Researchers (Zonooz *et al.,* 2011; Burgess, 2005; Chen, 2004; Davenport and Prusak, 2000) argue that if there exist motivating factors for knowledge sharing, there will be a greater likelihood of a successful knowledge transfer. Davenport and Prusak (2000) argue that in order for knowledge to be transmitted, the sender of knowledge needs to be motivated and have a reason to transfer knowledge. On the other end recipient of knowledge has to have a need and a motivation to receive the knowledge. They explain such motivation for knowledge sharing as relationships analogous to a seller and a buyer – the sender of the knowledge needs to have a valuable

[14] P&G – Proctor and Gamble

knowledge to disseminate (sell) and recipient of knowledge has a need to receive (buy) such knowledge. Burgess (2005) has found that knowledge is more likely to be shared outside the immediate work environment if there exist motivating factors for sharing such knowledge, whereas if there was a perception that knowledge should be shared due to reciprocity amongst groups, the knowledge was less likely to be shared.

2.7.4.1 Tacitness, Specificity and Complexity of Knowledge

Knowledge transfer is dependent on the aspect and characteristics of knowledge being transmitted (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011; Van Wijk *et al.*, 2008). Researchers argue that knowledge transferred can be ambiguous or context dependent (Qile *et al.*, 2011; Van Wijk *et al.*, 2008), and also simultaneously both ambiguous and context dependent (Williams, 2007). Van Wijk *et al.* (2008) outline that knowledge ambiguity (not to be mistaken with encoding-decoding issues) is one of the biggest challenges in organizational knowledge transfer and as such making it hard to communicate, interpret and absorb the knowledge. This is in line with Nonaka and Takeuchi's (1995) Dynamic Theory of Organizational Knowledge Creation as ambiguous knowledge is associated with the tacit nature of knowledge. The level of the tacitness (i.e. ambiguity) of the knowledge seems to dictate the mechanism of the knowledge transfer. If the knowledge transferred is ambiguous, the rate of exact replication of such knowledge is found to be higher, whereas if the knowledge transferred is context dependent, its adaptation rate – modification and assimilation within recipient's environment - is found to be higher (Williams, 2007). This is in line with Windsperger and Gorovaia (2010) arguing that if knowledge is highly tacit, the most likely transfer mechanism is through personal interaction – seminars, workshops, meetings, *et sim*. On the other hand, if the knowledge is low in tacitness (i.e. more explicit) the transfer mechanisms are information based – e.g. through electronic communication, documents, databases, etc. Due to this dual nature of knowledge transferred being ambiguous, context dependent, or both, Williams (2007) suggests that companies through their KM strategy should evaluate the nature of knowledge being transferred in order to devise the best possible mechanism for either replication or adaption of knowledge in order to foster the successful knowledge transfer. Oppat (2007) argues that design of the transfer approach fosters successful knowledge transfer in organizations.

2.7.4.2 Systems of Meaning and Interpretation

Early research on the topic of knowledge transfer (Oppat, 2007, Argote *et al.*, 2003) was focused on knowledge transfer encoding-decoding issues (i.e. misunderstanding) in the knowledge transfer process. Sender transmitting messages has to encode information and the recipient of the message needs to properly decode the information being received in order for the information to be received and understood correctly, otherwise problems of miscommunication occur (Oppat, 2007). In order to ensure that encoding and decoding of information transmitted is successful, researchers (Van Wijk *et al.*, 2008; Davenport and Prusak, 2000) argue that successful knowledge transfer has to be accompanied with creation of a common language, such that parties transferring knowledge can understand each other and effectively transfer knowledge.

2.7.4.3 Channel Richness

The actual transmission of information and knowledge is executed through communication channels with various degrees of channel richness (Dinur, 2011). Rich information media seems to be fundamental in pursuit of exploratory innovation required for novel product development (Jarle Gressgård, 2011). Richness of information and its redundancy (repetitiveness) transmitted through KT is responsible for establishing of trust in a team (Jarle Gressgård, 2011). Using rich communication media helps reduce ambiguity in knowledge transfer, therefore enhances the performance of knowledge transfer (Windsperger and Gorovaia, 2010). Media Richness Theory (MRT) describes that lean communication medium supports transfer of lean information only (e.g. text and documents), whereas rich communication medium supports much more complex communication and it has to consist of the following four characteristics (Dinur, 2011):

1) Ability to transfer sound and visual information in addition to transferring written information – such are documents
2) Ability to use multiple languages of communication, including communication without words – written or verbal (e.g. through other means such as video\visual communication)
3) Transmission and receipt of a prompt two-way feedback, and
4) Ability for conducting a personal communication besides corporate or public communication.

Researchers have initially believed that the richness of the communication media used to transmit knowledge by itself dictates the richness of the transfer, however it was understood that it is the usage of the media and the type of information being transferred that actually dictates the richness of the transfer (Ferry *et al.*, 2001). It should be noted that a mere transfer of the knowledge from sender to the recipient does not necessarily constitute a success of the knowledge transfer. Researchers (Van Wijk *et al.*, 2008; Davenport and Prusak, 2000) argue that in order for the knowledge transfer to be considered successful, the recipient organization needs to utilize the received knowledge for its benefit, otherwise the knowledge transfer cannot be considered as successful.

2.7.4.4 KNOWLEDGE ABSORPTION AND DESORPTION CAPACITY

The capacity to absorb the knowledge received, known as knowledge *absorption capacity* - denoting acquisition and utilization of such knowledge is one of the crucial elements of a successful knowledge transfer (Zou *et al.*, 2018; Kim *et al.*, 2016; Zonooz *et al.,* 2011; Volberda *et al.*, 2010; Van Wijk *et al.*, 2008). The larger organizational capacity to more quickly absorb new knowledge increases the innovation performance (Burkhart and Piller, 2010; Madsen *et al.*, 2010; Lichtenthaler *et al.*, 2010). Knowledge absorption capacity (Zou *et al.*, 2018; Kim *et al.*, 2016; Zonooz *et al.,* 2011; Soosay and Hyland, 2008; Liao *et al.*, 2007) can be increased in time through active knowledge sharing, therefore through gaining experience on the knowledge transfer. Zonooz *et al.* (2011) provide support that antecedents of a knowledge absorption capacity are prior experience with the knowledge transfer and complementary knowledge – a contextual dimension of knowledge characteristics denoting transfer of knowledge that is compatible with the organization's existing knowledge. Organizational size, and therefore the larger its resources and a wider knowledge base positively influence knowledge absorption capacity and extend of the knowledge being transferred (Khosravi *et al.*, 2019; Forés and Camisón, 2016; Anderson *et al.*, 2014; Laursen and Salter, 2006; Gray and Meister, 2004). Researchers (Kim *et al.*, 2016; Shaker and Gerard, 2002) distinguish between potential and realized knowledge absorption capacity. They argue that potential absorption capacity represents the ability to acquire and assimilate knowledge, whereas realized capacity represents transformation and exploitation of knowledge. Shaker and Gerard's (2002) model of knowledge absorption capacity is illustrated with the Figure 14.

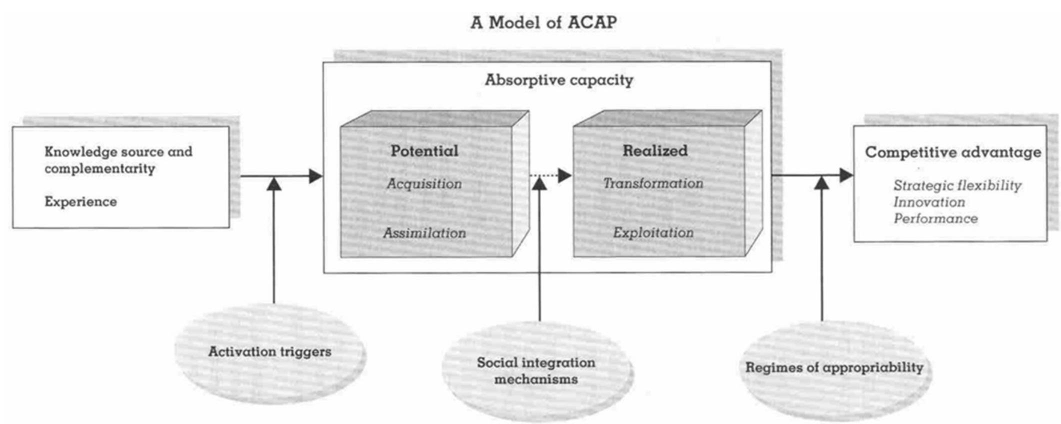

Figure 14 – Model of Knowledge Absorption Capacity (Shaker and Gerard, 2002)

The main premise of this theory is that not all knowledge absorbed in the organization through the process of acquisition and assimilation will actually be useful and exploited for the benefit of the organization. Both potential and realized capacities are important to the knowledge absorption capacity – organizations that are better in potential knowledge absorption capacity are most likely better in sustaining competitive advantage as they can reconfigure their resources for more successful acquisition and assimilation of the knowledge, whereas on the other hand organizations who are better in realized absorption capacity are better in innovation, as they are more successful exploiting acquired knowledge into products. Authors find that the mechanism of social integration is the main factor that facilitates the transformation from potential to realized knowledge absorption. Social integration is responsible for integration of the knowledge within the organization's employees through formal and informal transfer mechanisms. This is in line with Nonaka *et al.* (2000) who argue that new knowledge is created through acts of people, and it is stimulated through social relationships. Therefore, in order to increase the knowledge absorption capacity, organizations should implement formal and informal (Brennecke and Stoemmer, 2018) mechanisms of social integration of knowledge resulting in a better conversion of potential to realized knowledge absorption (Shaker and Gerard, 2002), and in turn positively influence innovation performance (Zou *et al.*, 2018; Camison and Villar-Lopez, 2014; Nonaka *et al.*, 2000; Nonaka and Takeuchi, 1995; Nonaka, 1994).

Researchers (Kim *et al.*, 2016; Najafi-Tavani *et al.*, 2012; Lichtenthaler *et al.*, 2010; Oppat, 2007) argue that besides knowledge absorption capacity, a capacity for outbound knowledge transfer – an ability of a sender to transfer its knowledge to recipients known as knowledge *desorption capacity* seems to be yet another crucial component of a successful knowledge transfer. Najafi-Tavani *et al.* (2012) argue that understanding the value of the knowledge being transmitted increases the knowledge desorption capacity. Oppat (2007) in his research on successful interorganizational knowledge transfer has focused on sender's knowledge desorption capacities. This researcher has identified several factors attributed to the successful knowledge transfer from the sender's perspective arguing that the sender of knowledge needs to be perceived as a valuable knowledge sender to attract and motivate receiver to receive the knowledge being transmitted. Similarly, sender needs to be very careful in selecting the knowledge to be transmitted, tailoring it to be compatible and useful for the recipient. Further, to avoid issues with decoding the knowledge, sender needs to focus on clear encoding of the knowledge transmitted, however at the same time focus on decontextualizing knowledge – making it as least ambiguous as possible. This is in line with (Van Wijk *et al.*, 2008) arguing that ambiguous knowledge is more difficult to transfer and absorb in the recipient organization. Oppat (2007) argues that to increase the knowledge desorption capacity, the sender needs to devise a careful transfer approach, invest closely in strengthening the relationships with the recipient of knowledge, and to also solicit feedback from the recipient on the value and experience of the knowledge transfer. Utilizing feedback in the communication implies utilization of a rich media (Ferry *et al.*, 2001) to improve knowledge dissemination capacities. Notion that knowledge transferred should be as least ambiguous as possible implies that it can be more easily transferred utilizing rich information media (Windsperger and Gorovaia, 2010), as such enhancing the performance of the knowledge transfer. Knowledge absorption and desorption capacity therefore govern the capacities of the sender and receiver of knowledge to be able to send and receive such knowledge. The larger this capacity is, the more likely is the success of a knowledge transfer (Zou *et al.*, 2018; Camison and Villar-Lopez, 2014; Burkhart and Piller, 2010; Madsen *et al.*, 2010; Lichtenthaler *et al.*, 2010).

2.7.4.5 IOR KT Specific Knowledge Absorption and Desorption Capacity

Knowledge absorption and desorption capacities (Zou *et al.*, 2018; Kim *et al.*, 2016; Zonooz *et al.,* 2011; Volberda *et al.*, 2010) positively influence interorganizational knowledge transfer (Lichtenthaler *et al.*, 2010). In transferring technology knowledge amongst organizations, research indicates that an obstacle to successful interorganizational knowledge transfer was a lack of marketing knowledge by highly technical companies wishing to license and disseminate knowledge (Lichtenthaler *et al.*, 2010). It was observed that companies who have a deep technical expertise wishing to license knowledge to organizations with a better capability to market and commercialize such knowledge have experienced difficulties due to the gap between their technical and marketing proficiencies. This indicates importance of knowledge desorption capacity and ability of senders to successfully market the value of their knowledge to potential recipients. Researchers therefore indicate that increasing company's marketing knowledge, hence deepening understanding on how to apply and commercialize their technology in various markets, is positively related to increasing their knowledge desorption capacity. It seems detrimental to interorganizational knowledge absorption capacity when organization practice predominantly closed innovation. Researchers (Kim *et al.*, 2016) argue that companies need to practice open innovation, but also alternate between cycles of closed and open innovation to increase absorption potential and realized absorption capacity. On the other hand, organizations receiving the knowledge utilize only what they need and adopt the received knowledge to their own circumstances and the environment (Zonooz *et al.,* 2011). This denotes that interorganizational knowledge transferred has to undergo a process of transformation and adaptation at the recipient side, which is in line with the theories of knowledge transfer (Brix, 2017; Van Wijk *et al.*, 2008). Therefore, it seems that knowledge absorption and desorption capacities are one of determinants of a successful interorganizational knowledge transfer (Zou *et al.*, 2018; Kim *et al.*, 2016; Lichtenthaler *et al.*, 2010; Chen, 2004).

2.7.4.6 Trust

Researchers (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011; Windsperger and Gorovaia, 2010; Heeseok and Byounggu, 2003) find support that trust positively influences successful knowledge transfer. Researchers (Jarle Gressgård, 2011) have found that in knowledge transfer process, using rich communication media can contribute to establishing trust in a team. Using rich communication media helps reduce ambiguity in knowledge transfer, therefore enhances the performance of knowledge transfer (Windsperger and Gorovaia, 2010). Trust is explained to relate to a belief that promise given by the partner shall be respected and obligations fulfilled. Trust is argued to enable successful knowledge transfer as it increases partners' willingness to cooperate (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011). Windsperger and Gorovaia (2010) have attempted to map influence of trust to the knowledge transfer mechanisms, however their findings were inconclusive that trust dictates personal versus informational knowledge transfer.

2.7.4.7 Shared Values

Researchers (Najafi-Tavani *et al.*, 2012; Naranjo-Valencia *et al.*, 2011; Yi and Begley, 2011; Donate and Guadamillas, 2010; Girdauskiene and Savaneviciene, 2007) argue that shared values amongst the sender and recipient in the knowledge transfer process is necessary to enable successful knowledge transfer. Najafi-Tavani *et al.* (2012) believe that shared values contribute to a better understanding of the value of knowledge being transferred therefore positively influencing the knowledge transfer in terms of communication and enhancing trust.

2.7.4.8 Corporate Culture

Researchers (Aksoy, 2017; Naranjo-Valencia *et al.*, 2016; Turró *et al.*, 2014; Büschgens *et al.*, 2013; Svetlana and Jucevicius, 2011; Van Wijk *et al.*, 2008) argue that knowledge-sharing culture positively influences knowledge transfer. Svetlana and Jucevicius (2011) in their research attempted to identify the core attributes of the knowledge culture in knowledge-intensive organizations. These researchers argue that main attributes comprising the knowledge-sharing culture are:

1) Symbols indicating importance of knowledge to the organization,
2) Shared attitudes, values, norms and beliefs, and
3) Basic assumptions for the success of a knowledge intensive organization.

Girdauskiene and Savaneviciene (2007) argue that systems and technology enable knowledge transfer, while soft skills, such as knowledge sharing corporate culture ensure knowledge transfer. These researchers have found that the knowledge aspect (level of ambiguity of knowledge transmitted) affects influence of the organizational culture to the knowledge transfer. They argue that if the knowledge being transferred has a high level of tacitness, the role of knowledge sharing organizational culture is greater. On the other hand, if the knowledge transferred is highly explicit, knowledge sharing organizational culture plays less of a role in success of the knowledge transfer. As such, they argue that knowledge sharing strategy has to be incorporated with the overall corporate strategy in order to ensure knowledge sharing in everyday employee tasks, and in turn creation of a knowledge sharing corporate culture.

2.7.4.9 ORGANIZATIONAL SYSTEMS AND IT

Function of organizational systems in knowledge transfer is to aid organizing, storing, transferring, retrieving and recombining knowledge. Information systems have revolutionized this process through enabling processing and manipulating of a staggering amount of information at extraordinary speeds. It should be noted that information by itself cannot be considered knowledge unless processed by individuals through combining and analysing such information to create *new justified belief*, hence new knowledge (Nonaka, 1994). Argote (2003) argues that information technologies and similar knowledge repositories positively affect knowledge transfer and retention in organizations. Van Wijk *et al.* (2008) argues that organizational systems facilitate knowledge transfer. Information technology support as a channel of transferring knowledge seems to positively influence transfer of knowledge regardless of the tacitness of knowledge (Ciabuschi *et al.*, 2011; Wu, 2010). This is perhaps because information technology can enable a large spectrum of communication channels of different richness (Wu, 2010). The richness of the communication channel was associated in previous research (Dinur, 2011) to be in relationship with the type of knowledge being transferred. Information technology also positively supports transfer of knowledge regardless if the knowledge is being transferred peer to peer (directly amongst organizations), or through a centralized communication channel - e.g. through a knowledge broker (Ciabuschi *et al.*, 2011). In implementing an information system supporting knowledge management in organizations, Alavi *et al.* (2005) believe that information technology tools can be successfully applied to both content and collaborative based information systems. They further argue that combination of the content and collaborative-based systems in a proper mix further enables the success of information technology support to knowledge management in organizations.

2.7.4.10 SOCIAL RELATIONSHIPS, SOCIAL CAPITAL AND ENTERPRISE SOCIAL CAPITAL

Researchers (Najafi-Tavani *et al.*, 2012; Van Wijk *et al.*, 2008; Argote, 2003) found that **socialization** greatly improves knowledge transfer as it improves the relationship between the sender and the receiver. Girdauskiene and Savaneviciene (2007) argue that organizational structure, information systems and communication channels alone will not ensure successful knowledge transfer as they are merely tools, while knowledge is transferred by people. This is in line with Nonaka and Takeuchi's (1995) theory of organizational knowledge creation arguing that new knowledge in organizations is created by actions of people. Brennecke and Stoemmer (2018) suggest that social relationships also provide informal communication channels between employees bridging gaps in organizations' formal communication structures, and hence improve knowledge transfer. This emphasizes the importance of social relationships to the successful knowledge transfer. Najafi-Tavani *et al.* (2012) found that shared values are positively associated with socialization. On the other hand, Dyer and Nobeoka (2000) argued that shared values emerge as a result of socialization. Social network relationships seem to be of a vast importance to tacit knowledge transfer, as through social capital information is exchanged and knowledge transfer between organizations is fostered (Borgatti and Foster, 2003).

Through social interactions in time the social relationships are strengthened, and social capital is built and accumulated. Social capital is defined as a sum of resources within a social network of people (or organizations) based on relationships of mutual recognition and trust that will allow one to draw a credit (favour) to achieve an action through such resources otherwise not possible (Berzina, 2011). Bordieu (1983) argues that social capital resources resulting from the social structure can be actual or virtual (tangible and non-tangible). This author also argues that social capital is a collectively owned capital within a social network. Berzina (2011) argues that social capital is a function or relationships made of connections amongst people and obligations to perform certain actions \ favours for each other. Coleman (1990) defines social capital as a function of social structure facilitating actions from people who are part of the social structure. Fukuyama (1999) defines social capital as being governed by a set of informal rules amongst the members of a social network facilitating cooperation amongst them. This author strongly believes that such cooperation is possible based on a strong trust amongst members of the social network. Berzina (2011) argues that social capital is built over time and it is a result of past activities. If not maintained, social capital will lose value over time. Bordieu (1983) argues that in some cases it is possible to convert social capital to economic capital. Similarly, Coleman (1990) equates social capital with other forms of capital. It should also be noted that social capital is not a public good, and outsiders are likely to be excluded from the access. As such, it is harder to build social capital through external interventions into a social network (Berzina, 2011).

Social capital is categorized into bridging and bonding social capital. Berzina (2011) describes bridging social capital as social linkages between homogenous social groups, whereas bonding social capital is described as social linkages amongst heterogeneous social groups. Each of these social groups forms a stronger or weaker strength of social ties. Brennecke and Stoemmer (2018) suggest that bridging social capital view provides better explanation for performance of knowledge transfer in knowledge intensive organizations than bonding social capital view. Researchers suggest that both individuals and groups benefit from stronger social ties – a higher number of connections (Brennecke and Stoemmer, 2018; Almeida *et al.*, 2011). Researchers also distinguish between there dimensions of social capital: relational, structural and cognitive (Van Wijk *et al.* , 2008). Relational dimension of social context denotes the relationship between actors, and it is governed by strength of relationships and trust amongst actors. Structural dimension of social context denotes pattern, linkage and connections amongst actors in a social network. Cognitive dimension of social context denotes resources in the relationships that provide shared interpretation, representation and systems of meaning. Van Wijk *et al.* (2008) have found that although all three dimensions of social capital are positively related to knowledge transfer, the dimension of relational capital seems to be the most influential amongst the three to the outcome of knowledge transfer.

Berzina (2011) makes a distinction between individual social capital and enterprise social capital – later consisting of internal and external social relationships enterprises invest into. Enterprise social capital can be the result of both formal and informal social interactions. Intent of the formal interaction is to intentionally boost organizational efficiency, whereas informal interactions result in pursuing different organizational aims or maximizing the utility. Enterprise social capital is divided further into internal and external enterprise social capital. Internal enterprise social capital denotes social relationships within organization's own boundaries, whereas external enterprise social capital denotes social relationships established between the organization and external entities. The author argues that external enterprise social capital can be further categorized into three types – production, environment and market related social capital, see Table 8.

Social capital internal to the enterprise	The enterprise's external social capital		
	Production-related social capital	Environment-related social capital	Market-related social capital
Links and relationships within the enterprise filled with attitudes, norms, traditions	Links and relationships to suppliers, products users, partners in cooperation and development	Links and relationships to the local and regional environment	General customer relations

Table 8 – Enterprise social capital – internal and external (Berzina, 2012)

Production related social capital denotes social capital built as links and relationships between the enterprise and external supply chain – suppliers, partners, cooperates and product users. Environment related social capital denotes capital built as links and relationships between the local and regional environments. Market related social capital denotes capital built as links and relationships between the enterprise and its customers (Berzina, 2011).

2.7.4.11 COMMUNITIES OF PRACTICE (CoP)

Communities of Practice (CoP) are freely formed and unmanaged communities allowing professionals to exchange thoughts, ideas and best practices from their professional lives amongst each other. CoPs are recognized as perhaps one of the best social learning systems to hold, transfer and create new knowledge (Roberts, 2006; Wenger *et al.*, 2000). The concept of CoPs was first introduced through the work of Lave and Wenger (1991) in a research on situated learning identifying it as a system of relationships amongst people. This work was further extended by Wenger (1998) who has developed a comprehensive understanding of CoPs defining it as social interactive dimension of situated learning. According to Wegner (1998) the systems of meaning in knowledge transfer in CoPs are negotiated through its members' participation. Due to the members having similar backgrounds and experiences, the meanings are more effectively communicated than compared to other knowledge transfer systems amongst groups with non-related experiences. Wegner (1998) defines three relational dimensions responsible for coherence of CoPs – mutual engagement (responsible for establishing norms and social relationships), joint enterprise (members are bound together as they are a part of the same enterprise) and shared repertoire (common interests, language, routines, *et sim.*). In his later work, Wegner (2000) identifies three modes of the sense of belonging to CoP as a social learning system: engagement: members engage into discussions and work together, imagination: brainstorming and exchange ideas amongst members, and alignment: aligning members' activities with other organizational processes.

Researchers argue that the reason as why CoPs are very effective in transferring and creating new knowledge is due to a more effective systems of common meaning - members with the similar background and experience are likely to more easily understand assumptions and implicit knowledge. Further, members of CoP have established common trust and a common shared interest in their practice that is positively related to knowledge sharing (Krishnaveni and Sujatha, 2012). These characteristics are allowing CoPs to be more effective in externalizing and internalizing knowledge – transferring their experiences through discussions and brainstorming sessions from tacit to explicit knowledge, and vice versa (Roberts, 2006; Wenger *et al.*, 2000). This approach is very much in line with Nonaka and Takeuchi's (1995) SECI model of organizational knowledge creation arguing that human interactions are a central component of new knowledge creation through externalization and internalization of tacit and explicit knowledge – which is something CoPs are achieving very effectively through their interactions (i.e. mutual engagement, joint enterprise and shared repertoire, as per Wegner, 1998).

Some CoPs are of course more and some less effective than others. Wegner *et al.* (2000) have looked into this issue and has found that although communities of practice are freely formed and unmanaged, the more effective ones still require non-traditional leadership in order to be setup and maintained. These authors recognize that informal communities already exist in each organization due to which they suggest managers need to recognize them in order to help them come out. It should be noted that CoPs by their definition of being freely forming communities cannot be formed by the management, their existence can only be recognized by them (Roberts, 2006). For example, CoPs can emerge as subject matter experts working on a certain project come together to exchange their knowledge. It should also be noted that some communities actually might not be aware of their existence as a community (Wegner, 1998). This is why once a community is freely formed managers need to recognize their existence and assist it to come out. In order to support growth of CoPs managers need to provide appropriate infrastructure within their organization to help them function – for example a place where CoP meetings will take place, and any other office material and infrastructure they would need. Further, the authors argue that managers need to recognize and promote work of CoPs throughout the organization in order for them to thrive.

On the other hand, Roberts (2006) argues that CoPs are not always the most effective knowledge management tool due to their limit in power. This author argues that power is essential in achieving a goal, as such CoPs being loosely formed without a specific leader have a limitation of how much they can achieve. Further, the author argues that CoPs have a limited size and spatial reach, which limits their ability in effectiveness of knowledge generation and transfer. Similarly, Hislop (2003) argues that effectiveness of a single CoP to innovation performance is arguable. This author argues that knowledge by itself is specific and that focus of each of CoP is very specialized and narrow. As innovation requires a wider access to and recombination of knowledge, Hislop (2003) argues that effectiveness of innovation through CoPs can only be achieved through interaction between "communities of communities" (a joint interaction of several CoPs together). Hislop (2003) believes that each organization consists of several communities of practice, and that these CoPs working together – either internally within a single organization, or externally with other organizations – are jointly responsible for innovation generation. In support, Soekijad *et al.* (2004) in their empirical study have showed that interorganizational CoPs consisting of multidisciplinary members can in fact function well and produce innovative solutions to real life problems. This is in line with theories of innovation arguing that joint collaboration in a network of partners is positively related to innovation outcomes (Almirall and Casadesus-Masanell, 2010).

2.7.4.12 ONLINE SOCIAL NETWORKS

Researchers (Ljepava *et al.*, 2013; Meyer, 2010) argue that online social networks (i.e. information technology supported social networks) attribute to strengthening the real-life social interactions. Meyer (2010) has explored utilization of information technology social networks in collaboration and exchange of knowledge as a tool of fostering innovation. Researcher discusses influence of social software in support of innovation activities, arguing there is a positive influence of social software to innovation. Author argues that findings of his research indicate that service companies who use social software are more likely to innovate than companies who do not use social software. In addition, researcher argues that service companies having a large number of employees and young companies from the sample were more likely to innovate than others. Furthermore, the author argues that the study was targeted at service companies noting there are differences in how service sector companies innovate vs. manufacturing, discussing that knowledge management is a much more crucial component fostering innovation generation in services compared to the manufacturing sector. Ljepava *et al.* (2013) provide insight into psychological personality traits of online social network users versus non-users finding that non-users of online social networks have a tendency of demonstrating weak real-life social relationships, contrary to the users of online social networks demonstrating a tendency towards strong real-life social relationships. Therefore, these researchers provide an insight that participation in online social networks is related to the existing real-life social networks, indicating that online social networks amplify the effect of existing social connections.

2.7.4.13 PARTNER TYPE WITHIN KNOWLEDGE NETWORKS

Partner type within organization's knowledge network seems to influence interorganizational knowledge transfer. Research (Chen, 2004) indicates that partnership types based on contract alliances are more likely to transfer explicit knowledge, whereas equity-based alliances were more likely to transfer tacit knowledge. This indicates that a closer type of relationship and motivation to exchange knowledge based on the specific partnership type influence outcome of the interorganizational knowledge transfer (Parmigiani and Riviera-Santos, 2011). Research (Kim and Park, 2010) also indicates that if partners exchanging knowledge are science institutions (e.g. universities), more likely is for the knowledge transfer to be intensified. On the other hand, research (Phan and Peridis, 2000) indicates that in knowledge network there has to exist a tension between partners in order to challenge the status quo to initiate knowledge transfer and generation of new knowledge. Research on influence of the partner type to interorganizational knowledge transfer seems to be without a clear definition and underdeveloped in academic literature.

2.7.4.14 STRENGTH AND NUMBER OR RELATIONSHIPS IN KNOWLEDGE NETWORKS

In both intra and inter-organizational knowledge transfer, researchers (Van Wijk *et al.*, 2008; Reagans and McEvily, 2003; Hansen, 1999) have found that strong relationships amongst organizations positively attribute to successful knowledge transfer. The notion of "strong relationships" is argued to relate to the frequency of communication and interaction (Van Wijk *et al.*, 2008; Hansen, 1999), therefore indicating that that more frequent communication and interaction amongst organizations, the stronger is the relationship. On the other hand, researchers (Najafi-Tavani *et al.*, 2012) argue that stronger social interactions are, stronger are the relationships amongst organizations transferring knowledge. Research (Van Wijk *et al.*, 2008) suggests that the number of established interorganizational relationships an organization has is linked to influencing success of knowledge transfer. This is in relationship with the research (Lichtenthaler *et al.*, 2010; Palmatier *et al.*, 2007; Davis and Eisenhardt, 2007; Faems *et al.,* 2005) indicating that access to a broader knowledge base (hence larger number of interorganizational relationships) positively influences innovation outcome.

2.7.4.15 POSITIONING WITHIN KNOWLEDGE NETWORKS

Research indicates that central positioning of an organization within a knowledge network positively affects success of knowledge transfer outcome – central positioning of an organization along the path of the knowledge exchange positively influences knowledge transfer (Phelps, 2010; Van Wijk *et al.*, 2008). Prominent position of an organization within the knowledge network is allowing an organization to benefit better from such network (Bergman and Maier, 2009; Owen and Powell, 2003). Research (Phelps, 2010) also indicates that partner's diversity of knowledge is more likely to affect transfer of knowledge that is novel to organization's existing base of knowledge. Kim and Park (2010) indicates that organizations that are cooperating with science institutions typically had a better position within the knowledge network.

2.7.5 Specifics of KT in SEE

In case of international knowledge transfer, a compatible corporate culture plays an important role in the knowledge transfer between both developed and developing countries (Yi and Begley, 2011). In order to maximize the success of international knowledge transfer, a fusion of two cultures is necessary in order to bring out the best from such cultural diversity to the knowledge transfer. Such fusion of international cultures and policies is likely to be much more potent to the common organizational performance outperforming either one of the individual organizations (Yi and Begley, 2011). International knowledge transfer can be improved through repatriation of expatriates who can positively influence organizational learning, as expatriates can introduce new knowledge obtained abroad for the benefit of the organization (Chang *et al.*, 2012; Nery-Kjerfve and McLean, 2012). The main properties related to successful expatriate knowledge transfer relate to the motivation and ability of expatriates to transfer knowledge, and the organizational ability to absorb such knowledge. In addition, the larger company's knowledge absorption capacity is, a more successful is the expatriate knowledge transfer (Chang *et al.,* 2012). Innovation in developing countries might face obstacles due to a potentially high level of bureaucracy and a corruption, as Mauro (1995) has found that they are negatively affecting innovation outcome. This is in line with Madsen *et al.* (2010) who found that effectiveness of legislative and political system of a country is positively related to a higher incentive to innovate due to a more effective protection of intellectual property. Therefore, an obstacle to innovation in developing countries might be complex bureaucracy, corruption and a low protection of intellectual property (Madsen *et al.*, 2010; Mauro, 1995).

2.8 THEORIES OF INTERORGANIZATIONAL RELATIONSHIPS

Organizations form and enter relationships with other organizations for an economic benefit or when they are missing a certain capability on their own that another organization in the network might have (Bergman and Maier, 2009). Synthesized definition (Lumineau *et al.*, 2015; Parmigiani and Rivera-Santos, 2011; Bergman and Maier, 2009) of **interorganizational relationships** adapted by this study is:

Definition of interorganizational relationships (adopted by this study)

Strategic cooperative relationships between organization and other external organizations to share and exchange resources for the purpose of improved business performance.

Interorganizational relationships are observed in the academic literature from the three main theoretical perspectives – Forms of IORs, Organizational Economic Theory and Organizational Theory (Parmigiani and Rivera-Santos, 2011; Lavie *et al.*, 2010; Bergman and Maier, 2009; Geyskens *et al.*, 2006). Each of the three theoretical perspectives provides a different evaluation perspective at the interorganizational relationships – evaluating relationship as a structure, process and outcome – as outlined with the Table 9.

Theoretical perspective of IORs	Evaluation type	Relationship motivator
▪ Forms of IORs	Structure evaluation	n/a
▪ Organizational economic theory	Process evaluation	Pursuit of efficiency
▪ Organizational theory	Outcome evaluation	Increase effectiveness

Table 9 – Theoretical perspectives of IOR, evaluation types and relationship motivators

Structural evaluation of organizational relationships is observing the structure of organizations interacting between each other – such as for example the composition, links, density of links, partner type and other structure attributes of an organizational network (Provan and Sydow, 2008). The process evaluation of interorganizational relationships provides a process view of IOR observing processes through which interorganizational relationships are governed, and how such processes are influencing organizational behaviour in a network of organizations – example being interorganizational learning processes, leadership processes and others (Parmigiani and Rivera-Santos, 2011). Outcome evaluation research of IORs is based on observing interorganizational relationships and their influence to an outcome of such relationship – such as for example financial and non-financial outcome, organization survival and similar outcomes (Parmigiani and Rivera-Santos, 2011). As the purpose of this study is to explore influence of KT and IOR to innovation outcomes, and as earlier review on theories of innovation has indicated separate theoretical facets of observing innovation as determinants, process and outcome, in exploring theories of IOR, this study does not necessarily take a singular theoretical approach of IOR, but is however open to exploring and connecting multiple theoretical facets of forms, process and outcome views of IORs.

2.8.1 IOR IN THE CONTEXT OF EXPLORATORY AND EXPLOITATIVE INNOVATION

Interorganizational relationships are argued to combine both co-exploration (e.g. joint innovation activities) and co-exploitation (e.g. licensing, alliances, buyer-supplier relationship *et sim.*) at the same time – indicating importance to observe both aspects of interorganizational relationships jointly (Lee *et al.*, 2019; Lavie *et al.*, 2010). Parmigiani and Rivera-Santos (2011) argue that there is an inherent tension between exploration and exploitation goals in organizations, and that in interorganizational relationships motivation for both goals might diverge, as a result even further complicating the relationship. Hoang and Rothaermel (2010) have researched exploration and exploitation in strategic alliances. They found a negative influence of joint co-exploration with partners. In cases an organization extends its exploration activities outside of organizational boundaries and explores jointly with another organization, the performance of research activities suffers. On the other hand, when an organization pursues exploration only internally, and uses alliances for exploitation, that is for pursuit of resources and effectiveness, this was found to have a positive effect strengthening its internal exploration activities. Contrary to this view is Hohberger *et al.* (2015) argue that when organizations form alliances for the purposes of exploitation on known innovation trajectories, they are strengthening their internal capabilities, but not necessarily pursuing innovation frontiers. Pursuing a known innovation trajectory is perhaps effective if companies do not wish to be at a forefront of innovation, but rather followers in the innovation area pursued. While some organizations can have exploitation stronger than exploitation activities and vice versa, researchers (Lee *et al.*, 2019; Lavie *et al.*, 2010) argue that organization should utilize ambidexterity approach in using both exploration and exploitation. Researchers (Lee *et al.*, 2019) have also found that companies who use both exploration and exploitation in a balanced manner, rather than one or the other, achieve better innovation performance. In support, Kim *et al.* (2016) suggest that organizations should pursue alternatively closed and open innovation to increase their potential and realized knowledge absorption capacities while innovating with external organizations.

2.8.2 MOTIVATING FACTORS FOR FORMING INTERORGANIZATIONAL RELATIONSHIPS

While the literature observes IORs predominantly from the structural point of view providing evaluations of the structural forms of the relationships in reference to the success of the relationship (Provan and Sydow, 2008; Combs *et al.*, 2004), researchers Parmigiani and Rivera-Santos (2011) argue that the most important characteristics of IOR is not the structural form of the relationship, rather it is the intent of the relationship – why organizations form relationships. Parmigiani and

Rivera-Santos (2011) argue that the motivation factor as of why companies enter into relationships drives the relationships and influences its form and outcome.

Organizational economic theory describes interorganizational relationships from the perspective of organizations forming a relationship for the pursuit of efficiency as its main motivator – i.e. organizations partner with others when it is more efficient for them to conduct an activity through a partner relationship rather on its own, or through the marketplace. Organizational efficiency can be attained in several different ways: through cost minimization (either the production or transaction costs), attainment of important assets and resources (in situations when there is no better and more cost-effective alternative) or increasing the economies of scale (Parmigiani and Rivera-Santos, 2011). Organization economic theory is based on the theories of economic transaction cost, resource-based and the agency theory. Transaction cost economics describes the governance structure of relationships in performing organizational activities. This theory observes costs as transactions used to create, use, maintain and change organizations in the marketplace. The theory stipulates that governance structure of a relationship is the judgment of economic quality – deciding on what makes the best economic value for transactions being performed (Garfamy, 2012) – this does not necessarily mean the lowest transactional cost. RBV perspective of interorganizational relationships represents perhaps one of the most important means of acquiring new resources, due to its lower costs of acquisition and a faster access to resources compared to resources developed internally (Armstrong and Shimizu, 2007). Agency theory stipulates that companies will use interorganizational relationship in order to balance the relationship amongst agents and the principal in cases when the control of ownership is separated. As such, companies will form a relationship when they are estimated to be the most efficient form of governance (Parmigiani and Rivera-Santos, 2011).

Organization theory observes interorganizational relationships forming in order to increase effectiveness of the different tasks and reinforce interorganizational and interpersonal relationships. Once established, these partnerships have positive impact on several aspects of company's business practices, improving the company's reputation, connections with other organizations and the overall number of sources of social capital. The organization theory view of interorganizational relationships is based on four theoretical approaches: resource dependence, stakeholder theory, institutional theory, and networks theory (Parmigiani & Rivera-Santos, 2011). Barney (1991) observed organizations as sources of resources with specific capabilities and competences. They argued that company-specific resources, competences and capabilities are the basis of the company's competitive advantage, directly influencing overall business efficiency and profitability of the company (Kraaijenbrink *et al.*, 2010). Hillman *et al.* (2009) discussed resource dependence theory identifying power and dependence as two main motivators for IOR. According to their research, organizations will use the relationships in order to achieve the higher level of control over vital resources. This process may lead to power struggles and insecurity; this, however, can be mitigated through creation of robust IORs, and creation of frameworks for cooperation and joint actions. They also argued that such partnerships are capable of assisting coordination and increase overall capacities of all enrolled organizations giving them competitive advantages over the competitors. The stakeholder theory suggested that main reasons for establishment of partnerships are rooted in the attempts to decrease uncertainty related to company's reputation (Stieb, 2009). As such, the main motivator for companies forming relationships is to increase its reputation and build brand value. Institutional theorists (Heugens and Lander, 2009) assumed that company's actions are influenced by different social constructs and expectations, and that number of external factors puts a pressure on company to conform in various situations. This view postulates that limitations of the social constructs influence organizational relationships.

2.8.3 FORMS OF INTERORGANIZATIONAL RELATIONSHIPS

Forms of interorganizational relationships represent a variety of forms in which one organization is in relationship to another, each with different attributes of the form in which they are associated - some common and some different from one to another (Parmigiani and Rivera-Santos, 2011; Lavie *et al.*, 2010). Forms of interorganizational relationships found in the academic literature are alliances, joint ventures, cross-sector partnership, networks, buyer-supplier agreements, technology licensing, franchising, co-branding, trade association, consortia and marketing licensing. Each of individual forms of IOR is categorized with a relevant key attribute and structure in Table 10.

Form of interorganizational relationship	**Key attribute**	**Structure**	**Adapted by this study**
Alliances	Set time and task	One to one	✓
Joint ventures	Equity stakes	One to one	✓
Cross-sector partnerships	Diverse partners	Social relationship	✓
Networks	Structure	Many to many	✓
Buyer-Supplier agreements, technology licensing	Vertical, supply chain	One to many	✓
Franchising	Business model	One to many	-
Co-Branding	Literature gap	One to one	-
Trade association	Structure	Many to many	-
Consortia	Structure	Many to many	-
Marketing licensing	Literature gap	One to many	-

Table 10 – Forms of interorganizational relationships (adapted from Parmigiani and Rivera-Santos, 2011)

Innovation collaboration between two organizations is either exploratory or exploratory activity (Albats *et al.*, 2019; Parmigiani and Rivera-Santos, 2011). Companies pursuing co-exploration typically form joint ventures, and companies pursuing co-exploitation typically form alliances, buyer-supplier agreement and technology licensing (Parmigiani and Rivera-Santos, 2011). These forms of interorganizational relationships are adapted by this study. On the other hand, forms of interorganizational relationships such are franchising, co-branding, trade associations, consortia or marketing licensing do not have the appropriate co-creation innovation development component this research is looking for, and as such are not adapted by this study (elaborated further in text below). Forms of interorganizational relationships adapted by this study will be described first:

Alliance form of an interorganizational relationship denotes a relationship between two partners that exists for a specific period of type, and typically involves a formal agreement as a contract frame between the partners (Parmigiani and Rivera-Santos, 2011). Difference between alliances and a network is in the focal point of view – as alliance denotes a focal point of view ("one to one") from a single organization and its relationship to others. It should also be noted that companies could perhaps have simultaneously more than one alliance. Alliances are observed as platforms of knowledge exchange, more tacit than codified, which is in support of fostering innovation (Wassmer, 2010). In co-exploration view of alliance, organizations utilize complementary skills (with possible skill overlaps) for better KT, learning and innovation. In co-exploitation view of alliance, organizations utilize distinct, but complementary skills for the purpose of more efficient task execution (Parmigiani and Rivera-Santos, 2011).

Joint venture form of an interorganizational relationship denotes a relationship in which two organizations form a separate new entity with shared risks and rewards for each partner. This relationship is viewed as one-to-one relationship. Controlling governance mechanism in this relationship is equity that partners have in the relationship. In co-exploration view of joint venture sharing value from new knowledge can be reinforced through an equity commitment. In co-exploitation view of joint venture specific investments leveraged by the new organization (i.e., venture) are motivated by equity (Parmigiani and Rivera-Santos, 2011).

Cross-sector partnerships form of an interorganizational relationship denotes a group of organizations (these could be business and non-business organizations such are for example research institutions) operating in different sectors. Interests and objectives of such diverse participant group in this relationship can be multiple; as such it is typically difficult to manage. Sometimes a "bridge" organization as a type of organizational structure dynamics is needed to manage the relationships and overcome the differences (Selsky and Parker, 2005). In co-exploration view of cross sector partnerships new knowledge generations is induced through diverse set of stakeholders. In co-exploitation view of cross sector partnerships organizations can leverage distinct connections they have to others (Parmigiani and Rivera-Santos, 2011). For example, collaboration between a business and a science institution is more likely to intensify knowledge transfer through cross-sector partnership form (Kim and Park, 2010).

Networks form of an interorganizational relationship denotes a group of companies connected in many to many relationships - being a key attribute of the network form of IOR. The theoretical approach for networks is driven from the organization theory. There are two main types of such relationships – a "goal directed" or "serendipitous" relationships. Goal directed relationships are planned and created in order to achieve specific goals and objectives, whereas serendipitous types of relationships were formed by a matter of chance (Kilduff *et al.,* 2006). For the purpose of this research relationships that were formed and intentionally created, as goal directed, will be adapted, and serendipitous relationships will not be adapted due to their non-predictive nature. Researchers (Pisano and Verganti, 2008) believe that organizations in an innovation network can have a better innovation performance, as combined resources and knowledge of the network are typically much larger than of an individual company. This is in line with the resource-based view of innovation arguing that innovation performance is a relationship with the size of resources available (Albats *et al.*, 2019; Ford and Paladino, 2013; Paladino, 2007). Researchers argue that a group of organizations innovating in a network can be observed as an extended, or distributed organization, as such, arguing that the same principles of innovation that can be applied to a single company, can be applied to a group of companies innovating together (Andersen and Drejer, 2008). In co-exploration view, networks form a broad and diverse knowledge flows leading to innovation (Phelps, 2010; Andersen and Drejer, 2008). It should be noted that repositories of learning and knowledge are individual network members, rather than the network itself - hence indicating distributed knowledge and learning across the network (Provan *et al.*, 2007). In co-exploitation view, networks form direct connections amongst network members. It is interesting to note that a disturbance in a network can actually create more benefits to its members, rather than network stability. It is argued that disturbance in the network of organizations challenges the status quo and stimulates re-evaluation and development of alternative solutions, in turn positively contributing to innovation performance (Slotte-Kock and Coviello, 2010).

Buyer-Supplier agreements and technology licensing of interorganizational relationship is focused on forward integration and supply chain management. This form is focused on a particular vertical (i.e. an industry) and can exist amongst many organizations. This form can also include outsourcing agreements. In some cases, companies supplying software outsourcing services can on behalf of the buyer (typically a multinational investing overseas) delivery buyer's innovative projects, and also improve upon them (Blit, 2018). Technology licensing relationship represents a commercial relationship in which one party licences knowledge to another party (Parmigiani and Rivera-Santos, 2011) used for innovation development.

Types of interorganizational relationships that are not adopted by this study are franchising, trade associations, consortia or co-branding forms of IORs as not having collaboration component this research is seeking to understand in terms of innovation development. For example, **franchising and licensing form** of an interorganizational relationship represents a relationship in which one company sells rights or licenses to another company to produce and brand in its name, and also to adopt its business processes (Combs *et al.*, 2004). This key attribute of this relationship is that this is a "one-to-many" relationship (e.g., franchising company is a single company that can sell the rights to many other companies – franchises). This form as such does not include a form of joint collaboration on innovation. Further, **co-branding** represents a type of relationship in which two companies brand jointly, trusting that they can gain a better value through joint branding rather through individual brands. **Marketing licensing** is form of licensing that is marketing oriented and it does not involve innovative product development. Finally, **trade associations** and **consortia** represent forms of interorganizational relationships in which organizations join associations or consortia for the purpose of networking and influence to policy makers (Parmigiani and Rivera-Santos, 2011), and as such do not include a form of joint collaboration on innovation.

2.8.4 PARTNER TYPES IN IORS

Partner type (one of the forms of partnerships described above) seems to be critical in success of innovation performance in organizational networks (Kim and Park 2010; Phelps, 2010; Kang and Kang, 2010; Faems *et al.*, 2005). Phelps (2010) argues that partner selection is a fundamental aspect of successful interorganizational relationship, as relationship with any partner is not sufficient for increased innovation performance. Researchers argues that compatible and complementary partners are necessary for an organization to benefit from interorganizational innovation. Kang and Kang (2010) supports this view and argues that partner selection is one of the most crucial components of networked innovation, as only proper partnership relationships can positively influence innovation performance.

Further, Kang and Kang's (2010) research on influence of the type of external partners collaborating in a network to innovation performance indicated that R&D collaboration on innovative product development with customers and universities has a strong positive influence on innovation performance, whereas on the other hand R&D collaboration with suppliers and competitors has an inverted "U" relationship to innovation outcome. The study was conducted on some sample of 1300 organizations with four major types of external partners – customers, suppliers, competitors and universities. The findings are explained through arguing that difference in resources and capabilities of each partner introduce a different type of collaboration relationship, and hence influence different innovation outcomes. These researchers argue that companies usually pursue several simultaneous partnerships and that relationships with various partnership types are necessary for a company growth, however the study recommends that a level of engagement with each partner type should be managed and involvement moderated accordingly in order to achieve the best innovation performance.

Chen (2004) has researched interorganizational knowledge transfer in the case of alliance relationships, namely contract based, and equity-based alliances with partners. This research indicates that knowledge absorptive capacity and knowledge context - level of the knowledge explicitness (versus ambiguity) influence successful knowledge transfer. In addition, trust between partners and ability to adapt to partners positively influences knowledge transfer, whereas conflict between partners has a negative effect to the knowledge transfer. On the other hand, researchers (Lumineau *et al.*, 2015; Henderson, 2012) argue that in alliances there must exist some tensions between partners to challenge the status quo and as such motivate resolution of the status quo resulting in creation of new knowledge. Chen (2004) find that contract-based alliances were more likely to transfer explicit knowledge whereas equity-based alliances were more likely to transfer tacit knowledge. This could perhaps be explained through motivation and closer cooperation as equity-based alliance is most likely to result in greater rewards as an outcome from the relationships, and also because this form of cooperation requires a closer interaction between partners. This is in line with Parmigiani and Riviera-Santos, (2011) arguing that it is not the type of the relationship, but the intention of the relationships that drives success of the relationship.

2.8.5 CONTRACT FRAME DYNAMICS IN IORS

The contract frame dynamics denote formal or informal contracts governing the collaboration. Contract frame dynamics regulate the knowledge transfer, IP exchange, shared risks and benefits amongst the partners. This norm can be both transactional and relational (Cao and Lumineau, 2015), see Figure 15. Contractual governance highlights the importance of contracts between organizations. Contracts safeguard against opportunism and conflict in the relationships, and they might define duties, rights, monitoring procedures and contingency plans in the relationship. However, governance includes more than formal contracts. Namely relational governance and especially trust were found to contribute to mitigating exchange risks associated with uncertainty of transactions. This is because contractual governance is positively related to both of its transactional and relational aspects.

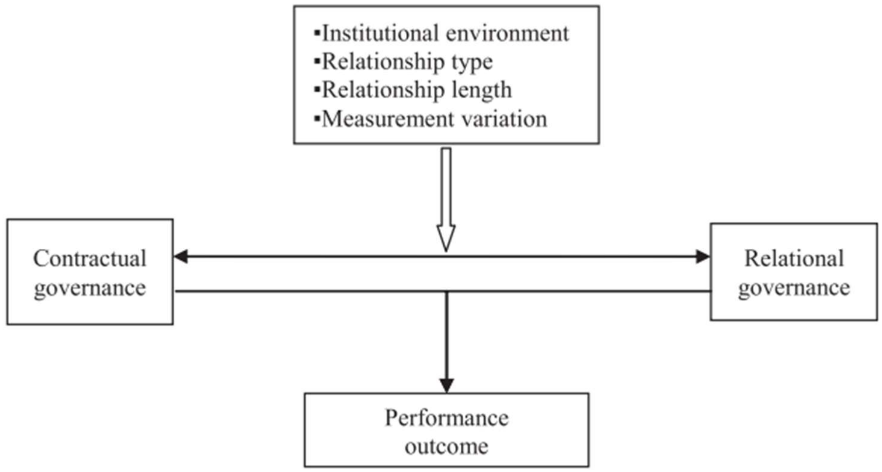

Figure 15 - Contractual vs. relational governance to performance of IORs (Cao and Lumineau, 2015)

Therefore, contracts, trust and relational norms positively influence performance of interorganizational relationship and reduce opportunism behaviours between partners. This indicates that contractual-relational governance influences the performance of interorganizational relationships. The interorganizational relationships were found to be moderated by institutional environments, type of relationships, length of interorganizational relationships and contract measurements regulating the interorganizational collaboration (Cao and Lumineau, 2015).

2.8.6 Trust Dynamics in IORs

Trust is an important part of interorganizational relationships as a relational component of contract frame dynamics. Trust in interorganizational relationships has been defined as expectation that partner organization can be relied upon to fulfil its obligations in predictable manner and will behave fairly when possibility of opportunism emerges (McEvily *et al.*, 2017). Individuals are a major driver of trust in IORs as major vehicle of collaboration and trust-building amongst individuals in the partnership (McEvily *et al.*, 2014; Almeida, 2011). Trust is argued to enable successful knowledge transfer as it increases partners' willingness to cooperate (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011). On the other hand, shared values amongst partners contribute to enhancing trust in IORs (Najafi-Tavani *et al.*, 2012).

Observed through the lens of traits and individual behaviours, trust was found to have a dual property, as it can be both positive (functional) and negative (dysfunctional) in interorganizational relationships and co-existing at the same time as two parallel processes (McEvily *et al.*, 2017; Thorgren and Wincent, 2011). Research also finds that trust is NOT mutual amongst partners and that it has a dyadic nature (Ekici, 2013). This indicates that both partners could have different levels of trust in the relationship, which seems to be governed by power position of a partner in the relationship. Trust relationship between the partners also seems to change in time based on the relationship experience, and it can go both in positive and negative directions (both functional and dysfunctional trust could also co-exist at the same time). Length of the relationship introduces risks of creating vulnerabilities as opportunistic behaviours could arise. The trust relationships seems to be regulated by relational contract frame relationship between partners (Cao and Lumineau, 2015). Indeed, relational contract frame relationship could influence to reduce opportunistic behaviours and increase trust between partners.

2.8.7 Dark Sides of Trust in IORs

Dark sides of interorganizational trust are betrayal and relational tensions. Researchers (Ekici, 2013) identify several categories of dark sides of trust: disappointment, being unreasonable in the relationships, feeling taken advantage of, being taken for granted, setting high expectations, expecting partners to go an extra mile and being asked to do favours. When relationship between partners becomes "comfortable", a partner could expect to ask for favours which go above and beyond the original relationship goal. Similarly, in long relationships being taken for granted or expecting partners to go an extra mile of them could be expected, while this perhaps might not be reasonable. Going and extra mile represents a state in which one of the partners does something more for the other party and expects reciprocity, which is not the case of trust relationship – trust is not reciprocal and it has different levels with each partner (McEvily *et al.*, 2017; Ekici, 2013). Feeling being taken advantage of typically is behaviour of opportunism in a relationship when one of the partners behaves in opportunistic way damaging the relationship.

Some of the most common causes for terminating IOR is due to betrayal due to opportunistic behaviour or being incompetent business partner indicating that the relationship does not provide value expected. On the other hand, there are examples of partners staying in a relationship although the trust is diminished or non-existent. This is typically the reason of some other factors of relationship considerations, such is for example non-existence of alternative partners they could switch to, or inability to perform the partner functions by the organization itself – indicating dependency in IOR (Ekici, 2013; Tangpong *et al.*, 2010).

Trust is also an important regulator of interorganizational knowledge transfer as is existence of trust and ability to adapt to partners was found to be positive to KT. On the other hand, lack of trust between partners negatively influences KT (Lumineau *et al.*, 2015; Chen, 2004). Interorganizational trust could perhaps be enhanced with enhancing the communication between partners in using richness of information and redundancy (repetitiveness) of information exchanged between the parties (Jarle Gressgård, 2011).

2.8.8 COLLABORATION CHANGE DYNAMICS IN IORS

Interorganizational collaboration is an ongoing relationship being communicated between the two organizations. Studies on this topic are based on organizational theory evaluating outcomes of relationships, with the goal of increasing effectiveness of interorganizational relationships. Majchrzak *et al.* (2015) through an extensive literature study based on 22 longitudinal studies of dynamic interorganizational collaboration have identified fix types of characteristics that affect change in interorganizational relationships in time, shown in Table 11. Dynamics of interorganizational collaboration describe changes in internal collaboration between parties and over time. Internal interorganizational collaboration is not considered to be affected with market or hierarchical forms of control. These dynamic changes can be qualitative, for example change in form, function, or how decisions are made, or quantitative in terms in increase or decrease of current characteristics of a relationship. These shifts could be linear, nonlinear, sudden or gradual.

Characteristics of interorganizational collaboration change	Dynamics of change
Goal dynamics	Goals of collaboration between the parties and the mutual mission.
Contract frame dynamics	Formal or informal contracts governing the collaboration. Governs knowledge transfer, IP exchange, shared risks and benefits.
Interaction style dynamics	Individual collaboration between the parties – collaborative or competitive (opportunistic)
Decision-making control dynamics	Direction of decision making – top-down and bottom-up.
Organizational structure dynamics	Roles and processes governing collaboration between the parties.
Actor composition dynamics	Introduction or change of key individuals or partners in interorganizational collaboration.

Table 11 – Characteristics of interorganizational collaboration change (adapted from Majchrzak *et al.*, 2015)

Goal dynamics represents the goal, that is the mission that is established for collaboration between the parties. Changes in goal dynamics could include change in the scope of the goal or adding an entirely new goal. In case organizations are not aligned in terms of interest around the same goal, friction in the relationship is likely to occur (Lumineau *et al.*, 2015).

Contract frame dynamics represent formal or informal contracts parties have in terms of agreement about their collaboration. This agreement governs collaboration regarding knowledge-transfer, IP exchange, shared risks and shared benefits. The contract frame dynamics can be both transactional and relational (Cao and Lumineau, 2015). Transactional dynamics represents a formal relationship between the parties that is based on strict rules on exchange in the relationship. On the other hand, relational dynamic represents mutual collaboration in which two companies relate one with the other.

Interaction style dynamics represent the way individuals from two separate organizations collaborate. Characteristic of this dynamics was found to be competitive and collaborative. There could exist a mismatch between competition and collaboration creating conflicts in this interaction (Tangpong *et al.*, 2010).

Decision making control dynamics represents the direction in which decision are made in interorganizational relationships top-down or bottom up. Changing dynamics of this relationships are changes in direction of decision making. For example, managers could make decisions initially and the transition to employees. It also could be the other way around with management taking over decision making from employees. This could also involve more people being involved in making decisions across both organizations. The direction of decision making could also be related to innovation performance, as the direction of innovation process in organizations influences innovation performance. Top-down approach is more likely to be beneficial to business process improvements, and bottom-up approach is more likely to be beneficial to product development (Tushman, *et al.*, 2010).

Organizational structure dynamics relates to roles and processes between the two organizations, that is to their formalization and standardization. Shifts in structure dynamic could include adding new roles, or new process, or changing existing roles and processes. Organizations in interorganizational relationship have a tendency of self-governance (Cao and Lumineau, 2015). Researchers found that even if organization started without a clear structure, the tendency as the relationship progressed was for the structure only to increase in terms of forming roles and processes, and not to reduce (Majchrzak *et al.,* 2015).

Actor composition dynamics represents introduction or change key individuals in interorganizational collaboration. This can include both people and partner organizations. For example, the shift in this dynamic could denote change of management, or addition of new managers, or for example change of partners or addition of new ones (Berends *et al.*, 2011).

2.8.9 Sources of Collaboration Changes in IORs

Sources of change to the identified six (6) characteristics (goal, contract, interaction, decision-making, organizational structure and actor composition dynamics) that change dynamics of interorganizational collaboration are found to be classified in three categories (Majchrzak *et al.,* 2015), shown in Table 12.

Categories of sources of interorganizational collaboration change	Source of change
Between-partner differences	Change in dynamics of relationship related to organizational culture, organizational practices, being open or closed to cultural specificities.
External sources	External environment changes affecting the IOR, such are for example legislative, regulatory or technological changes outside of the control of the parties in interorganizational relationship.
Withing interorganizational collaboration sources	Internal sources of change within the IOR based on the six (6) types interorganizational collaboration change (goal, contract, interaction, decision-making, organizational structure and actor composition dynamics).

Table 12 – Categories of sources of interorganizational collaboration change (adapted from Majchrzak *et al.*, 2015)

Between partner differences contribute to change in dynamic relationships due to different organizational culture, being open or closed to partner organization's cultural specificities. In addition, change in dynamic relationships could be also due to partner differences in the way they make decisions, solve problems, which criteria do they use for evaluation, which innovation process was followed, how decisions were made, and how are people involved (Majchrzak *et al.,* 2015; Lumineau *et al.*, 2015; Cao and Lumineau, 2015). Some companies were successful in addressing this friction through introducing new roles to handle interorganizational relationships and processes.

External sources contribute to change in dynamic relationships due to external forces acting outside both partners, outside of their control. These could for example be regulatory, environmental and technological changes. Significant change in regulations could result in friction to the dynamic of interorganizational relationships Radical technology changes could also affect the international relationships dynamics as an external factor. In case of influence of external sources to interorganizational relationships some companies pursue strategic reorientation overcome the dynamic changes (Berends *et al.*, 2011).

Withing interorganizational collaboration sources contribute to change in dynamic relationships due to internal changes within the six (6) types of interorganizational characteristics (goal, contract, interaction, decision-making, organizational structure and actor composition dynamics). An example of such internal change could perhaps be change in the contract-frame relationship through which relationship between partners was transactional, until companies have exchanged sufficient level of technology and process collaboration, which has caused the relationship to become relational. Another example could be performance failures, that is failure of a partner in interorganizational relationship to provide expected value (Berends *et al.*, 2011).

2.8.10 Patterns of Collaboration Changes in IORs

Identified six (6) interorganizational collaboration dynamics (goal, contract, interaction, decision-making, organizational structure and actor composition dynamics), influenced by three categories (between-partner differences, external sources, and withing interorganizational collaboration sources) describe internal dynamics of positive and negative effects to the interorganizational collaboration between partners in several distinct patterns (Majchrzak *et al.,* 2015). The patterns recognized were studies from the cause-effect dynamics. Distinct patterns of interorganizational collaboration changes are:

- Single change in characteristics of interorganizational collaboration; consisting of
    - Single change patterns
    - Binary loop patterns
    - Parallel multisource pattern
- Multiple changes in characteristics of interorganizational collaboration; consisting of:
    - Positive multi-characteristics loops
    - Positive multiloop flows
    - Negative multi-characteristics loops

2.8.10.1 Single Change Characteristics

Single change in characteristics of interorganizational collaboration represent a change between individual facets of one of six (6) identified characteristics of change (goal, contract, interaction, decision-making, organizational structure and actor composition dynamics), without spill-over to other characteristics, and a single effect outcome (Majchrzak *et al.,* 2015). Shown in Figure 16 is recognized pattern of influence of external source of change (such is for example legislative or other external environmental changes) influencing a single change to actor composition dynamics (introduction or change of key individuals or partners) in the interorganizational relationship.

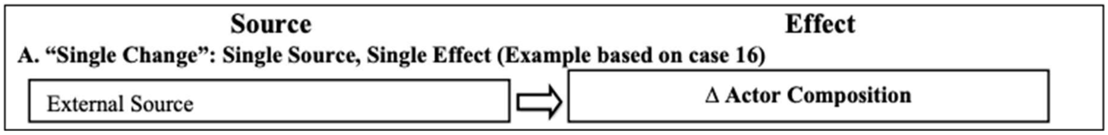

Figure 16 - Single change, single effect (Majchrzak *et al.*, 2015)

Shown in Figure 17 is recognized pattern of "binary loop", describing influence of two[15] sources of change - between partner differences and actor composition, making a looping effect to change in interaction style and contract frame. For example, partner differences in joint venture or alliance working on an innovation project could perhaps arise due to cultural incompatibilities between the two organizations resulting in organizations not trusting one to another. Bundled with change of actor composition, that is change in key individuals, an effect is made to interaction style – which perhaps could move from collaborative to competitive interaction between organizations. The change in interaction style to competitive then influences the contract frame governing the relationship of collaboration from for example relational (collaboration) to transactional (buyer-supplier). Such change in the contract frame then further influences the change in interaction style, hence making the effect of a looping change.

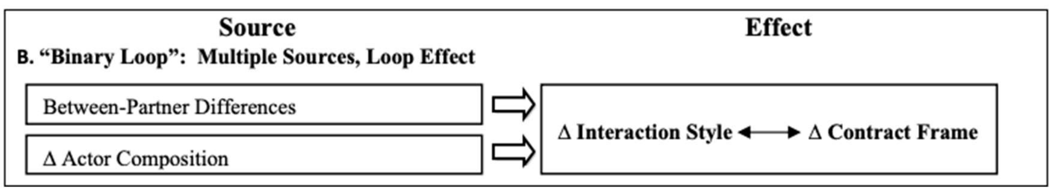

Figure 17 - Multiple source, loop effect (Majchrzak *et al.*, 2015)

Shown in Figure 18 is recognized pattern of "parallel multisource" describing influence of multiple sources of change (actor composition, organizational structure and decision-making control) at the same time, making a single effect to interaction style (collaborative vs. competitive). For example, change of leadership (actor composition) bundled with improvements to the collaboration process (organizational structure) and improvements to the decision-making process, could have an effect of interaction style changing from competitive to collaborative.

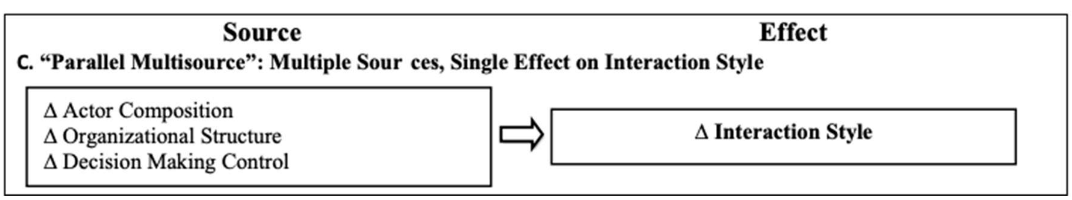

Figure 18 - multiple sources, single effect (Majchrzak *et al.*, 2015)

[15] Binary denotes two states

On the other hand, research (Srivastava, 2015) indicates that when organizational structure changes are negative (for example employee layoffs), the interaction style changes in terms of formal interactions decreasing and informal interactions between individuals increase.

2.8.10.2 MULTIPLE CHANGE CHARACTERISTICS

Multiple change characteristics of interorganizational collaboration represent a change whose source comes from between-partner differences and has an effect of multiple looping changes between several characteristics of interorganizational collaboration change (Majchrzak *et al.,* 2015). These changes can be positive or negative in terms of their outcome to IOR between parties.

2.8.10.2.1 POSITIVE CHANGE CHARACTERISTICS

Shown in Figure 19 is a “positive multi-characteristic loop” pattern showing an influence of between-partner differences having a positive effect to three change characteristics - contract form, decision making OR organizational structure and interaction style, with a positive self-reinforcing loop. This change is triggered by between partner differences. In this case, partners are different in terms of culture or working practices, however striving to improve their IOR. Between-partner differences trigger a positive change in decision making in which for example technical team developing innovation is empowered to make decisions, OR there exist organizational roles supporting interorganizational collaboration. This builds trust amongst the parties collaborating and influences the interaction style to move from transactional to relational, which in turn has an effect to the contract frame, for example positive change of the formal and informal relationships that govern knowledge transfer, IP sharing and team collaboration. Interaction between these 3 characteristics creates a positive loop of change, with three change characteristics feeding one off the other.

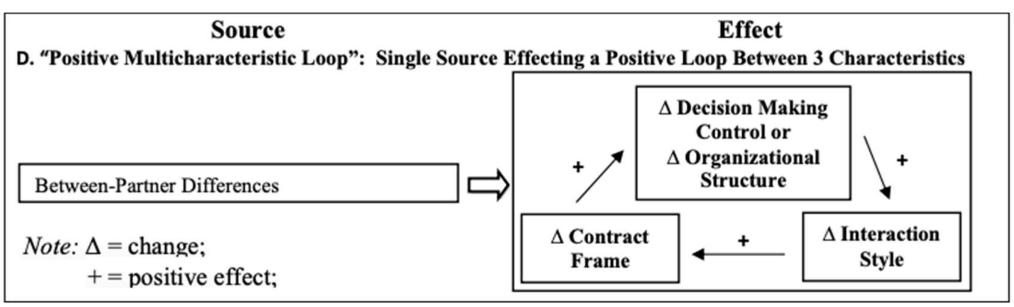

Figure 19 - Single source effecting a positive loop between 3 characteristics (Majchrzak *et al.*, 2015)

Similar but slightly different example is positive multiloop flow pattern shown in Figure 20 which effects creation of two (instead of a single) positive loops of dynamic change (Majchrzak *et al.,* 2015). In this case the single source of change between-partner differences influences creating two positive change loops functioning in parallel. One loop is created between the contract frame, decision making and interaction style, and the other loop between the contract frame, organizational structure and interaction style. In this case, both decision making, and organizational structure positively effects the interaction style of individuals working with both partner organizations, and in turn the positive change in interaction styles positively effects contract form governing the IOR, knowledge transfer, and IP exchange.

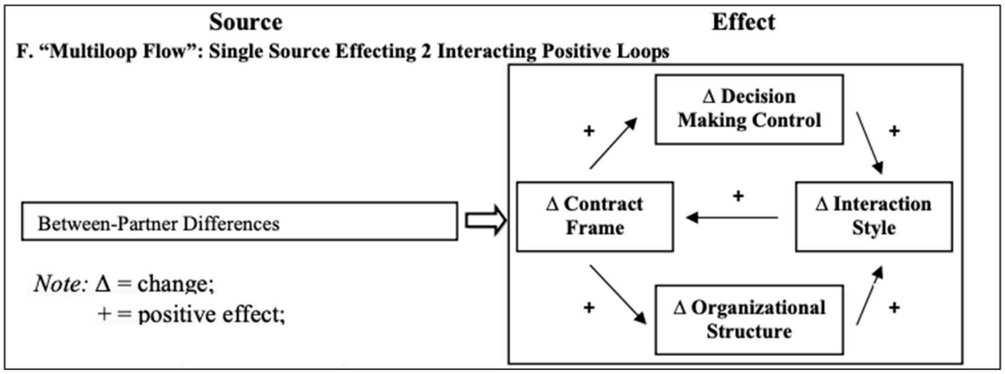

Figure 20 - Single source effecting 2 interacting positive loops (Majchrzak *et al.*, 2015)

2.8.10.2.2 Negative Change Characteristics

On the other hand, previously described change loops can also take a negative cycle, shown in Figure 21. In this case the recognized pattern is similarly triggered with between-partner differences, negatively influencing three change characteristics - decision making, contract frame, and interaction style. For example, if the contract frame is transactional, it could negatively influence decision making, perhaps due to a lack of trust, or fear of a competition, which negatively influences interaction style between the parties to become competitive, versus collaborative. This in turn further negatively influences the contract frame perhaps making it more formal and rigid between the parties, and the negative loop of changing dynamics continues.

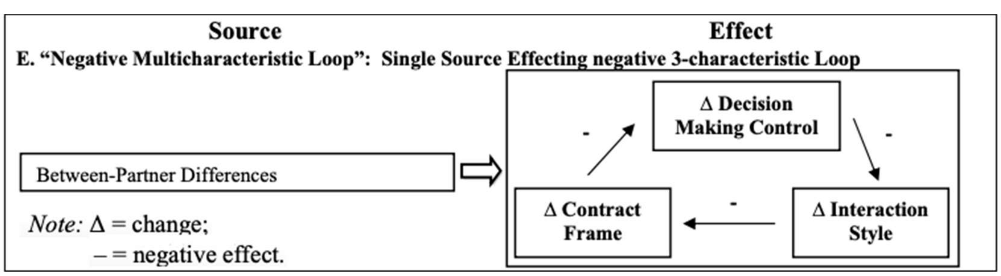

Figure 21 - Single source effecting negative 3-characteristic loop.

Researchers (Majchrzak *et al.,* 2015) argue that more complex relationship dynamics, rather than simple ones, between organizations were found to result in a more successful interorganizational relationships.

2.8.11 Strengths and Number of Relationships in Organizational Network

When strong interorganizational relationships are created, both organizational learning and innovation are facilitated (Van Wijk *et al.* 2008). As a result, those relationships contribute to the increase of competitive advantages of the organizations. Relationships can be stronger or weaker, however companies need both types of relationships since stronger relationships provide them with deeper exchanges, while weaker relationships established with a wider range of partners provide them with a wider array of knowledge and resources. The notion of “strong relationships” is argued to relate to the frequency of communication and interaction (Van Wijk *et al.*, 2008; Hansen, 1999), therefore indicating that that the more frequent communication and interaction amongst organizations, the stronger is the relationship. Najafi-Tavani *et al.* (2012) connect strength of relationships as a relational dimension of a social context, arguing that stronger the social interactions are the stronger are the relationships. It should be also noted that Van Wijk *et al.* (2008) have found that the number of relationships organization has with the external world positive affects success of knowledge transfer.

2.8.12 Positioning in Organizational Network

Research indicates that central positioning of an organization within the network positively affects success of knowledge outcome (Phelps, 2010; Van Wijk *et al.*, 2008). Phelps (2010) argues that innovation related to acquiring knowledge that is novel to organization’s existing base of knowledge (such is example of exploratory innovation) is positively influenced by relationship of the size of partner’s technological diversity - different technological pursuits of each network member organization. This researcher further argues that the intensity of influence of technological diversity on the focal organization is strengthened in relationship with the density of its partner network. If partner organizations in the network have relationships amongst them, in other words when two or more partners to a focal organization are also partners to each other (also known as network closure), there is a positive influence to exploratory innovation performance. Researchers (Bergman and Maier, 2009; Owen and Powell, 2003; Moore, 1993) believe that prominent position of an organization within the network is likely to allow organizations to highly benefit from such alliance. In order for organizations to maximize their innovation performance, they should surround themselves with the best possible peers in the network (Moore, 1993). It is interesting to note that

Moore (1993) believes that competition today is not between individual companies, but rather a competition between ecosystems. This researcher provides support that the most successful and disruptive organizations create new ecosystems. Organization's prominent position within a network does not necessarily denote that company should be centrally positioned with the network of relationships, rather Owen and Powell (2003) argue that organization's "central" positioning within the information conduits is crucial for knowledge exchange and innovation performance. Such positioning along the central information conduits is known as central path view and enables the company to become a knowledge broker with majority of the knowledge access in the network. In support, research (Almirall and Casadesus-Masanell, 2010; Lichtenthaler *et al.*, 2010; Palmatier *et al.*, 2007) indicated that access to a larger pool of knowledge positively influences innovation performance.

In attempting to understand as why some organizations can attain advantageous position in innovation networks in the first place, Bergman and Maier (2009) explore a central position of an organization in an innovation network not only from the path central view, but also from a link central view (when an organization has direct links to all other nodes). Researchers have distinguished between organizations exploring and exploiting innovation noting that organizations that explore innovation are regarded as members of localized innovation networks, whereas organizations exploiting innovations are regarded as members of distant networks. Study finds that physical proximity to R&D centres and skilled labour force does not seem to have an effect to advantageous positioning within the innovation network, including a company size as they have found examples of small companies playing very important centric roles within innovation networks. It seems that in cases where there is a strong **link** and cooperation between university research and companies, such firms were positioned more advantageously within the innovation network, and also had access to larger knowledge networks. Kim and Park (2010) explain this by arguing that stronger the link of "science intensity" cooperation between universities and companies better are the chances for the company attaining a more advantageous positioning within an innovation network.

2.8.13 Leadership Structure in the Organizational Network

Organizational process of leadership and decision making of organizations within an organizational network seems to be very important IOR to the outcome of innovation (Davis and Eisenhardt, 2007; Cardinal, 2001; Frost *et al.*, 2002). Research (Davis and Eisenhardt, 2007) indicates there seems to be a less successful innovation performance in case there is a single leader organization within a network of organizations, compared to when the leadership was rotated amongst organizations – in which cases the innovation performance was more successful. Researchers argue that rotating organizational leadership creates new dynamic relationships structure within a network, allowing a different "point of view" and leadership objectives when organization leadership is rotated, in turn creating a broader area of innovation search, hence influencing the innovation performance. This dynamic IOR is forcing members of the network to adapt and change to new partner's strategies. Such rotational leadership makes it more difficult to predict organizational relationships; however, it increases the probability of breakthrough innovations and organizational changes. Research (Cardinal, 2001) indicates that decentralized decision-making has a positive effect on interorganizational knowledge transfer as it forces organizations to broaden its communication channels with organizations they are cooperating with in a network. The reason for this is perhaps related to organizations perceiving a larger degree of freedom through decentralized decision-making enabling them to share knowledge more easily (Van Wijk *et al.*, 2008). On the other hand, Frost *et al.* (2002) disputes there is any significance between decentralized decision-making and a positive effect to interorganizational knowledge transfer.

2.8.14 Social Networks in IORs

The social network approach builds on organizational position in the overall social structure of its relationship in a network of organizations; however, it also takes into consideration aspects of individual relationships that exist between employees (Brennecke and Rank, 2016; Kilduff *et al.,* 2006). As such, there exist two main types of social relationships: relationships at the organizational level, based on the market relations, and individual social networks made up of employees' social contacts. From the perspective of the organizational level social relationships, the motivation for establishing such relationships stems from the need of creating information and social capital exchange and knowledge transfer between companies (Borgatti and Foster, 2003) and between individuals (Almeida, 2011). The perspective of individual level social relationships is in line with the organizational theory of knowledge creation arguing the social interactions amongst individuals are fundamental to organizational knowledge creation as new knowledge is created as an interaction of epistemic and ontological knowledge; the latter argued to come from the social interactions of humans (Brennecke and Stoemmer, 2018; Almeida, 2011; Girdauskiene and Savaneviciene, 2007; Spender and Scherer, 2007; Nonaka, 2008, 2001, 1994;). Individuals' informal social relationships can help bridge gaps in formal organizational systems of knowledge transfer (Brennecke and Stoemmer, 2018; Almeida, 2011) and therefore enable knowledge transfer otherwise not possible. In addition, individuals who are shared between projects can through their informal social relationships help bridge the knowledge transfer gaps between otherwise unconnected projects (Brennecke and Rank, 2016). Researchers (Parmigiani and Riviera-Santos, 2011) argue that organizations operate within the wider social circumstances, and that overall position in a wider social environment can position company as more or less desirable partner. These researchers also argue that formation of interorganizational relationship is typically based on extending the prior relationships.

Palmatier *et al.* (2007) argue that the stronger the mutual commitment on the interorganizational relationship, mostly evident through a commitment of relationship specific investment (making specific investments into the relationships), the stronger was the exchange performance amongst organizations. Therefore, strengthening trust and social relationship seems to positively affect successful interorganizational relationships. This is also in line with knowledge transfer theories (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011; Windsperger and Gorovaia, 2010; Heeseok and Byounggu, 2003) arguing that trust positively influences successful knowledge transfer. Further, strong social relationships also positively influence knowledge transfer and new knowledge creation (Najafi-Tavani *et al.*, 2012; Van Wijk *et al.*, 2008; Argote, 2003; Nonaka, 2008, 2001, 1994).

2.8.15 Dark Sides of IORs

Researchers (Lumineau *et al.*, 2015; Cao and Lumineau, 2015; Lumineau and Henderson, 2012; Tangpong *et al.*, 2010) argue that key characteristics of interorganizational relationships is conflict. This is because this relationship leads to behavioural contradictions between the parties in terms of cooperation versus competition, structural contradictions in rigidity versus flexibility, and temporal contradictions in short and long-term goals. In case organization is unable to avoid these contradictions, conflicts occur. By the nature of joining an interorganizational relationship, organizations introduce an additional (external) organization into their domain by voluntarily agreeing to relinquish certain freedoms, and to shape parts of their activities under the regime of the arrangement. As such, interorganizational relationships contain properties of interdependencies between parties. Conflicts could occur due to incompatible values and beliefs, there could also exist issues with incentive misalignments between the parties, and dynamic business environments make a continuous pressure to changing and evolving relationship arrangements (Lumineau *et al.*, 2015).

Forms of governance also cause conflicts in interorganizational relationships, as they are typically informal and largely self-governed arrangements. Informal structures of interorganizational relationships make governance more difficult (Cao and Lumineau, 2015), as in case of a conflict, there isn't a formal singular hierarchy to resolve disputes (Lumineau and Henderson, 2012). Engaging a third party arbitrary is typically lengthy and too expensive. An additional obstacle in conflict resolution is related to individuals responsible to manage IORs. There could exist a mix and mismatch between individual interests and organizational interests creating another layer of conflict.

In such cases, conflict resolution is complex and requires a management of both individual and organizational conflicts (Tangpong *et al.*, 2010).

2.8.16 SEE IN CONTEXT OF IORS

In developing economies, such is SEE, economic growth seems to be fuelled by imitation of globally novel innovation – adopted innovation novel only at the industry or a national level (Madsen *et al.*, 2010). Developing countries in SEE are expected to predominantly practice imitation and dependent innovation strategies. Imitation innovation strategy denotes producing a product or a service in SEE that is very similar to (i.e. imitates) an existing global product\service. Dependent innovation denotes a rather passive cooperation of firms in SEE with a foreign provider of technology, such as an equipment supplier or an advanced foreign firm. The type of interorganizational relationships expected in software companies in SEE are buyer-supplier, licensing, alliances and joint ventures, especially in the cases of dependent innovation strategies in which domestic firms purchase or license technology from developed countries for local adoption and implementation, and in cases when strong (dependent) relationship is required with a foreign partner. In many cases it is expected that firms in SEE will have network relationships in cooperation on innovation activities (such is the case of SEE ICT, 2013).

These relationships vary a great deal in asymmetry amongst partners, as firms innovating in a developing country in SEE are likely to be in somewhat unequal (inferior) position with respect to at least one of its partners\firms from developed countries (Rivas and Gobeli, 2005). When strong interorganizational relationships are created, organizational learning and innovation are facilitated (Van Wijk *et al.* 2008). The notion of strong relationships is argued to relate to the frequency of communication and interaction (Felin *et al.*, 2014; Van Wijk *et al.*, 2008). Research indicates that stronger relationships seem to provide deeper exchanges fostering organizational learning and innovation, while weaker relationships established between a wider range of partners provide the company with a wider range of knowledge and resources (Van Wijk *et al.* 2008). The number of relationships organization has with the external organizations seems to positively affect success of knowledge transfer (Felin *et al.*, 2014; Van Wijk *et al.*, 2008).

Najafi-Tavani *et al.* (2012) connect the strength of relationships as a relational dimension of a social context, arguing that stronger the social interactions are the stronger are the relationships. Research (Berzina, 2011) indicates that developing countries of Eastern Europe value more strong social relationships, compared to the developed countries.

2.9 Literature Synthesis

To set the stage for the synthesised literature review and further reading, the following definitions were adopted from the literature review by this study.

2.9.1 Definitions Adopted by This Study

- **Definition of innovation:** Application of invention to the realm of an organization in the form of technological or organizational change to provide a positive change to the organization through application of new or existing knowledge across knowledge networks, resulting in the competitive advantage for the organization (De Bassi *et al.*, 2017; Ukko and Saunila, 2013; Madsen *et al.*, 2010; Dervitsiotis, 2010; Van de Ven *et al.*, 2007).

- **Definition of innovation outcomes**: Innovation outcome in organizations can be viewed as tangible and intangible outputs taking form of technological innovation, product innovation, process innovation and marketing innovation whose magnitude could be incremental and radical with novelty levels at the firm, regional or global level (Khosravi *et al.*, 2019; Saunila, 2017b Yang, 2011; Madsen *et al.*, 2010; Gunday *et al.*, 2011; Crossan and Apaydin, 2010).

- **Definition of knowledge transfer (KT):** Knowledge sharing in which organization leverages information assets from various external organizations and learns from the experience of other organizations. (Chen *et al.*, 2014; Easterby-Smith *et al.*, 2008)

- **Definition of interorganizational relationships (IOR):** Strategic cooperative relationship between organization and other external organizations to share and exchange resources for the purpose of improved business performance. (Parmigiani and Rivera-Santos, 2011; Bergman and Maier, 2009)

2.9.2 Innovation Introduction

Innovation is a novel change produced through adoption, assimilation or exploration in business and social spheres (Crossan and Apaydin, 2010). Innovation can take a form of tangible outputs: products, services, business processes and business models, and intangible forms: services, intellectual capital and social innovation (Gunday *et al.*, 2011; Yang, 2011; Adams and Hess, 2010; Madsen *et al.*, 2010). Researchers (Denicolai *et al.*, 2016; Bueno *et al.*, 2010) indicate that companies need a diverse portfolio of both tangible and intangible resources and capabilities in order to produce innovation value. Not all innovation is equally novel – researchers (Saridakis *et al.*, 2019; Rivas and Gobeli, 2005) provide a referent view of innovation classifying innovation as a globally novel innovation, novel to the industry\country only, and novel to an organization only. The impact of innovation also varies by its magnitude and it is classified as incremental innovation – introduction of innovation with a minor degree of novelty (e.g. improvements of the existing) and radical (breakthrough or disruptive) innovation – introduction of innovation with a major degree of novelty (Forés and Camisón, 2016; Van Beers and Zand, 2014; O'Connor and Rice, 2013; Sainio *et al.*, 2012; Pavitt, and Bessant, 2011).

2.9.3 Drivers of Organizational Innovation

Innovation process in organizations seems to be driven either externally by pressures of market demands and internally by resources enabling companies to innovate (Santa *et al.*, 2019; Ford and Paladino, 2013). Market-based view of innovation describes external drivers of innovation process. These drivers are market demand for products representing market opportunities as well as market pressures driving innovation development in organizations (Albats *et al.*, 2019; Chang *et al.*, 2014; Janssen *et al.*, 2011). Companies observing the market-based view of innovation are reacting on customer demand and trying to understand the way customers use products and services. Close co-development relationship between companies and customers with an active customer involvement was found to result in an accelerated pace of innovation development (Maria-Stock and Zacharias, 2017). Such customer co-development influences customer satisfaction which is found to be one of major indicators of innovation performance (Zizlavsky, 2016; Janssen *et al,* 2011). In customer co-development of innovation, technology and especially software and web services seem to play an important role in understanding the ways customers are using products and services (Saldanha, 2017). As technology enables a direct link between customers and companies, especially with Internet, it seems only natural for IT companies to be typically market oriented practicing co-development of innovative products and services with customers (Saldanha, 2017). On the other hand, innovation growth through customer co-development is not infinite – it is effective only to a certain point at which it starts to have diminishing returns (Maria-Stock and Zacharias, 2017; Knudsen, 2007). At this tipping point customer input can no longer provide sufficient value to move innovation development to a new level of novelty.

Innovation performance in organizations seems to be in a positive relationship with availability of physical and financial resources to an organization (Albats *et al.*, 2019; Ford and Paladino, 2013; Paladino, 2007; Atuahene-Gima *et al.*, 2005). Organizational size also plays an important role as the size of organization is in relationship to the size of resources available for innovation and in turn has a positive effect on innovation performance (Forés and Camisón, 2016). Beyond resources, companies seeking to increase innovation performance need to internally develop and grow the organizational capacity to innovate (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Santa *et al.*, 2019; Zou *et al.*, 2018; Saunila, 2017a; Klewitz and Hansen, 2014) as resources and organizational innovation capacity to innovate are closely interlinked with each other (Albats *et al.*, 2019; Sok and O'Cass, 2011). It seems that literature is polarized between market and resource-based view of innovation arguing that companies should approach one or the other, depending if they are focused on incremental or radical innovation. On the other hand, contrary to the established view, companies should consider practicing both market and resource-based view of innovation, as ambidextrous view of innovation provides arguments that companies who practice both types are likely to achieve a better innovation performance (Boukamel *et al.*, 2019; Lee *et al.*, 2019; Forés and Camisón, 2016). Some researchers (Forés and Camisón, 2016; Chang *et al.*, 2014) argue that organizational innovation performance depends on their ability to introduce both radical and incremental innovation. Industrial example of this perhaps is introduction of the new Apple iPhone for the first time as a radical innovation creating completely new market opportunity, and thereafter continuous improvement throughout the years as incremental innovation (Lashinsky, 2012).

2.9.4 Determinants of Innovation Effectiveness in Organizations

Determinants of innovation effectiveness clearly standing out in the literature are knowledge management and organizational size (Khosravi *et al.*, 2019; Saunila, 2017b). Knowledge management seems to be at the core of innovation theories as one of the most critical and major drivers of new knowledge generation and hence innovation. New organizational knowledge creation occurs through knowledge transfer (KT) and it positively influence innovation performance (Khosravi *et al.*, 2019; Alipour and Karimi, 2011; Crossan and Apaydin, 2010; Madsen *et al.*, 2010; Lichtenthaler, 2011; Zhang *et al.*, 2010). Access to a broader knowledgebase positively influence innovation performance (Wang and Lam, 2019; Kim *et al.*, 2016; Dolińska, 2015; Hohberger *et al.*, 2015; Lichtenthaler *et al.*, 2010). Extending the knowledgebase access beyond a single organization is possible through interorganizational knowledge transfer with external organizations, and therefore learning from their experiences provides new knowledge that was previously not available within the organization itself (Wang and Lam, 2019; Kim *et al.*, 2016; Dolińska, 2015; Hohberger *et al.*, 2015; Chen *et al.*, 2014; Lichtenthaler *et al.*, 2010; Easterby-Smith *et al.*, 2008). Fundamental aspect of innovation is "*making novel linkages and associations*" in knowledge creation and further extending such linkages to transcend boundaries of a single organization (Kim *et al.*, 2016). Academic literature is increasingly recognizing that successful innovation performance relies on making links with external source of knowledge, transferring and using such knowledge for innovation purpose, and perhaps continuing cooperation with external sources of knowledge. Interorganizational knowledge transfer denotes organizations seeking expertise beyond their corporate boundaries, even outside of national or regional boundaries, as such it is very important for innovation and competitive advantage (Zhou *et al.*, 2019; Kim *et al.*, 2016; Chen *et al.*, 2014; Lichtenthaler *et al.*, 2010; Huggins and Johnston, 2009).

Organizational size is recognized in the literature as one of the major determinants influencing innovation outcomes. Organizational size plays an important role to the size of resources available for innovation and in turn has a positive effect on innovation performance (Forés and Camisón, 2016). Innovation performance in organizations seems to be in a positive relationship with availability of physical and financial resources to an organization (Ford and Paladino, 2013; Paladino, 2007; Atuahene-Gima *et al.*, 2005). Resources and organizational capacity to innovate are closely interlinked to each other and appear critical for the success of innovation in organizations (Albats *et al.*, 2019; Sok and O'Cass, 2011). Organizations seeking to improve organizational capacity to innovate are dependent resources whose availability positively drives organization's capacity to innovate and hence innovation performance and new product development (Santa *et al.*, 2019). Resources positively affect quality of products and financial performance. Extending access to resources beyond a single organization is possible through interorganizational collaboration with external organizations. Access to broader range of resources through external organizations was found to positively influence innovation performance (Wang and Lam, 2019; Dolińska, 2015; Parmigiani and Rivera-Santos, 2011; Lichtenthaler *et al.*, 2010; Phelps, 2010). In this context, organization working with external organizations and leveraging external knowledge and resources can be observed as an extended organization (Andersen and Drejer, 2008). This effectively can be viewed as an organization enlarging its size and knowledge through partnering and working with external organizations.

It therefore seems that in order expand its access to knowledge base, and to expand its resources, both found to positively influence innovation performance, organizations need to collaborate with external organisations. Fundamental to success of such collaboration are interorganizational relationships (IOR) defined as strategic cooperative relationship between organization and other external organizations to share and exchange resources for the purpose of improved business performance (Parmigiani and Rivera-Santos, 2011; Bergman and Maier, 2009). Companies form relationships for the pursuit of efficiency as its main motivator – i.e. organizations partner with others when it is more efficient for them to conduct an activity through a partner rather on its own, or through the marketplace (Parmigiani and Rivera-Santos, 2011). Number of interorganizational relationships with external organizations is positively linked with success of interorganizational knowledge transfer (Van Wijk *et al.*, 2008). Stronger the social interactions are between organizations, stronger are interorganizational relationships and positive influence to innovation performance (Najafi-Tavani *et al.*, 2012, Almeida *et al.*, 2011).

2.9.5 Software Companies Innovating in Practice

In support to the theoretical findings with practice, it seems that a single software company can only do so much innovating by itself, indicating that majority of software products today are composed of components contributed by many providers (McManus and Ardley, 2019). It is very unusual for a new software development to start from scratch as this would be economically unfeasible in terms of time, expertise, human resources and the investment standpoint. Instead, most of software developments starts by integrating reusable software components (Barros-Justo, 2019; Subramanyam *et al.*, 2012; Mohagheghi and Conradi, 2007) and building on top of the existing tools and readily available commercial, or open source software (Barros-Justo, 2019; Casadesus-Masanell and Llanes, 2015). There are examples of commercial enterprises such is Microsoft investing considerable amounts of free software to the open source domain as they believe such investment would propel others to build on top of it, in turn producing innovation that could not be attained by a single company only, even of such size (Casadesus-Masanell and Llanes, 2015). Reusing software components provides companies with a better predictability and planning of new development efforts (Mohagheghi and Conradi, 2007). Examples of important interorganizational collaboration between IT companies resulting in significant innovation is for example case of Microsoft and Intel partnering together and creating a joint "Wintel" platform consisting of Windows operating system running on Intel processors, in turn resulting in capturing 80% of the PC market (Casadesus-Masanell and Yoffie, 2007). In addition, Apple could have not created iPhone without strategic interorganizational partnerships with Qualcomm and Broadcom enabling features such are GSM/GPS/Wi-Fi/Bluetooth capabilities for the iPhone (Lashinsky, 2012). Since the year 2000 and onwards there has been an explosion of interorganizational partnerships with scholars only starting to understand this area (Davis, 2016; de Faria and Lima, 2012).

2.9.6 KT AND IOR EMERGE AS CRITICAL TO INNOVATION OUTCOMES

It therefore emerges from the literature that knowledge transfer (KT) in the context of organizational knowledge creation and innovation performance, and interorganizational relationships (IOR) in the context of extended organization innovating with other external organizations are perhaps two most critical determinants of innovation outcomes. Fragmented view of innovation effectiveness in literature seems to be underdeveloped on connections between KR and IOR, with no consolidated frameworks or measures on influence of KT and IOR to innovation outcomes. Understanding KT and IOR to innovation outcomes in the context of interorganizational collaboration provides further insights into models of innovation effectiveness and expands theoretical views of organizational innovation dynamics beyond a single organization. As such, developing a measure of KT and IOR to innovation outcomes as the main objective of this study is addressing this literature gap as the first attempt of its kind in the academic literature.

2.9.7 ROLE OF INDIVIDUALS AND GROUPS TO INNOVATION PERFORMANCE

Innovation process in literature is viewed from organization, group and individual level. The most common view in the literature is observing innovation at the organization level with group and individual levels being less studied views in the literature. Individuals are essential building blocks of organizations. Understanding individual level behaviours in innovation process is relevant as it is linked to organizational behaviour. Collection of individual behaviours therefore makes group and organizational behaviours. The organismic analogy theory is one of the grounding theories and starting points in organizational behaviour linking the organizational behaviour with the human behaviour based on Darwinist explanation of open complex systems (Hodgson, 2002; Keeley, 1980). Individuals activities and behaviours through their job and contextual factors influence ideation and implementation of innovation (Andreson, 2014; Almeida, 2011). From all individual factors argued to contribute to innovation performance (personality, creativity, education, tenure and motivation), the core of individual contribution to organizational innovation performance was isolated to individual’s abilities fostering knowledge transfer and collaboration (Almeida, 2011). On the other hand, research suggests that individual creativity, education, nor tenure at an organization is a predictor of organizations’ innovation performance (Hammond *et al.*, 2011). While individuals’ creativity was not found to influence innovation performance, it seems to have a moderating effect to innovation performance (Baron and Tang, 2011; Hammond *et al.*, 2011). Complex jobs whose goals were designed to support innovation activities seem to have a positive effect to innovation performance (Hammond *et al.*, 2011) suggesting that innovation needs to be embedded as a job requirement.

Individuals form groups in organization, and groups are typically capable of delivering a more sizeable innovation compared to an individual contribution. Individuals are a major vehicle of collaborating with other individuals, with trust-building being a major moderator of collaboration success (Almeida, 2011). Important distinction of a group level innovation is that group needs to share a common goal and values providing the team cohesion (West, 2014; Naranjo-Valencia *et al.*, 2011), and it needs to have a clear leadership (Schippers *et al.*, 2015). Group composition is an aggregate of individual personality traits, and group cohesion promotes innovation performance (Somech and Drach-Zahavy, 2013; Miron-spektor *et al.*, 2011). Group level creativity is an aggregate of individual creativities and performances, as such groups are expected to be more creative and performant than individuals (De Dreu, *et al.* 2011). This suggests that well fitted and coherent team members working together are more likely to provide an aggregate of their creativity in turn positively affecting innovation performance. Similar to the individual level process, knowledge transfer plays an important role to innovation performance as individual knowledge is integrated at the group level. When individuals in a group approach the knowledge process in a systematic and organized manner, attention is given to new knowledge, additional information is searched and integrated in a deliberate manner (De Dreu, *et al.* 2011). Some group friction is however expected as the nature of innovation is to introduce a change, and change is very likely to expose conflicts within the group. To improve group innovation performance, group's reflection and learning upon the previous innovation experiences is linked to increasing group innovation performance (Schippers *et al.*, 2015). On the dark side of group innovation, unsuccessful group innovation leading to failure is often a result of lowered group cohesion and ineffectiveness, likely leading to resistance of future innovation. In such constellation unclear leadership and unclear objectives seem to be negative costs of the innovation process (Janssen *et al.*, 2004).

It therefore emerges from the literature that individual behaviours on innovation activities can be observed collectively as representing group behaviour (Somech and Drach-Zahavy, 2013; Miron-spektor *et al.*, 2011; De Dreu, *et al.* 2011) and also individual behaviours collectively represent organizational behaviours (Hodgson, 2002; Keeley, 1980). This indicates that developing a measure of KT and IOR to innovation outcomes based on individual behaviours perhaps could provide further insights into innovation effectiveness in organizations.

2.9.8 Theories of Knowledge Transfer (KT)

Understanding theories of knowledge management is necessary in developing measures of KT to innovation outcomes. Connecting previous generalized knowledge with new knowledge as an outcome from this research, allows generalization of new knowledge (Sherif, 2006). Essential to innovation is organizational capacity to learn and generate new knowledge (Khosravi *et al.*, 2019; Santa *et al.*, 2019; Camison and Villar-Lopez, 2014; Alipour and Karimi, 2011; Ramirez *et al.*, 2011; Nonaka *et al.*, 2006). Creation of new knowledge according to one of the most cited theories in academic literature Dynamic Theory of Organizational Knowledge Creation (Nonaka, 2006) starts with information flow, that is knowledge transfer (KT). Existing literature points out a number of determinants of successful knowledge transfer, outlined in Table 13.

Determinants of KT	**Literature support**
Knowledge absorption and desorption capacity	Khosravi *et al.* (2019); Zou *et al.* (2018); Brennecke and Stoemmer, 2018; Camison and Villar-Lopez (2014); Chang *et al.* (2012); Nery-Kjerfve and McLean (2012); Zonooz *et al.* (2011); Lichtenthaler *et al.*, 2010; Van Wijk *et al.* (2008)
Trust	McEvily *et al.* (2017); Chen *et al.* (2014); Najafi-Tavani *et al.* (2012); Windsperger and Gorovaia (2010); Qile *et al.* (2011); Thorgren and Wincent (2011); Van Wijk *et al.* (2008)
Motivating factors of knowledge transfer	Kim *et al.* (2016); Felin *et al.* (2014); Zonooz *et al.* (2011); Burgess (2005)
Tacitness, specificity and complexity of knowledge	Najafi-Tavani *et al.* (2012); Olie *et al.* (2011); Windsperger and Gorovaia (2010); Van Wijk *et al.* (2008); Oppat (2007)
Systems of meaning and interpretation	Olie *et al.* (2011); Van Wijk *et al.* (2008); Oppat (2007)
Channel richness	Dinur (2011); Oppat (2007)
Shared values	Najafi-Tavani *et al.* (2012); Naranjo-Valencia *et al.*, 2011; Olie *et al.* (2011); Yi and Begley (2011); Donate and Guadamillas (2010); Van Wijk *et al.* (2008)
Corporate culture	Aksoy (2017); Naranjo-Valencia *et al.*, (2016); Turró *et al.*, (2014); Büschgens *et al.*, (2013); Svetlana and Jucevicius (2011); Yi and Begley, (2011)
Organizational systems and IT	Ciabuschi *et al.* (2011); Dinur (2011); Wu (2010); Alavi *et al.* (2005)
Social relationships, social capital and communities of practice (CoP)	Brennecke and Stoemmer (2018); Brennecke and Rank, (2016); Najafi-Tavani *et al.* (2012); Berzina, (2011); Almeida, (2011); Van Wijk *et al.* (2008)
Determinants of interorganizational knowledge transfer	
Interorganizational knowledge transfer absorption and desorption capacity	Zhou *et al.*, (2019); Zou *et al.* (2018); Chen *et al.*, 2014; Zonooz *et al.*, (2011); Lichtenthaler *et al.*, (2010)
Online social networks	Ljepava *et al.*, (2013); Meyer, (2010)
Partner type within knowledge networks	Kim and Park (2010); Chen (2004)
Strengths and number of relationships in knowledge networks	Brennecke and Stoemmer (2018); Najafi-Tavani *et al.* (2012); Van Wijk *et al.* (2008); Oppat (2007)
Positioning within knowledge networks	Bergman and Maier (2009); Van Wijk *et al.* (2008); Davis and Eisenhardt (2007)

Table 13 – Factors influencing knowledge transfer

Knowledge creation is a continuous process of transferring tacit into explicit knowledge. Tacit knowledge denotes knowledge specific to individual cognitive processes, such are for example experiences, concepts and ideas specific to an individual. When tacit knowledge is documented and recorded as explicit knowledge, disseminated within an organization and being used, it becomes an operational or routine knowledge (Alipour *et al.*, 2011; Nonaka, 2006, Nonaka, 1994). Such collection of organizational knowledge represents organizational knowledge capital.

Essential component of KT process are people who are creating new knowledge (Girdauskiene and Savaneviciene, 2007; Spender and Scherer, 2007). As people are creating knowledge, this denotes importance of social interactions amongst individuals to the success of knowledge transfer (Brennecke and Stoemmer, 2018; Brennecke and Rank, 2016). Shared values amongst individuals are positively associated with strengthening social interactions (Brennecke and Stoemmer, 2018; Najafi-Tavani *et al.*, 2012; Naranjo-Valencia *et al.*, 2011). Supporting corporate culture positively affects promoting shared values and organizational knowledge sharing (Aksoy, 2017; Naranjo-Valencia *et al.*, 2016; Turró *et al.*, 2014; Büschgens *et al.*, 2013; Svetlana and Jucevicius, 2011; Yi and Begley, 2011). Strong social relationships resulting in a higher number of social connections provide stronger social ties for both individuals and groups (Brennecke and Stoemmer. 2018). Social relationships also provide informal communication channels between employees bridging gaps in organizations' formal communication structures, and hence improve KT (Brennecke and Stoemmer, 2018). Individuals who are shared between different projects can through their informal social relationships help bridge the knowledge transfer gaps between otherwise unconnected projects (Brennecke and Rank, 2016). Communities of Practice are freely formed and unmanaged communities allowing professionals to exchange thoughts, ideas and best practices from their professional lives amongst each other. They are recognized as perhaps one of the best social learning systems to hold, transfer and create new knowledge (Roberts, 2006; Wenger *et al.*, 2000). It is interesting to note that online social networks (i.e. using information technology to support social networks) attribute to strengthening the real-life social interactions (Ljepava *et al.*, 2013; Meyer, 2010). Utilization of online social networks in collaboration and exchange of knowledge was found to foster innovation performance (Meyer, 2010).

Interorganizational knowledge transfer represents a concept of organizations seeking expertise beyond their corporate boundaries, even outside of national or regional boundaries, as such it is very important for innovation and competitive advantage (Zhou *et al.*, 2019; Chen *et al.*, 2014; Lichtenthaler *et al.*, 2010; Huggins and Johnston, 2009). Interorganizational knowledge transfer enables access to a wider knowledgebase (i.e. knowledge of external organizations) and is needed by the organization in order to be able to meet the challenges of the increasing pace of global competition

(Wang and Lam, 2019; Zhou *et al.*, 2019; Dolińska, 2015; Chen *et al.*, 2014; Hohberger *et al.*, 2015; Easterby-Smith *et al.*, 2008). Partner's diversity of knowledge is more likely to affect transfer of knowledge that is novel to organization's existing base of knowledge (Phelps, 2010). Wider knowledgebase could perhaps be established through cooperation with multiple external companies. Stronger are the interorganizational relationships in terms of the number of connections between the recipient organization and external providers of knowledge, stronger is the interorganizational knowledge transfer (Almeida *et al.*, 2011; Van Wijk *et al.*, 2008). Theories of interorganizational relationships argue that organizations form relationships with other organizations for economic benefit or when they are missing a certain capability on their own (Parmigiani and Rivera-Santos, 2011; Bergman and Maier, 2009). This is in line with innovation theories that companies form relationships with other organizations for the benefit of access to external knowledge, achieving cost effectiveness and access to human resources (Santa *et al.*, 2019; Wang and Lam, 2019; Dolińska, 2015). Motivation to transfer knowledge is a function of opportunity and ability to share knowledge leading to a more successful knowledge transfer (Zonooz *et al.,* 2011; Burgess, 2005). However, both sender and receiver of knowledge need to be motivated to transmit and receive knowledge (Burgess, 2005). Partners' willingness to cooperate is increased with trust which in turn enables successful knowledge transfer (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011).

In transferring knowledge, the level of knowledge ambiguity plays a significant role for successful KT. More ambiguous the knowledge, more difficult is it to be transmitted (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011). In cases of a highly ambiguous, that is more tacit knowledge, personal interaction through seminars, workshops and meetings has a better chance for knowledge transfer success, whereas if the knowledge is explicit (less ambiguous), using electronic communication, documents and databases is likely to result in successful knowledge transfer (Windsperger and Gorovaia, 2010). However, if the language of communication is not the same, including using comm terminology and interpretation of knowledge, this will result in miscommunication and unsuccessful knowledge transfer (Oppat, 2007). This is why knowledge transfer has to be accompanied with creation of a common language, such that parties transferring knowledge can understand each other and effectively transfer knowledge (Van Wijk *et al.*, 2008; Davenport and Prusak, 2000). Richness of communication media seems to be related to the richness of information being transmitted. Non-rich communication media is considered to be text only, versus rich communication media providing capability to transfer images, videos, and also enable personal communication (Ferry *et al.*, 2001). Rich communication media also provides a feedback loop in communication. As such, using rich communication media provides a better support for knowledge transfer and innovation effectiveness, and is fundamental to novel product development (Jarle Gressgård, 2011). Support to a richness of communication media can be supported through information technology and organizational systems supporting knowledge transfer (Ciabuschi *et al.*, 2011; Dinur, 2011; Wu, 2010). This is perhaps because information technology can enable a large spectrum of communication channels of different richness (Wu, 2010).

Mere transfer of knowledge however does not assure that knowledge transmitted will be used by the receiving organization. Organizations need to implement and develop knowledge absorption capacity, that is ability to absorb and utilize the knowledge received (Zou *et al.*, 2018; Zonooz *et al.,* 2011). The larger organizational capacity to more quickly absorb new knowledge increases the innovation performance (Burkhart and Piller, 2010; Madsen *et al.*, 2010; Lichtenthaler *et al.*, 2010). Knowledge absorption capacity can be increased in time through active knowledge sharing, therefore through gaining experience on the knowledge transfer (Zonooz *et al.,* 2011). Organizational size, and therefore the larger its resources and a wider knowledge base positively influence knowledge absorption capacity and extend of the knowledge being transferred (Khosravi *et al.*, 2019; Forés and Camisón, 2016; Anderson *et al.*, 2014; Laursen and Salter, 2006; Gray and Meister, 2004). On the other hand, some researchers (Shaker and Gerard, 2002) argue there exists a difference between potential and realized knowledge absorption. Potential knowledge represents all absorbed knowledge, whereas realized knowledge is the knowledge actually used in an organization. Researchers argue that social interactions play an important role in transfer from potential to realized knowledge absorption, that is to knowledge that ends up used in organization. To increase the knowledge absorption capacity, organizations should consider implementing formal and informal mechanisms of social integration (Brennecke and Stoemmer, 2018).

Besides knowledge absorption capacity, a capacity for outbound knowledge transfer – an ability of a sender to transfer its knowledge to recipients known as knowledge *desorption capacity* seems to be yet another crucial component of a successful knowledge transfer (Najafi-Tavani *et al.*, 2012; Lichtenthaler *et al.*, 2010; Oppat, 2007). When value of the knowledge being transmitted is understood, it increases the motivation to transmit the knowledge, and therefore the knowledge desorption capacity (Najafi-Tavani *et al.*, 2012). Knowledge absorption and desorption capacity therefore govern the capacities of the sender and receiver of knowledge to be able to send and receive such knowledge. The larger this capacity is, the more likely is the success of a knowledge transfer (Zou *et al.*, 2018; Camison and Villar-Lopez, 2014; Burkhart and Piller, 2010; Madsen *et al.*, 2010; Lichtenthaler *et al.*, 2010).

In interorganizational knowledge transfer, central positioning of an organization within a knowledge network along the path of knowledge exchange positively affects success of knowledge transfer (Phelps, 2010; Van Wijk *et al.*, 2008). Prominent position of an organization within the knowledge network is allowing an organization to benefit better from such network (Bergman and Maier, 2009; Owen and Powell, 2003). It is interesting to note that organizations that are cooperating with science institutions typically had a better position within the knowledge network (Kim and Park, 2010). On the other hand, as organizations operate within the wider social circumstances, overall position in a wider social environment can position company as more or less desirable partner (Parmigiani and Riviera-Santos, 2011).

Emerging from the synthesis of knowledge management theories is notion that people, and social relationships foster knowledge transfer within organizations and between organizations through interorganizational knowledge transfer. This finding provides support that developing measures of influence of KT to innovation outcomes based on individual behaviours, collectively representing organizational behaviours, has a potential of provide novel insights in the domain of innovation research. Existing literature points out a number of determinants governing knowledge transfer, yet the literature seems undeveloped on which determinants are perhaps most critical to success, or failure of knowledge transfer to innovation. Through developing measure of KT to innovation outcomes, it would be possible to understanding which of determinants of KT in the existing literature are perhaps the most attributable, or not, to success of innovation outcomes. This has a potential to further our understanding of influence of KT to innovation outcomes, and contribution to theories of innovation effectiveness.

2.9.9 THEORIES OF INTERORGANIZATIONAL RELATIONSHIPS (IOR)

Interorganizational relationships are strategic cooperative relationships between organization and other external organizations to share and exchange resources for the purpose of improved business performance (Parmigiani and Rivera-Santos, 2011; Bergman and Maier, 2009). Interorganizational relationships are fundamental to the performance of organizational network as intensive knowledge sharing contributes to the increased interorganizational innovation performance (Phelps, 2010). Understanding theories of IOR is necessary in developing measures of IOR to innovation outcomes. Connecting previous generalized knowledge with new knowledge as an outcome from this research, allows generalization of new knowledge (Sherif, 2006). Summary of the existing theories on interorganizational relationships are provided in Table 14.

Determinants of IOR	**Literature support**
Motivating factors for forming interorganizational relationships	McEvily *et al.* (2017); Parmigiani and Rivera-Santos (2011)
Form of interorganizational relationships	Cao and Lumineau, (2015); Parmigiani and Rivera-Santos (2011); Lavie *et al.* (2010); Wassmer (2010); Provan and Sydow (2008)
Partner type in organizational network	Kim and Park (2010); Phelps (2010); Kang and Kang, 2010); Faems *et al.* (2005)
Strengths and Number of Relationships in Organizational Network	McEvily *et al.* (2017); Najafi-Tavani *et al.* (2012); Van Wijk *et al.* (2008)
Positioning in Organizational Network	Almeida (2011); Phelps (2010); Bergman and Maier (2009); Van Wijk *et al.* (2008)
Leadership structure in the organizational network	Lumineau *et al.* (2015); Lumineau and Henderson, (2012); Tangpong *et al.* (2010); Davis and Eisenhardt (2007)
Social networks	Ekici (2013); Tangpong *et al.* (2010); Parmigiani and Riviera-Santos (2011); Van Wijk *et al.* (2008)
Dynamics of interorganizational collaboration	
Goals between partners, contract frame, interaction style, decision-making control, organizational structure and actor composition.	McEvily *et al.* (2017); McEvily *et al.* (2014); Cao and Lumineau (2015); Lumineau *et al.* (2015); Majchrzak *et al.* (2015); Ekici (2013); Jarle Gressgård (2011); Thorgren and Wincent (2011); Tangpong *et al.* (2010)

Table 14 – Factors influencing interorganizational relationships

Perhaps the most important first step into IORs is understanding the intent of why organizations form relationships (Parmigiani and Rivera-Santos, 2011). Organizational economic theory describes interorganizational relationships from the perspective of organizations forming a relationship for the pursuit of efficiency as its main motivator – i.e. organizations partner with others when it is more efficient for them to conduct an activity through a partner relationship rather on its own, or through the marketplace. Organizational efficiency can be attained in several different ways: through cost minimization (either the production or transaction costs), attainment of important assets and resources, such are for example knowledge assets required for innovation (in situations when there is no better and more cost-effective alternative), or increasing the economies of scale (Parmigiani and Rivera-Santos, 2011).

Forms of interorganizational relationships represent a variety of forms in which an organization is in relationship with another organization, each with different attributes of the forms - some are common and some different from one to another (Parmigiani and Rivera-Santos, 2011; Lavie *et al.*, 2010). Forms of interorganizational relationships found in the academic literature are alliances, joint ventures, cross-sector partnership, networks, buyer-supplier agreements, technology licensing, franchising, co-branding, trade association, consortia and marketing licensing. Innovation collaboration between two organizations is either co-exploration or co-exploitation activity (Albats *et al.*, 2019; Parmigiani and Rivera-Santos, 2011). Researchers (Lee *et al.*, 2019; Lavie *et al.*, 2010) argue that organization should utilize "ambidexterity" approach in using both exploration and exploitation, as companies who use both approaches in a balanced manner achieve better innovation performance. Companies pursuing co-exploration typically form joint ventures, and companies pursuing co-exploitation typically form alliances, buyer-supplier agreement and technology licensing (Parmigiani and Rivera-Santos, 2011). These forms of interorganizational relationships are adapted by this study. On the other hand, forms of IORs such are franchising, co-branding, trade associations, consortia or marketing licensing do not have the appropriate co-creation innovation development component this research is looking for, and as such are not adapted by this study.

Partner type seems to be critical in success of innovation performance in organizational networks (Kim and Park 2010; Phelps, 2010; Kang and Kang, 2010). Phelps (2010) argues that partner selection is a fundamental aspect of successful interorganizational relationship, as relationship with any partner is not sufficient for increased innovation performance. Researchers argue that compatible and complementary partners are necessary for an organization to benefit from interorganizational innovation. Kang and Kang (2010) supports this view and argues that partner selection is one of the most crucial components of networked innovation, as only proper partnership relationships can positively influence innovation performance. This is because access to a broader knowledge base through IORs enables for a more successful creation of new knowledge and in turn innovation (Wang and Lam, 2019; Dolińska, 2015; Parmigiani and Rivera-Santos, 2011; Lichtenthaler *et al.*, 2010). As such, network diversity, that is access to multiple sources of knowledge through IORs also influences more successful creation of new knowledge, and therefore innovation performance (Phelps, 2010). Literature indicates there exist several factors influencing interorganizational knowledge transfer that are in common with factors influencing interorganizational relationships. These common factors for interorganizational knowledge transfer and partner type (Kim and Park, 2010), strength and number of relationships (Brennecke and Stoemmer, 2018; Najafi-Tavani *et al.*, 2012) and positioning within the partner network (Bergman and Maier, 2009). Literature also indicates that both KT and IOR have social relationships as a common factor influencing their performance. Social network interactions influence successful knowledge transfer (Najafi-Tavani *et al.*, 2012), strengthen social relationships and help accumulate social capital (Berzina, 2011). Relational social capital is significant to IORs as it is positively related to trust and strength of IORs (Cao and Lumineau, 2015; Lumineau *et al.*, 2015; Najafi-Tavani *et al.*, 2012). The partner type, strength of IORs and social relationships all seem to be common factors influencing KT and IOR performance.

Factors influencing dynamics of interorganizational collaboration are perhaps some of the most important to understand as they govern the interorganizational dynamics of IORs and influence change, either positive or negative to performance of the relationship. Interorganizational collaboration is an ongoing relationship being communicated between the two organizations. Studies on this topic are based on organizational theory evaluating outcomes of relationships, with the goal of increasing effectiveness of interorganizational relationships. Majchrzak *et al.* (2015) through an extensive literature study based on 22 longitudinal studies of dynamic interorganizational collaboration have identified six (6) types of characteristics that affect change in interorganizational relationships in time, shown in Table 15.

Characteristics of interorganizational collaboration change	**Dynamics of change**
Goal dynamics	Goals of collaboration between the parties and the mutual mission.
Contract frame dynamics	Formal or informal contracts governing the collaboration. Governs knowledge transfer, IP exchange, shared risks and benefits.
Interaction style dynamics	Individual collaboration between the parties – collaborative or competitive (opportunistic)
Decision-making control dynamics	Direction of decision making – top-down and bottom-up.
Organizational structure dynamics	Roles and processes governing collaboration between the parties.
Actor composition dynamics	Introduction or change of key individuals or partners in interorganizational collaboration.

Table 15 - Summary of characteristics of interorganizational collaboration change (adapted from Majchrzak *et al.*, 2015)

Dynamics of interorganizational collaboration describe changes in internal collaboration between parties and over time. Internal interorganizational collaboration is not considered to be affected with market or hierarchical forms of control. These dynamic changes can be qualitative, for example change in form, function, or how decisions are made, or quantitative in terms in increase or decrease of current characteristics of a relationship. These shifts could be linear, nonlinear, sudden or gradual. Sources influencing the six characteristics of interorganizational collaboration change are: between-partner differences, external sources, and withing interorganizational sources. Research (Majchrzak *et al.*, 2015) indicates that between-partner differences are most influential to triggering dynamic change in IORs. These changes can enter a dynamic loop of change between contract-frame, decision making and interaction style, being either positive or negative. Contract frame represents formal or informal frame governing the relationships between partners, knowledge transfer, IP exchange, collaboration, and decision making. Decision making relates to decision making process in IORs, typically described as top-down and bottom-up. Interaction style dynamics represent interaction between partners, either as collaborative or competitive due to opportunism (McEvily *et al.*, 2017). Positive loop of change to interorganizational collaboration dynamics is shown with Figure 22, and negative loop is shown with Figure 23.

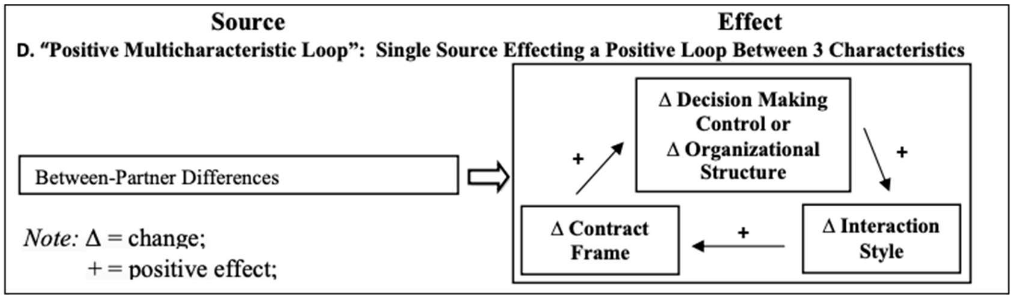

Figure 22 - Positive loop of change to interorganizational collaboration dynamics

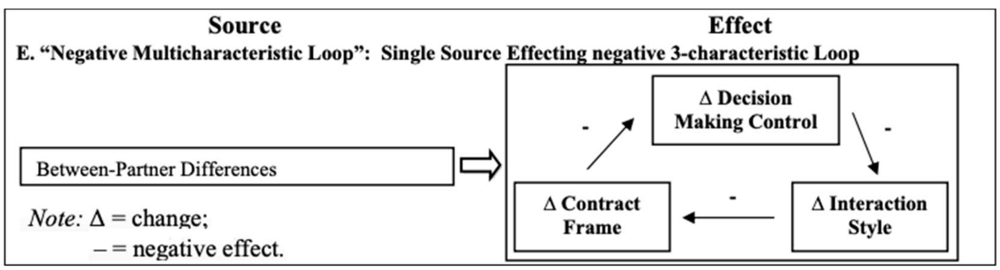

Figure 23 - Negative loop of change to interorganizational collaboration dynamics

Understanding interorganizational collaboration dynamics helps understand IORs, and in relationship with KT helps understand influence to innovation outcomes. In support strong IORS and open innovation (open exchange of knowledge and IP) are most likely to increase innovation performance, rather than if a company was to innovate on its own (Almirall and Casadesus-Masanell, 2010; Lichtenthaler *et al.*, 2010; Palmatier *et al.*, 2007).

2.9.10 DARK SIDES OF IORS

In understanding dark sides of IORs, researchers (Lumineau *et al.*, 2015; Cao and Lumineau, 2015; Lumineau and Henderson, 2012; Tangpong *et al.*, 2010) argue that key characteristics of interorganizational relationships is conflict. This is because this relationship leads to behavioural contradictions between the parties in terms of cooperation versus competition, structural contradictions in rigidity versus flexibility, and temporal contradictions in short and long-term goals. In case organization is unable to avoid these contradictions, conflicts occur. By the nature of joining an interorganizational relationship, organizations introduce an additional (external) organization into their domain by voluntarily agreeing to relinquish certain freedoms, and to shape parts of their activities under the regime of the arrangement. As such, interorganizational relationships contain properties of interdependencies between parties.

Forms of governance (formal vs. informal) also cause conflicts in interorganizational relationships. Informal structures of interorganizational relationships make governance more difficult (Cao and Lumineau, 2015), as in case of a conflict, there isn't a formal singular hierarchy to resolve disputes (Lumineau and Henderson, 2012). Engaging a third party arbitrary is typically lengthy and too expensive. An additional obstacle in conflict resolution is related to individuals responsible to manage IORs. There could exist a mix and mismatch between individual interests and organizational interests creating another layer of conflict. In such cases, conflict resolution is complex and requires a management of both individual and organizational conflicts (Tangpong *et al.*, 2010).

While academic knowledge provides insights on positive aspects influencing innovation outcomes, the literature on the contrary is underdeveloped on negative influences to innovation outcomes (Witell *et al.*, 2015; Anderson *et al.*, 2014), as such understanding further aspects negative aspects of IOR- to innovation outcomes is a future research opportunity.

Emerging from the synthesis of IOR theories is notion that social interactions strongly influence interorganizational relationships, and also knowledge transfer. The literature also indicated that both co-exploration and co-exploitation can simultaneously occur in interorganizational relationships, which is also in line with innovation theories on exploitation and exploration pursuit of innovation, indicating ambidextrous innovation approach. Existing literature points out a number of determinants governing IORs, yet the literature seems undeveloped on which determinants are perhaps most critical to success, or failure of interorganizational relationships to innovation. Literature also indicates six characteristics of interorganizational collaboration dynamics positively and negatively influencing performance of IORs. Through developing measure of IOR to innovation outcomes, it would be possible to understanding dimensions of IOR are perhaps most attributable, or not, to success of innovation outcomes. This has a potential to further our understanding of influence of IOR to innovation outcomes, and contribution to theories of innovation effectiveness.

2.9.11 Theoretical Views of Innovation in Literature

Innovation is an abstract and a multidimensional concept (Khosravi *et al.*, 2019; Saunila, 2017b; Černe *et al.*, 2016; Damanpour and Aravind, 2012; Crossan and Apaydin, 2010; Van de Ven *et al.*, 2007; Anderson *et al.*, 2004). Theoretical views of innovation are siloed and studied from the following perspectives (Janssen *et al.*, 2011; Saunila, 2017a):

- **Outcome** view of innovation,
- **Process** view of innovation, and
- **Determinants** view of innovation.

Innovation as an **outcome** is observing the outputs of innovation produced (Madsen *et al.*, 2010; Dervitsiotis, 2010; Van de Ven *et al.*, 2007; Narvekar and Jain, 2006; Lloyd, 2006) and innovation as a **process** is observing the process of how innovation was produced (Albats *et al.*, 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2011; Dervitsiotis, 2010; Desouza *et al.*, 2009; Fallah and Lechler, 2008; Hansen and Birkinshaw, 2007). Innovation process and innovation outcome are dependent upon each other as process of how innovation is developed is related to the outcome of innovation – what was actually developed (Lee *et al.*, 2019; Saunila, 2017a; Janssen *et al.*, 2011; Crossan and Apaydin, 2010). **Determinants** of innovation describe factors influencing innovation outcomes (Khosravi *et al.*, 2019; Crossan and Apaydin, 2010; Smith, 2008; Adams *et al.*, 2006). There does not seem to exist a consolidated theoretical framework of innovation connecting these separate theoretical facets together (Khosravi *et al.*, 2019; Saunila 2017b; Crossan and Apaydin, 2010; Xu *et al.*, 2007). Research indicates that innovation, although an abstract concept can be a managed organizational process (Albats *et al.*, 2019; Geissdoerfer *et al.*, 2016; Camison and Villar-Lopez, 2014; Damanpour and Aravind, 2012; Dervitsiotis, 2010; Desouza *et al.*, 2009; Fallah and Lechler, 2008; Mrinalini and Nath, 2008; Hansen and Birkinshaw, 2007). This managed organizational process, also known as innovation management, represents a system that organizations need to implement in order to be able to manage innovation as a continuous process for delivery of innovative products and services (Khosravi *et al.*, 2019; Cerne *et al.*, 2016; Nieves, 2016; Desouza *et al.*, 2009; Gold, 2009; Pollard, 2009).

2.9.12 Integrated Frameworks of Innovation

Reviewed integrated frameworks of innovation in the literature (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Geissdoerfer *et al.,* 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007) observe innovation as an internal organizational process. Observing innovation as an organizational process is perhaps one of the most represented theoretical viewpoints in the academic literature describing a value-adding transformation process between components of the innovation system (Albats *et al.*, 2019; Boukamel *et al.,* 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007; Sirkin, 2007; O'Connor and DeMartino, 2006; Stalk 2006). The synthesised view of components representing the *innovation value chain* from reviewed innovation frameworks (Albats *et al.*, 2019; Boukamel *et al.,* 2019; Geissdoerfer *et al.*, 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007) is comprised of the following links:

1) **Idea generation and capture** (search, discovery, creation, capture)
2) **Project selection** (conversion of ideas to projects)
3) **Innovation development** (project development and implementation)
4) **Taking to markets** (diffusion - dissemination and commercialization of innovative products and services in the marketplace; capturing economic benefits)

Each of the links in the innovation process adds an innovation value into the system until the outcome of innovation is produced and its recognized as organizational value captured (Albats *et al.*, 2019; Boukamel *et al.,* 2019). To evaluate capacity of an organization to innovate, the innovation value adding capacity of each link within the innovation value chain needs be evaluated to understand the strongest and weakest links. By focusing on improving the weakest link within the innovation value chain the organization’s capacity to innovate is most likely to increase (Santa *et al.*, 2019).

Several models (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Geissdoerfer *et al.,* 2016; Dervitsiotis, 2010; Hansen and Birkinshaw, 2007) denote connection with external organizations collaborating on innovation indicating importance of extended innovation network. Hansen and Birkinshaw (2007) model shown in Figure 24 recognizes importance of external knowledge transfer and collaboration (KT and IOR) and call for external partner collaboration during idea generation phase and diffusion in the marketplace, however this is not noted during the innovation development phase.

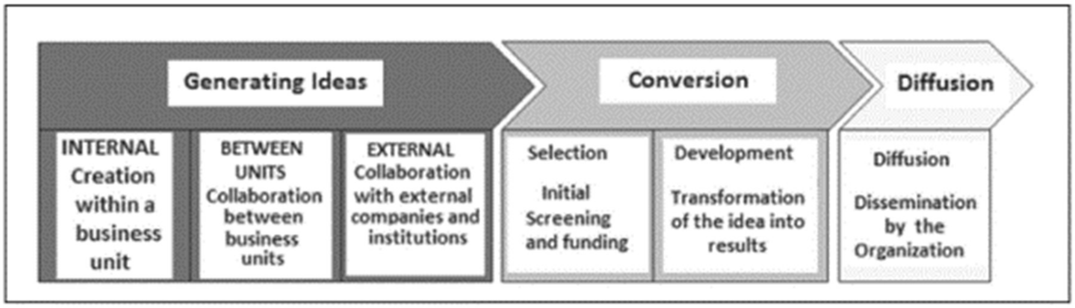

Figure 24 - Innovation value chain (Hansen and Birkinshaw, 2007)

Unlike other models, Albats *et al.* (2019) model shown in Figure 25 extends the influence of KT and IOR as moderators of the innovation process to all chains of the process. They also extend the knowledge-based approach in implementation and capturing commercial benefits with external expertise and resources obtained through a network of companies. This is in line with theories of interorganizational knowledge transfer (Wang and Lam, 2019; Dolińska, 2015; Lichtenthaler *et al.*, 2010) and interorganizational relationships as drivers of innovation performance (Davis, 2016; de Faria and Lima, 2012).

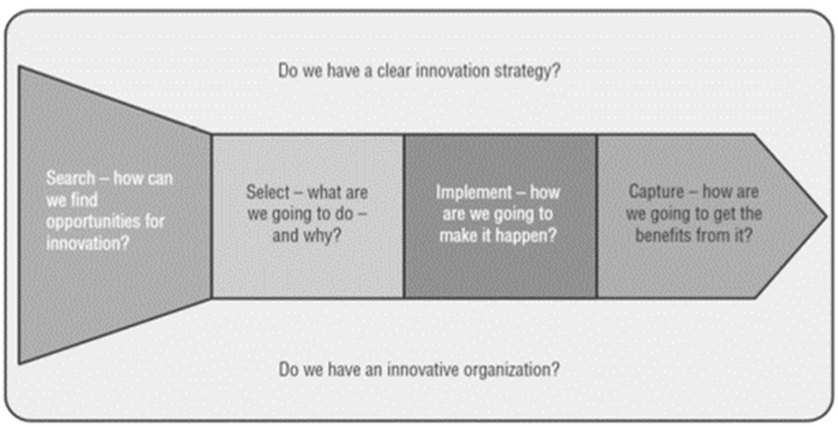

Figure 25 - Innovation process (Albats *et al.*, 2019)

Albats *et al.* (2019) innovation framework also connects the first stage of idea generation with triggers arguing there has exist a trigger initiating the innovation process. Researchers argue these triggers can be either internal – team's ideas, intelligence, entrepreneurial ideas and external – market demand, market opportunities, and market turbulence. Both internal and external triggers of innovation are connected with knowledge exchange, either internal or external required as an input to the innovation process. This is aligned with market-oriented and resource-oriented view of innovation (Albats *et al.*, 2019; Chang *et al.*, 2014; Ford and Paladino, 2013; Janssen *et al.*, 2011; Nylund, 2008; Palmatier *et al.*, 2007) and knowledge transfer as one of the main drivers of innovation (Wang and Lam, 2019; Dolińska, 2015; Alipour and Karimi, 2011). Once innovation process has been triggered, companies are selecting which projects to work on and proceed with concept development in an agile manner. This approach is aligned with the modern software development methodologies based on agile software delivery with short development lifecycles based on rapid prototyping and validating models before investing further in development (Scrum.org, 2017; Stray *et al.*, 2016).

Geissdoerfer *et al.* (2016) innovation framework shown in Figure 26 expands the innovation process by further detailing the idea generation link to innovation concept design and detailing the conversion (project selection) link to a detailed design of innovative product. Concept design has two sub-categories: concept design and virtual prototyping with the goal of rapid prototyping and a fast delivery of proof of concept. Detailed design has three sub-categories: experimenting, detailed design and piloting with the purpose of developing an innovation in an agile manner and piloting it in the marketplace as soon as possible. This approach is aligned with the modern software development methodologies based on agile software delivery with short development lifecycles based on rapid prototyping and validating models before investing further in development (Scrum.org, 2017; Stray *et al.*, 2016). This approach is believed to be more effective in saving time and investments as with a working prototype early on and testing it in the marketplace, a quicker feedback on the product adoption by the market and any needs to adjust the product is obtained before deciding to invest in a full-scale product.

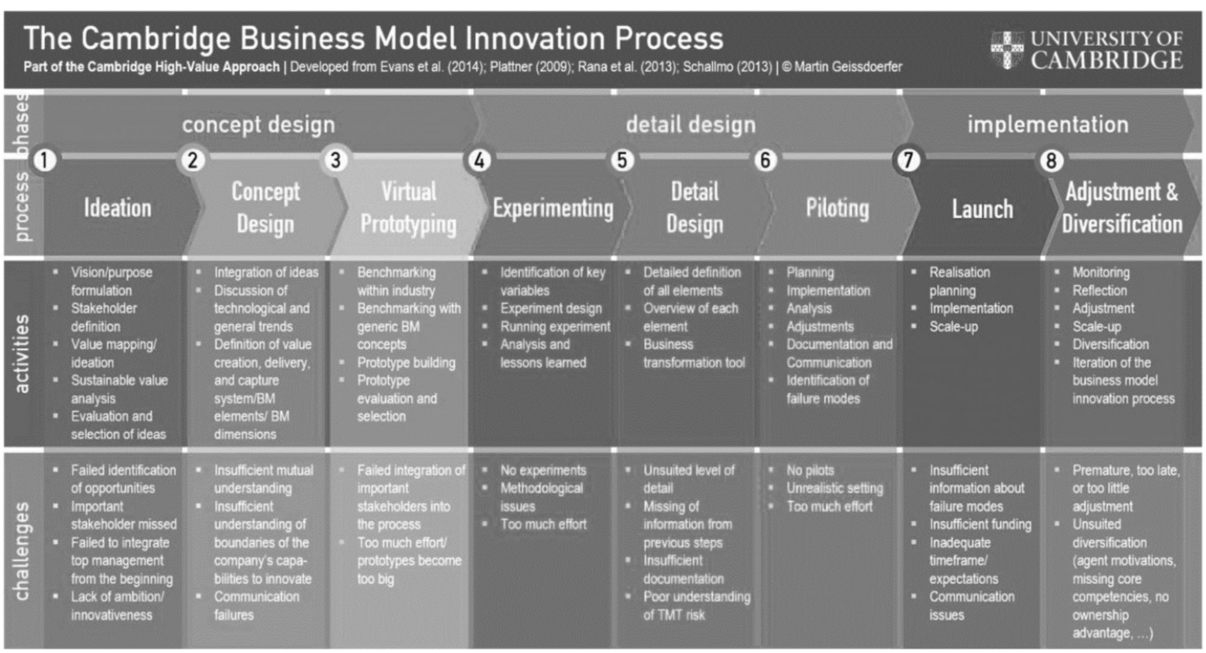

Figure 26 - The Cambridge Business Model Innovation process (Geissdoerfer *et al.*, 2016)

Innovation frameworks of Albats *et al.* (2019); Geissdoerfer *et al.* (2016) and Hansen and Birkinshaw (2007) observe innovation as an internal organizational process connecting it with determinants and regulating moderators, however without clearly connecting them with outcome view of innovation. Understanding connection between the innovation process governing internal organizational dynamics and innovation outcomes is important as they are dependent upon each other – the process of how innovation is developed is related to the outcome of innovation (Lee *et al.*, 2019; Saunila, 2017a; Janssen *et al.*, 2011; Crossan and Apaydin, 2010). This emerges as one of the gaps in the academic literature.

Dervitsiotis (2010) innovation model shown in Figure 27 provides perhaps the most comprehensive integration of various theoretical facets in a single model (extended with understanding of KT and IOR to innovation outcomes as identified gap by this study). This model, similar to other models (Albats *et al.*, 2019; Geissdoerfer *et al.*, 2016 and Hansen and Birkinshaw, 2007) describes the internal process of innovation consisting of idea generation and capture, project selection, innovation development and taking innovation to the market.

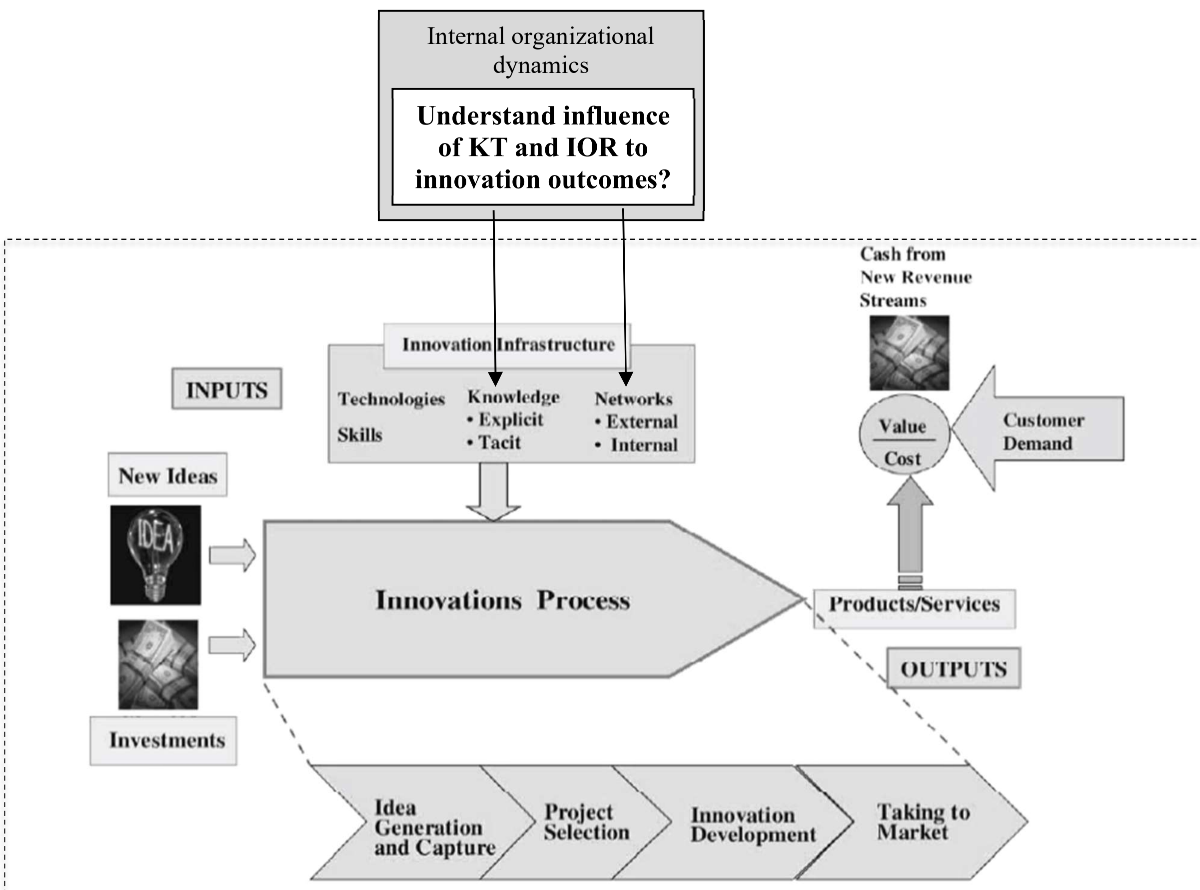

Figure 27 - Innovation System (Dervitsiotis, 2010) – extended with KT and IOR contribution of this research

Outcome view of innovation is shown with outputs (products/services) and business value consisting of value and cost. The model also integrates a market-based view of innovation feeding customer demand as a regulator of innovation's performance, which is in alignment with market-based drivers of innovation (Albats *et al.*, 2019; Chang *et al.*, 2014; Ford and Paladino, 2013; Janssen *et al.*, 2011; Nylund, 2008; Palmatier *et al.*, 2007). Determinants and regulating moderators of innovation process shown in Dervitsiotis (2010) model are indicated as innovation infrastructure – resources needed (technologies and skills), knowledge (tacit and explicit - KT), access to networks (internal and external - IORs) and open and closed locus of the innovation process. This is in alignment with theories arguing that KT is one of the main drivers of innovation (Wang and Lam, 2019; Dolińska, 2015; Alipour and Karimi, 2011), along with IOR (in case of this model, these are external networks), as companies collaborating together have access to a broader knowledge and resources which are found to positively influence innovation performance (Wang and Lam, 2019; Dolińska, 2015; Parmigiani and Rivera-Santos, 2011; Lichtenthaler *et al.*, 2010; Phelps, 2010).

It seems that Dervitsiotis (2010) innovation model is perhaps one of the most comprehensive models in the literature to extend further with understanding of KT and IOR as one of the major factors influencing innovation outcomes, and also to extend the model beyond a single organization view to interorganizational innovation. Connecting siloed theoretical views of innovation (Khosravi *et al.*, 2019; Saunila 2017b; Crossan and Apaydin, 2010; Xu *et al.*, 2007) together is emerged theoretical gap. This is why in Figure 27 in addition to original Dervitsiotis (2010) innovation model, an additional box stating "Understand influence of KT and IOR to innovation outcomes?" was drawn to indicate that this research could perhaps plug into this particular model describing KT and IOR (external networks) under innovation infrastructure. Using findings of this research to extend Dervitsiotis (2010) model in connecting process of how innovation is developed based on internal organizational dynamics with the outcome view of innovation could perhaps further help facilitate models of innovation effectiveness.

2.9.13 DARK SIDES OF INNOVATION

Academic literature is scarce on observing innovation through negative views, rather majority of literature focuses on positive outcomes of innovation (Witell *et al.*, 2015; Anderson *et al.*, 2014). While innovation outcome is typically perceived from its positive benefits, innovation outcome can also be negative with unwanted consequences to organizations (Anderson *et al.*, 2014; Rosenbusch *et al.*, 2011; Lloyd, 2006), including high costs and negative financial performance (Janssen *et al.*, 2004). Dark side of innovation indicates that some events, such are negative work role evaluations and moods, and also experiences of conflict could provoke innovation attempts (Bledow *et al.*, 2013; Binnewies and Wörnlein, 2011; Janssen *et al.*, 2004). This could perhaps indicate that negative experiences provoke a need for innovation. Such changes are likely to cause psychological stress in employees as they require changes in job approaches, methods, job design, changes in employee expectations (Janssen *et al.*, 2004). Indeed, researchers (Hammond *et al.*, 2011) indicate that job description including innovation as an objective is likely to have a positive effect to innovation performance. On the other hand, researchers (Binnewies and Wörnlein, 2011) find a relationship between perceived job control and job stressors to have a negative influence to innovation performance. Innovative employees are also at risk of conflict with actors preventing changes required by innovation, and taking initiative can cause frustration, antagonism and animosity (Janssen *et al.*, 2004). Unsuccessful group innovation leading to failure is often a result of lowered group cohesion, group ineffectiveness and resistance to future innovation. In such constellation unclear leadership and unclear objectives are negative costs of the innovation process (Janssen *et al.*, 2004). The research on dark sides of innovation is also not clear why some employees positively benefit from taking an innovative approach, and why some employees pay the costs of such actions in organizations (Janssen *et al.*, 2004).

While organizational culture is one of key determinants of innovation effectiveness, it can also be a barrier against innovation. In particular researchers (Naranjo-Valencia *et al.*, 2016; Büschgens *et al.*, 2013) found that hierarchy cultures with traits such are centralized decision making and a high degree of formalization, are negatively associated with innovation. Organizations whose culture supports stability in their thought or action have been associated with negative innovation effectiveness (Büschgens *et al.*, 2013). On the other hand, flexible (adhocracy) cultures with traits of creativity, freedom, and a risk-taking attitude is positively related to innovation performance.

Despite intellectual property positively affecting innovation performance, organizations who heavily rely and form their business models on capitalizing from intellectual property are found to negatively affect innovation performance. In particular, companies (aka patent trolls) who focus on build portfolios of patents for sale (or re-sale) of licenses as a business model, and do not focus on creating customer value are obstructing innovation and new knowledge generation through high licencing fees or blocking access to license technology (Teece, 2018). This in particular makes sense observing that Zou and Chen (2019) argue that more than 50% of products license various technologies across industries.

Rapid pace of innovation also seems to generate considerable waste. Witnessing larger than ever creation of various systems and technologies, it is questionable however if various systems are interoperable and can be integrated one with the other. Inability of technology to integrate with other systems results in diminishing returns and throwaway technologies (Teece, 2018). This has resulted in the convergence of several industries across common platforms, such are for example interoperable music and photo platforms attempting to address this issue.

Emerging as research gap - understanding negative influences to innovation performance emerge as a research gap as applied novelty can also produce a neutral or even negative (unwanted) value to an organization (Anderson *et al.*, 2014; Rosenbusch *et al.*, 2011; Lloyd, 2006). Researchers (Witell *et al.*, 2015) critically argues that majority of academic literature is based on studies on a small percentage of innovation activities that succeed, while neglecting a large sample of innovation projects that have failed. The number of failed projects and opportunity to learn from them, also when observed longitudinally, seems much larger in volume than successful innovation. Understanding negative sides of innovation effectiveness and can help managers focus on mitigating and removing factors negatively influencing innovation performance. Understanding negative sides of innovation is underdeveloped in academic literature, including interaction between positive and negative factors influencing innovation outcome (Anderson *et al.*, 2014), and if they perhaps could be viewed and managed jointly or separately.

2.9.14 INNOVATION SPECIFIC FOR DEVELOPING COUNTRIES AND SEE

In developing economies, such is SEE, economic growth seems to be fuelled by imitation of globally novel innovation – adopted innovation novel only at the industry or a national level (Madsen *et al.*, 2010). Innovation novel to the region\country only is sufficient to stimulate the economic growth in that region only (Rivas and Gobeli, 2005), versus globally novel innovation. Research also indicates that the source of innovation in developing countries is typically a transfer of technology from developed and its adaptation in developing countries (Aggarwal and Madhavi, 2018; Edison *et al.*, 2013; Rivas and Gobeli, 2005). Regional and national level of innovation novelty seems to be a sufficient stimulus to the national productivity and growth in developing countries (Rivas and Gobeli, 2005). As such, developing countries require technology transfer primarily in stimulating their growth, rather than being at the cutting edge of globally novel innovation (Madsen *et al.*, 2010). On the other hand, there exist examples of global innovation being developed through multinational development centres present in satellite R&D offices (Blit, 2018). The aspect of development of globally novel innovation in developing countries is underdeveloped in the literature.

Emerging as research gaps - understanding interorganizational collaboration and transfer of technology between developed and developing countries will provide novel insights to understanding of adaptation of global innovation in developing countries (Madsen *et al.*, 2010), and understanding of global innovation produced in developing countries (Blit, 2018).

2.9.15 RESEARCH GAPS

Drawing from the synthesised literature review, the knowledge gaps were identified as a subject of this research are outlined in Table 16.

Theoretical gaps		Research opportunities (addressed by this study)
▪ Knowledge transfer (KT) was found to be one the most critical factors to creation of new organizational knowledge (Khosravi *et al.*, 2019; Aggarwal and Madhavi, 2018; Park *et al.*, 2015) influencing organizational learning and therefore innovation performance (Khosravi *et al.*, 2019; Damanpour and Aravind, 2012; Alipour and Karimi, 2011; Crossan and Apaydin, 2010). The size of organization and the organizational resources available to innovation was also found to be one of the most critical factors influencing innovation performance (Khosravi *et al.*, 2019; Ford and Paladino, 2013; Bueno *et al.*, 2010). Access to a broader knowledgebase and larger organizational resources beyond a single organization is possible through collaboration with other organizations resulting in increased innovation performance (Wang and Lam, 2019; Dolińska, 2015; Hohberger *et al.*, 2015; Lichtenthaler *et al.*, 2010; Phelps; Parmigiani and Rivera-Santos, 2011). Knowledge transfer between organizations is mediated through interorganizational knowledge transfer (Chen *et al.*, 2014; Phelps, 2010; Van Wijk *et al.*, 2008). Collaboration between organizations is mediated through interorganizational relationships (IOR) as drivers of innovation performance (Davis, 2016; de Faria and Lima, 2012). Literature indicates that KT and IOR seem to be one of the most critical factors moderating the innovation process (Dervitsiotis, 2010). Understanding KT and IOR to innovation outcomes in the context of interorganizational collaboration provides further insights into models of innovation effectiveness and expands the view of innovation dynamics beyond a single organization. ▪ Further, connection between the innovation process governing internal organizational dynamics and innovation outcomes seems important to understand as they are dependent upon each other – the process of how innovation is developed is related to the outcome of innovation (Lee *et al.*, 2019; Saunila, 2017a; Janssen *et al.*, 2011; Crossan and Apaydin, 2010). However, innovation process models (Albats *et al.*, 2019; Boukamel *et al.*, 2019; Geissdoerfer *et al.,* 2016) reviewed observe innovation as an internal organizational process connecting them with determinants and regulating moderators, however without clearly connecting them with outcome view of innovation. Understanding KT and IOR as moderators of innovation process to innovation outcomes bridges gaps across the boundaries of academic knowledge between the process view and outcome view of innovation. ▪ In addition, individual human behaviours are linked to organizational behaviours and can be used to map organizational	→	**Develop scales measuring positive and negative organizational behaviours of KT and IOR influencing innovation outcomes.**

behaviours (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Cinite *et al.*, 2009; Hodgson, 2002;). Developing measures of KT and IOR to innovation outcomes using behavioural methodology of AFA – Act Frequency Approach (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Tucker and Turner, 2010; Cinite *et al.*, 2009; Ivcevic and Mayer, 2009; Szamosi and Duxbury, 2002; Buss and Craik, 1984) is likely to provide novel theoretical perspectives (Wahyun, 2012; DeLuca *et al.*, 2008; Buelens *et al.*, 2008) in the field of innovation research.		
▪ Innovation effectiveness is better measured through integration of separated theoretical facets (Saunila, 2017a; Janssen *et al.*, 2011). Understanding relationships between KT and IOR moderating the innovation process, and outcome view of innovation is contributing to models of innovation effectiveness. ▪ Understanding positive influences (positive measures of KT and IOR) to innovation performance, along with negative influences (negative measures of KT and IOR), can contribute to integrated and holistic view of innovation (Anderson *et al.*, 2014) and to models of innovation effectiveness. ▪ Understanding negative influences to innovation performance is important as applied novelty can also produce a neutral or even negative (unwanted) value to an organization (Rosenbusch *et al.*, 2011; Lloyd, 2006). This contributes to models of innovation effectiveness and can help managers focus on mitigating and removing factors negatively influencing innovation performance. ▪ Understanding if there exist differences between positive and negative influencing innovation outcomes could provide novel insights into the literature. Understanding if innovation can be moderated and managed separately for behaviours positively and behaviours negatively influencing innovation outcomes would contributes to development of models of innovation effectiveness	→	**Understand relationships between KT and IOR.**
▪ Developing countries in SEE are on one hand on a growth path are fuelled predominantly by adoption of globally novel innovation and intensive knowledge transfer and collaboration between local firms and foreign providers of technology (Aggarwal and Madhavi, 2018; Edison *et al.*, 2013; Madsen *et al.*, 2010). On the other hand, there exist examples of global innovation being developed through multinational development centres present in satellite R&D offices (Blit, 2018). Understanding interorganizational collaboration and transfer of technology between developed and developing countries will provide novel insights to understanding of adaptation of global innovation in developing countries (Madsen *et al.*, 2010), and understanding of global innovation produced in developing countries (Blit, 2018).	→	**Understand interorganizational collaboration and transfer of knowledge between developed and developing countries.**

Table 16 – Identified knowledge gaps (addressed by this study)

2.10 SUMMARY

The literature review chapter has provided a theoretical foundation for this research thesis. Specifics of interorganizational knowledge transfer and innovation in developing countries, such is SEE, are discussed as applicable to each individual theoretical facet. The chapter provides detailed overview of innovation theories from multiple theoretical points of view found in the academic literature: process view of innovation, outcome view of innovation and determinants of innovation.

Theoretical aspects of knowledge management, nature and source of knowledge, including theories of organizational knowledge creation are discussed. Further focus on knowledge transfer was provided, as knowledge transfer is one of the major factors influencing new knowledge creation, and in turn positively influencing innovation performance. The mechanism of knowledge transfer and factors of a successful knowledge transfer are reviewed. Interorganizational knowledge transfer was discussed and its similarities and specifics with the knowledge transfer theories.

The chapter further provides an overview of interorganizational relationships from the three major theoretical points of view: structural forms or interorganizational relationships, process and outcome view of interorganizational relationships. Focus of the literature review on successful interorganizational relationships from the perspective of characteristics influencing interorganizational collaboration dynamics was provided as it relates to quality of interorganizational relationships, and therefore interorganizational knowledge transfer and innovation performance.

The chapter concludes with synthesis of the academic literature as a foundation of this research and theory knowledge gaps identified.

3 INTRODUCTION

This chapter presents multi-methodology devised to conduct the field research to develop scales to understand impact of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes – as the overall aim of this research. The chapter starts with discussing the philosophical stance chosen as a grounding belief in conducting this study. Methodology chosen to develop the scales is presented, along with a critical discussion. Detailed overview of the field research phases is presented with the target sample and data collection details. Analysis methods used to develop scales and to test for validity, stability and reliability are presented. Ethics consideration that have governed the research are presented in this chapter as well.

3.1 RESEARCH PHILOSOPHY

The term philosophy is derived from the Greek word φιλοσοφία (philosophia) – meaning "*the love of wisdom*" – as an investigation into the role and limitations of reason, our sensory perceptions, what is knowledge and how is it acquired (IEP, 2012). The main three branches of philosophy originating from the Greek philosophical tradition are metaphysics, epistemology, and axiology (IEP, 2012; Bahm, 1993). Metaphysics inquiries into the existence and being and its main branch is ontology – the study of being and how reality is perceived (Bryman, 2012). Epistemology is the study of knowledge and deals with what constitutes the acceptable knowledge and how is it created and utilized (Audi, 2011). Axiology is the study of value, concepts of good and wrong and its main branch is ethics – also known as moral philosophy (Bahm, 1993). All other sciences can be further derived from one of these three general philosophical sciences - metaphysics, epistemology, and axiology, although it should be noted that some sciences inquire into all three (Bahm, 1993).

In order to devise the appropriate research approach, the researcher first had to identify a research philosophy and ground its approach based on a fundamental belief regarding the nature of knowledge and how such knowledge is developed (epistemology), with the appropriate views on being and the existence (metaphysics\ontology) and the view of value (axiology\ethics). Two main research philosophies discussed in the academic literature are epistemology - the study of knowledge, and ontology – the study of being (Bryman, 2012; Wahyuni, 2012; Audi, 2011; Saunders *et al.*, 2009). Axiology provides inquiry into value, and it is needed by both epistemology and ontology as evaluation of goodness of the scientific inquiry (Bahm, 1993).

Epistemology as a term is derived from the Greek language – "episteme" (ἐπιστήμη) meaning knowledge and "logos" (λόγος) meaning the "study of" (Audi, 2011). Epistemology research philosophy is a theory of knowledge and it relates to a philosophical stance on what constitutes acceptable knowledge, acceptable ways of creating, understanding and utilizing knowledge (Bryman, 2012; Audi, 2011; Kalof *et al.*, 2008). Moser (2012) defines epistemology as "*the study of the nature of knowledge and justification*". As such, basic premise of what constitutes knowledge in epistemology is based on the following three principles: belief – what we believe in, truth – what is the actual truth, and justification – support that a given proposition is true (Moser, 2012; Bryman, 2012). The intersection of our belief and what is the actual truth when justified represents a "*justified true belief*" (JTB) and it is what constitutes the knowledge (Moser, 2012; Bryman, 2012; Saunders, 2009; Hendricks, 2006). On the other hand, scepticism as a philosophical stance of "*what do people know*" is questioning if certain knowledge is possible and it argues that there is little or no knowledge at all. Sceptics critically examine the systems of meaning with such examination typically resulting in a doubt (Saunders, 2009). Therefore, the main goal of epistemology in defining and securing knowledge is to defeat scepticism through justification as a necessary condition – hence a "justified true belief" (JTB) is considered knowledge (Hendricks, 2006).

Ontology as a term is also derived from the Greek language – "onto" (ὄντος) meaning being, and "logos" (λόγος) meaning the "study of" (Bryman, 2012). Ontology relates to the philosophical stance on how researcher as a social entity perceives reality – as either objective or subjective. From the ontological philosophical perspective subjectivists or nominalists perceive reality dependant on social actors – they believe the reality is built and influenced with perceptions and actions of social actors, they believe the reality is a social construction with man as a social constructor of reality (Bryman, 2012; Audi 2011; Saunders *et al.* 2009). On the other hand, objectivist or realist perceives reality with an external view in which there is no influence of social actors, the reality is a concrete process and a structure with man as an adaptor and a responder to such processes (Bryman, 2012; Audi 2011; Saunders *et al.* 2009). From the epistemological stance of how knowledge is created and understood, subjectivists seek to understand how social reality is created whereas objectivists seek to study systems, processes and change, and to construct a positivist science (Morgan and Smircich, 1980). As such, subjectivism and objectivism present two opposing views on the opposite ends of the ontological continuum (Bryman, 2012; Brink and Rewitzky, 2002; Morgan and Smircich, 1980).

Evaluation of how realities are investigated – i.e., how the research is conducted, and appropriate philosophical stances had to be evaluated by the researcher following the consideration of the nature of knowledge and how is such knowledge developed. Two fundamental philosophical stances dominating in literature on how realities are investigated are axiology and methodology (Bryman, 2012; Wahyuni, 2012; Saunders *et al.*, 2009). Axiology belief relates to the issues of value and ethics, whereas methodology relates to the model in which reality is investigated in context of a chosen research philosophy (Wahyuni, 2012).

Axiology as a term comes from the Greek language – with axiā (αξια) meaning the "value" and logos (λόγος) meaning the "*knowledge of*". Axiology is also known as the "*value theory*" and its main branch is *ethics* (also known as *moral philosophy*) dealing with the concepts of right, good and wrong conduct in the social context. Axiology is needed by other non-value sciences – epistemology and ontology (branch of metaphysics) in order to provide the view of the goodness of the scientific inquiry (Bahm, 1993). Axiology provides separation between the researcher and the researched subject (Wahyuni, 2012). Viewed from the positivist philosophical stance, the research is value free and the researcher maintains independence from the data with an objective stance and the research methodology of inquiry is quantitative. Viewed from the postpositivist philosophical stance, the research is presupposing the acceptance of a certain set of values while the researcher is biased, with the research methodology of inquiry being quantitative or qualitative. From the interpretivist axiological point of view, the research is value bound with the researcher being subjective and a part of the researched, also with the research methodology being qualitative. Pragmatic axiological point of view is also value bound and the value plays a large role in interpreting the results with the researcher adopting both subjective and objective points of view, with the mixed and multi-methodology approach (Wahyuni, 2012; Saunders *et al.* 2009).

Methodology represents a model in which reality is investigated in context of a chosen research philosophy (Wahyuni, 2012). Researchers (Boxenbaum and Rouleau, 2011; Davis, 2010; Jean 1992) take a critical view at research methodologies – how the research is conducted, specifically applied to organizational research. In their longitudinal study on new theoretical knowledge generated in organizational behaviour Boxenbaum and Rouleau (2011) and Davis (2010) have determined that predominantly institutionalized and scholarly accepted view of building new knowledge in this area is through adopting philosophical belief of epistemology. On the other hand, researchers (Pluye and Hong, 2014) critique the traditional research approach of positivism and systematic testing of hypothesis in organizational behaviour arguing that statistics tables alone do not provide a realistic picture of the real life, rather interpretivism in organizational research, combined with positivism can provide a much richer and deeper context into organizational behaviour research. Similarly, number of researchers (Choy, 2014; Wahyun, 2012; DeLuca *et al.*, 2008; Buelens *et al.*, 2008) believes that utilizing multi-methodology approach provides a more comprehensive view, often with novel insights at the research topic. DeLuca *et al.* (2008) argue that multi-methodology provides a higher quality of data in helping interpret the researched subject from multiple points of view, arguing that quantitative and qualitative methodologies are complementary one to another.

Each of the fundamental philosophical beliefs – epistemology, ontology, axiology and methodology are further viewed through one of research paradigms: positivism, postpositivism, interpretivism and pragmatism. These paradigms apply a view of the natural science to social science and observed through the prism of axiology provide separation between the researcher and the researched subject (Wahyuni, 2012).

Positivism and postpositivism paradigms viewed through ontology as a fundamental belief take a socially external view at the researched (Bryman, 2012). On the other hand, both paradigms of positivism and postpositivism viewed through epistemology as a fundamental belief view that only observable phenomena could provide reliable facts (Bryman, 2012). Positivist researchers seek to obtain absolute laws governing a certain phenomenon, believing such laws can be generalized and reproduced by others (Creswell, 2009). Acceptable knowledge is generated through creating a numerical measure and testing a theory from an external view at the researched subject. The theory is tested through setting a hypothesis and numerically justifying adoption of such knowledge – quantitative methodology (Bryman, 2012; Audi, 2011). On the other hand, postpositivists, also known as critical realists, question the absolute truth and believe that social behaviour is conditioned. Postpositivists also believe that knowledge regarding the researched domain can be generalized, however it needs to be framed in a context of an observable social phenomena (Bryman, 2012). Researchers believe that the most adequate research methodology for postpositivism researchers is either quantitative or qualitative (Pluye and Hong, 2014; Bryman, 2012; Wahyuni, 2012; Jean, 1992). Therefore, positivism and postpositivism paradigms go beyond observable in attempting to predict and explain phenomenon researched, and to universally generalize it with various degrees of universality (Audi, 2011).

Interpretivism paradigm viewed through ontology as well as epistemology as a fundamental belief views the reality as subjective, with the difference that ontological belief is socially constructed, whereas epistemology belief is focused on situational details and motivating actions (Bryman, 2012; Saunders *et al.*, 2009; Jean, 1992). Jean (1992) argues that interpretivism can provide a much deeper social picture of the "real life" of the researched domain. This author critiques the traditional positivist view that organizational research should typically be conducted through systematic testing of hypothesis as tables and statistics do not provide a realistic picture of the real life. Bryman (2012) and Saunders *et al.* (2009) believe that interpretivist researchers seek value bonds and are part of the researched – they cannot be inseparable from the subject of research, hence can only be subjective.

As interpretivists believe the reality is constructed through social interactions, and as interpretation of those interactions is subjective, it can therefore lead to multiple perspectives. Interpretivists therefore do not subscribe to a single truth, but to multiple possible truths being on the opposite end of postpositivist beliefs (Saunders *et al.*, 2009). DeRose (2009) argues that epistemic justification in this case might be a subject of situational variation, as the same knowledge in a different social context of the observed might require different types of justification. Researchers (Pluye and Hong, 2014; Bryman, 2012; Wahyuni, 2012; Jean, 1992) believe that the most adequate methodology for interpretivism researchers is qualitative methodology. Qualitative methodology provides rich descriptions of social reality and is conducted through in person interviews, hence involving the researcher in a dialogue with the research subjects. Such researchers utilize a narrative form of data analysis providing socially rich descriptions of a particular social phenomena being researched. (Saunders *et al.* 2009). On the other hand, consequences are that the parameters to test knowledge generated in such way are very distant (Wahyuni, 2012).

Pragmatism paradigm viewed through ontology as a fundamental belief views the reality externally from multiple angles, with views chosen to best answer the researched. Pragmatism paradigm viewed through epistemology as a fundamental belief views the reality as both an observable phenomenon and a subjective interpretation with the purpose of integrating various perspectives (views) to interpret the research data (Bryman, 2012; Saunders *et al.* 2009; Wahyun, 2012). Therefore, pragmatists do not view objective and subjective as mutually exclusive at the opposite ends, rather they observe the reality on a continuum allowing mixed use of epistemology, ontology and axiology in order to have a better understanding of complexities of the social reality (Wahyun, 2012). Pragmatist researchers seek value bonds, and the value plays a significant part in results interpretation, with researchers adopting both subjective and objective points of view. Pragmatist researcher prefer to work with both qualitative and quantitative research methodologies for better understanding of the social reality, hence the most adequate research methodology is mixed or multi-method methodology (Bryman, 2012; Saunders *et al.* 2009).

Scientific research represents a systematic method of discovering meaningful facts and insights for the purpose of enlarging the existing body of knowledge (Bryman, 2012; Gratton and Jones, 2004; Drew, 1980). Discovery of new knowledge is based on a systematic method of inquiry – through systematic questioning (Bryman, 2012; Audi, 2011; Saunders *et al.*, 2009). Contribution of knowledge through research should be contribution to the global body of knowledge and for benefit of all (Gratton and Jones, 2004).

3.1.1 Qualitative and Quantitative Methodologies

Most commonly used methodologies in research, based on different philosophical stances discussed are qualitative and quantitative. Both qualitative and quantitative methodologies have their differences and limitations. Qualitative research is used typically as exploratory and inductive, and quantitative as confirmatory and deductive, although quantitative can also be used as exploratory, for example, to confirm a hypothesis. The main difference between the two however is not along the lines of exploratory and confirmatory, or between inductive or deductive, rather the heart of the difference is in the philosophical stances of positivist and the interpretive paradigms. Because positivist and interpretivist paradigms are based on different assumptions, they require different instruments and procedures to obtain research data. In this respect, qualitative methodology is interpretative, and quantitative is empirical, also known as scientific research paradigm. Paradigms ensure validity of the process and rigour of clarification, definitions, or use (Silverman, 2016; Ochieng, 2009). Therefore, in considering using qualitative methodology, its limitations need to be observed from the interpretivist paradigm, and in considering using quantitative methodology, its limitations need to be observed from the positivist paradigm.

In using qualitative methodology, researchers need to be aware that researcher is the primary instrument for data collection and analysis. Researcher interprets, builds abstractions, concepts, hypothesis and theories from words and pictures gained as data input, and inductively comes to concussions. As such, limitation of the qualitative research is that it is limited by the researcher's personal interpretation, and hence biased by researcher's individual perceptions. Qualitative researchers do not assume that individual perception is a reality. Since each individual experience has a different point of view, each of the experiences therefore differ in reality. Further, as language used as data input is interpreted, there could be issues in interpreting the meaning of recorded text and visuals. In addition, limitation with qualitative research is that human behaviour in participants might be influenced in settings it occurs. Because of this, sometimes participants in the study perhaps cannot adequately articulate or report their behaviours. As such, with qualitative methodology there is no point in establishing validity, all that researchers can hope for is to focus on the qualitative inquiry (O'Brien *et al.*, 2014; Ochieng, 2009).

In using quantitative methodology, researchers need to be aware that this research method is based on the philosophy of positivism taking a socially external view at the researched (Bryman, 2012). With focus on objectivity, quantitative methodology adopts structured procedures and formal instruments for data collection. Its strength is in precisely measuring variables and testing hypotheses linked to general causal explanation, therefore it can help establish correlations between variables and outcomes. This allows validation of original findings by independently replicating the analysis. Shortcoming of effective quantitative research typically requires a large sample size, however, sometimes lack of resources prevents obtaining sufficiently large samples making conducting quantitative research impossible. As an additional shortcoming, researchers have to analyse data using background knowledge on the research topic and questions. In turn, quantitative methodology does not provide in depth description of the experiences as it lacks human perception and beliefs. This means that people, perceptions, beliefs, et sim. cannot be meaningfully reduced or adequately understood only with numbers and without the context (Choy, 2014; Dudwick *et al.*, 2006).

On the other hand, mixed methods are used to combine strengths and to compensate for limitations of the quantitative and qualitative methods. There are three dimensions of why researchers could perhaps consider using mixed methods. First, researchers might consider using mixed methods to interpret qualitative data with quantitative. Second, researchers might want to use quantitative data to generalize qualitative findings. Third, researchers may need to better understand a new phenomenon with qualitative data, and to measure its effects, trends and magnitude with quantitative data (Choy, 2014; Pluye and Hong, 2014; Wahyun, 2012; DeLuca *et al.*, 2008; Buelens *et al.*, 2008).

Understanding the philosophical stances of qualitative and quantitative methodologies, their strengths and limitations will help further in evaluation of the research approach and justification.

3.2 Research Approach and Justification

In choosing the appropriate research approach, philosophical stance matching research methodology needs to be evaluated.

3.2.1 Philosophical Stance

Academic literature on innovation (Khosravi *et al.*, 2019; Saunila, 2017b; Damanpour and Aravind, 2012; Crossan and Apaydin, 2010; Xu *et al.*, 2007) indicates that innovation is an abstract multidimensional construct that should be studied through a multi-methodology approach. This approach can be supported through the philosophical stance of pragmatism allowing for a mixed use of epistemology, ontology and axiology. The philosophical stance of pragmatism allows a better understanding of complexities of the social reality through observing both subjective and objective on a continuum and not as mutually exclusive (Bryman, 2012; Wahyun, 2012; Saunders *et al.* 2009). This approach is also in line with Nonaka's (1994) arguing that interaction between epistemological and ontological dimensions of knowledge creation results in new knowledge creation. Researchers (Wahyun, 2012; DeLuca *et al.*, 2008; Buelens *et al.*, 2008) argue that utilization of multi-methodologies provides a greater validity of the researched, with a better potential to provide new research insights. Longitudinal study of Buelens *et al.* (2008) on research methodologies utilized within the last 40 years in academia indicates there is a considerable rising trend in utilization of multi-methodologies, believed to be a better-suited approach in acquiring new knowledge. Therefore, in order to properly observe the phenomena of innovation this research adopts pragmatist philosophy requiring observation of researched through multiple angles, requiring multi-methodology approach.

3.2.2 Methodology Choice and Justification

In line with academic knowledge on innovation arguing that innovation is an abstract construct comprised of multiple factors, the overall aim of the study was to map relationships between KT and IOR, with the goal to understand their influences to innovation outcomes. This denotes that the methodology should encompass measurement of the main variables of KT and IOR to innovation outcomes and allow for understanding of causal connections between KT and IOR in reference to the innovation outcomes. However, each of the variables of KT and IOR are not individually measurable, rather they are also abstract constructs comprised of different individual indicators (dependent variables). This indicates a need to understand and identify indicators for each of the abstract constructs KT and IOR to innovation outcomes. For example, researchers (Crossan and Apaydin, 2010; Smith, 2008) argue that determinants of innovation are leadership, managerial levers and business processes. These three factors are also abstract and need to be measured with sets of indicator variables. Further, if one of the determinants of innovation – for example managerial levers is to be measured, researchers (Saunila, 2017b; Alipour and Karimi, 2011; Crossan and Apaydin, 2010; Madsen *et al.*, 2010; Lichtenthaler, 2011; Zhang *et al.*, 2010) indicate this determinant actually consists of multiple sub-constructs: knowledge management, organizational learning, culture, structure and systems. Similarly, both KT and IOR are comprised of multiple abstract constructs (for example, both have the abstract construct of social relationships as a common determinant). This indicates several sub-levels of abstraction in each of the three top-level constructs (KT, IOR and innovation outcomes), therefore outlining an extremely high level of abstraction. While it is arguable if current research of KT and IOR literature is providing measures of all sub-level constructs developed and tested, it is however known that measure of innovation outcome sub-level construct has been underdeveloped in the literature (Khosravi *et al.*, 2019; Saunila 2017b; Janssen *et al.*, 2011), and still lacking consolidation and further research direction (Saunila 2017b). As there exist multiple sub-levels of abstraction in each of the top-level constructs, building a measure purely on existing literature could be an endeavour with extremely high level of complexity and without certainty if the literature contains measures developed for all sub-level constructs. This is why perhaps taking an approach of developing a measure based on empirical approach, rather than on the existing literature might be a better direction to take. In support, innovation literature indicates that innovation is an abstract multidimensional construct that should be best observed through a multi-methodology approach (Khosravi *et al.*, 2019; Saunila, 2017b; Damanpour and Aravind, 2012; Crossan and Apaydin, 2010; Xu *et al.*, 2007).

In considering appropriate empirical approach for this research, the first evaluation was of made in reference to confirmatory methodologies CFA[16] and SEM[17] as an extension of multiple regression analysis. These methodologies could be used to build a causal model (or multiple models) in order to understand relationships and causality between constructs – latent variables, and outcome variable (Senthikumar, 2011; Roberts *et al.*, 2010). To be able to utilize SEM, each of the latent variables needs to be comprised of set of different indicators and confirmed previously through CFA in order to show that a particular set of individual indicator variables indeed measures a latent variable in a model. However, each of the constructs in this research (KT, IOR and innovation outcomes) in the literature is described with yet another subset of abstract constructs and not with specific and measurable indicators. This would therefore indicate that CFA tests would need to exist on many sub-levels of abstractions for each of the top-level constructs (KT, IOR and innovation outcomes). This would make the use of SEM methodology extremely complex consisting of multiple research studies to develop measures for each of the sub-level constructs which would extend this study well beyond its original scope. In addition, SEM is considered to be a confirmatory methodology, indicating that model that describes relationships between variables needs to be proposed based on a strong theoretical support. This does not seem to be the case as literature on innovation is still new and a relatively young research are for which there exists no consolidated theoretical framework (Khosravi *et al.*, 2019; Saunila, 2017b; Černe *et al.*, 2016; Damanpour and Aravind, 2012; Crossan and Apaydin, 2010; Xu *et al.*, 2007; Van de Ven *et al.*, 2007; Anderson *et al.*, 2004). As a reminder, the main objective of this study was to understand, therefore explore the influence of KT and IOR to innovation outcomes. As a confirmatory methodology, SEM would help predict outcomes, however the objective of this study was not to predict, but to understand more. This indicates that SEM as a confirmatory methodology would not be appropriate for this exploratory research aimed towards understanding influence of KT and IOR to innovation outcomes. It should be noted that in recommended future research in Chapter V – Conclusions of this study, it is noted that confirmatory methodologies could be used to validate measures developed through exploratory this study as a future research opportunity.

[16] CFA – Confirmatory Factor Analysis

[17] SEM – Structural Equation Modelling

This analysis lead to an indication that methodology that would be the most appropriate for this study should allow for building constructs in cases where no strong theoretical support exists. Academic literature indicates that in the cases when there is no strong theoretical support for an abstract construct, when earlier or compatible measures exist, and in the cases where mapping and identifying organizational behaviours is the main purpose of the scientific inquiry, the Act Frequency Approach (AFA) multi-methodology would be an appropriate choice (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Reif, 2012; Schimmack, 2010; Tucker and Turner, 2010; Cinite *et al.*, 2009; Ivcevic and Mayer, 2009; Hirsh *et al.*, 2009; Vazire and Mehi, 2008; Church, 2007). All of the above mentioned conditions are applicable in this study – innovation is a relatively young research subject due to which academic literature does not contain theoretical frameworks or measures developed for measuring influence of interorganizational relationships to innovation performance. In addition, the main assumption of AFA is that the domain investigated consists of multiple and not a single behavioural determinant (Vazire and Mehi, 2008; Cooper *et al.*, 1990). This is in line with innovation theories (Khosravi *et al.*, 2019; Saunila, 2017b; Crossan and Apaydin, 2010; Xu *et al.*, 2007; Van de Ven *et al.*, 2007; Anderson *et al.*, 2004) arguing that innovation is of a multi-dimensional nature, therefore investigation of innovation requires observing multiple behaviours influencing this phenomenon. Further, AFA is a multi-methodology combining quantitative and qualitative methodologies for developing behavioural-based composite measures, which is in line with the pragmatic philosophical stance adopted and also in line with the multidimensional nature of innovation. AFA multi-methodology consists of two phases – the first phase is qualitative methodology used to identify behaviours that are identified as potential determinants of phenomena studied and the second phase is quantitative methodology used to test relationships by utilizing regression analysis. This indicates that AFA methodology still allows for a traditional quantitative methodological approach with multiple regression analysis, with the help of qualitative methodology in measuring behavioural indicators that describe abstract constructs. It should also be noted that Cinite *et al.* (2009) have developed an organizational behaviour scale based on AFA methodology (as an exploratory part of the study) and have tested the validity of the construct utilizing SEM (as a confirmatory part of the study) – therefore indicating reliability of utilizing AFA methodology in developing new scales where previous theoretical support was poor or non-existent, such is the case of this study. In addition, AFA as a multi-methodology observes the researched from multiple angles and as such it supports the adapted pragmatist philosophy believing it to be the appropriate grounding belief best suited to answer the research objectives of the study. It therefore seems that the most appropriate research methodology for this study would be exploratory AFA methodology, whereas the earlier evaluated confirmatory SEM methodology could be suggested to validate the measure as some future research opportunity.

As there exists no evidence in academic literature on prior utilization of AFA methodology in innovation research, this study would most likely be the first global application of AFA methodology in academic literature on innovation. As researchers (Wahyun, 2012; DeLuca *et al.*, 2008; Buelens *et al.*, 2008) believe that observing the researched through multiple points of view and different methodologies provides a more comprehensive view and often results in novel insights at the research topic, this also indicates that utilization of AFA could help provide novel insights in innovation research.

3.3 ACT FREQUENCY APPROACH

Act Frequency Approach (AFA) is a mixed methodology (qualitative and quantitative) designed for exploratory research of behaviours and development of behavioural measures in cases of abstract constructs, lack of comparable earlier measures or lack of strong theoretical support for an abstract construct. The methodology is successfully used and adopted by researchers for the past thirty years for the purpose of behavioural research (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Reif, 2012; Schimmack, 2010; Tucker and Turner, 2010; Cinite *et al.*, 2009; Ivcevic and Mayer, 2009; Hirsh *et al.*, 2009; Vazire and Mehi, 2008; Church, 2007; Cooper *et al.*, 1990; Gosling, 1998, Angleitner and Demtröder, 1998) since its original development by Buss and Craik (1980, 1981, 1983a, 1983b, 1983c, 1984).

Although AFA was originally developed to measure individuals' personality traits, this behavioural methodology can also be applied to measure organizational behaviours - being the core inquiry of this research. In support, researchers (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Cinite *et al.*, 2009; Szamosi and Duxbury, 2002; Russel, 2001; Bhar, 1995; Allen, 1993; Cooper *et al.*, 1990) have successfully shown that AFA can be applied to develop definitions of organizational behaviours following the same AFA concept as originally suggested by Buss and Craik (1980, 1981, 1983a, 1983b, 1983c). The organismic analogy theory is one of the grounding theories and starting points in organizational behaviour linking the organizational behaviour with the human behaviour based on Darwinist explanation of open complex systems (Hodgson, 2002; Keeley, 1980). Therefore, it is plausible to believe that through locating acts of previous individual behaviours and sampling them from the domain researched, future organizational behaviours could be identified utilizing the AFA methodology.

The methodology's main premise is that by identifying and summarizing previous individual behavioural acts (participants' historical knowledge of behaviours) in a particular domain and over a certain period of time will likely identify future behaviours, with the main assumption that past behaviours will continue to be the same in the future (Buss and Craik (1980, 1981, 1983a, 1983b, 1983c, 1984). This provides a composite behavioural measure (i.e. scale) that can be utilized to identify and measure future organizational behaviours influencing the observed phenomena. The methodology consists of three phases of the field research (AFA I – act nominations, AFA II – prototypicality ratings and AFA III – testing the measure). In all cases, output from one phase feeds as an input into the next phase, essentially connecting all three field research phases together. The objective of the first two phases (AFA I and AFA II) is to develop the measure, and the objective of the third phase (AFA III) is to test the measure for validity and reliability. The first phase (AFA I) is qualitative and the second and third phases (AFA II and AFA III) are quantitative. Three phases of AFA methodology are broken into six steps (Cinite and Duxbury, 2018) as outlined in Table 17.

AFA phase	Type	Step	Description of Activity
AFA I phase – act nominations	**Qualitative** (interviews)	1.	Interviews with participants to nominate behavioural acts of KT and IOR to innovation outcomes through a qualitative field study.
		2.	Qualitative analysis of collected data for keywording and elimination of duplicate acts, non-act statements, frequency related and vague statements. Construction of survey for the next phase.
AFA II phase – prototypicality ratings	**Quantitative** (surveys)	3.	Collect surveys to rate identified behavioural acts from the first phase for prototypicality ratings (agreeing or disagreeing that behaviours identified through interviews in the previous phase influence researched phenomena) through a quantitative field study.
		4.	Quantitative analysis with statistical tests to construct the measures – determine consensus from participants on the highest rated behaviours influencing the phenomena researched. Construction of the measure based on the highest rated behaviours identified.
AFA III phase – testing the measure	**Quantitative** (surveys)	5.	Collect survey to validate the measure developed in the previous phase through a qualitative field study.
		6.	Analyse data with statistical tests for validity, stability and reliability of the measures.

Table 17 – AFA methodology objectives, phases and steps

The first AFA I phase is used for act nominations. In this phase individual behavioural acts related to the phenomena researched are identified through qualitative sampling - conducting interviews with participants believed to contain historical knowledge of behaviours influencing the domain researched. The list of acts generated through interviews is as exhaustive as possible as the interviewing process continues until there are no new behavioural acts identified with two subsequent interviews. Once the list is compiled, it is stripped off any redundancies, non-act statements, frequency-related and vague statements (Cinite and Duxbury, 2018; Szamosi and Duxbury, 2002; Buss and Craik, 1983a). The final list of individual behavioural acts nominated by participants is used as an input to develop a survey for the second phase of the field research.

The second AFA II phase is used for prototypicality ratings. In this phase individual behavioural acts identified in the first phase are rated by participants for prototypicality – a degree of agreement or disagreement in which identified behaviours represent the nature of the inquired phenomena. Such ratings are given by participants' on a seven (7) point Likert scale (from strongly disagree, disagree, somewhat disagree, neither agree or disagree, agree, somewhat agree, to strongly disagree) for each of individual behaviours nominated in the first phase of the field research. The rated list is analysed through evaluation of the lowest and highest rated prototypical acts in the sample. The lowest rated prototypical acts are discarded (as non-supportive acts of behaviours researched) and the final list contains the highest rated prototypicality acts representing group's consensus on acts supporting behaviours researched. This provides a composite behavioural measure (i.e. scale) that can be utilized to identify future organizational behaviours supporting the inquired – therefore the composite acts serve as predictor and criterion variables. Completion of AFA II phase produces the organizational behavioural measure that is used as an input to the third and final phase of the field research.

Several studies (Cinite *et al.*, 2009; Vazire and Mehi, 2008, Angleitner and Demotroder, 1998) have confirmed the validity of the AFA methodology as originally suggested by Buss and Craik (1983a, 1983b, 1983c, 1984). Angleitner and Demtröder (1998) have critically questioned the validity of the original AFA methodology arguing that Buss and Craik (1983a, 1983b, 1983c, 1984) have perhaps underestimated the complexities of multiple act categories. In the original research Buss and Craik (1993a, 1993b, 1993c, 1984) have applied a method in which a variable number of judges assigned behavioural acts to multiple categories. Angleitner and Demotroder (1998) questioned the validity of this method due to the evaluation variability and have conducted a similar study in which a fixed number of judges were used to categorize identified acts into behavioural categories. The results of this research have confirmed findings of the original research – individual acts vary on the continuum of the high prototypicality acts (good examples of acts supporting a behaviour) to low prototypical acts (peripheral acts, poor examples of acts non-supportive of a behaviour). Further, Angleitner and Demotroder (1998) have shown that composite acts from the methodology can successfully serve as predictor and criterion variables, as originally argued by Buss and Craik (1983a, 1983b, 1983c), therefore validating AFA methodology. Vazire and Mehi (2008) has also provided validity of AFA methodology through utilization of multi-methodology approach by combining unobtrusive electronic surveillance of subjects' real-life behaviours coupled with the AFA methodology. Furthermore, AFA methodology was enhanced through self and a three peer (informant) reporting. The self and peer-evaluation of prototypical ratings allowed for comparison if self-reported ratings in fact truly represent one's behaviours. In case of Vazire and Mehi (2008), three-peer informants consisted of one parent, one friend and one romantic partner. The premise of this method is that it was argued that immediate peers close to the subject would have the best knowledge of subject's behaviour. In addition, subjects wore unobtrusive electronic surveillance devices for several days which have audio-recorded subjects' real-life behaviours during the test period. It is believed that identification of behaviours from the electronic recorder provides a true insight of the actual subjects' real-life behaviour during the test period. The three views were compared – self-ratings, peer-ratings and electronic surveillance to provide triangulation of the research data. Vazire and Mehi (2008) confirm that self-reported ratings were in fact accurate prediction of one's behaviour, as originally argued by Buss and Craik (1983a, 1983b, 1983c, 1984).

AFA continues to be successfully utilized for development of behavioural measures in a variety of applications (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Tucker and Turner, 2010; Cinite *et al.*, 2009; Ivcevic and Mayer, 2009) providing further validity of the original methodology as suggested by Buss and Craik (1983a, 1983b, 1983c, 1984). Cinite and Duxbury (2018) have used AFA methodology to develop scales to measure employees' commitment and resistance toward organizational change. Gardner *et al.* (2018) have used AFA to develop scales to measure employee pre-quitting behaviours to indicate employees' intent to leave a company. Chapman and Goldberg (2017) have successfully utilized AFA in developing measures of personality behaviours related the big five[18] personality traits known in psychology. Cinite *et al.* (2009) have developed an organizational behaviour scale for perceived organizational readiness for change based on AFA methodology. Ivcevic and Mayer (2009) have successfully mapped the area dimensions of creativity and in turn have identified behaviours supportive of three different types of creativity utilizing AFA. Tucker and Turner (2010) have also successfully mapped the area of workplace safety behaviours identifying personal behaviours that could endanger safety in the workplace. The literature therefore indicates there exists a large number of studies who have successfully utilized AFA methodology to develop behavioural measures in a variety of applications.

Validations of AFA methodology in literature include research by Reif (2012), Schimmack (2010) and Cinite *et al.* (2009). All researchers sought validation of behavioural measures and have attempted to address measuring of situation-based behaviours. Reif (2012) has aimed to improve the validity of questionnaire constructs through applying self-nominated questionnaire items utilizing AFA, combined with Rasch (psychometrics tests to determine how well a criterion is met) and LLTM (Linear Logic Testing Model) for validation of the model. Schimmack (2010) research has aimed to address the validity of behavioural measures through applying causal models of multi-method data. Researcher utilizes three external informant reports of subject's acts for each individual self-reported

[18] Big five personality traits are: conscientiousness, openness to experience, agreeableness, extraversion, and neuroticism (Raja and Johns, 2010)

act. This external view from informants (a colleague, a friend and a spouse) on behaviours of subject's is argued to provide a way to compare the results and validate the measure. Schimmack (2010) model accounts for situational circumstances for each of the three informants, situation-person circumstances and errors in reporting by each of the three informants. This multi-method data approach allows for separation of variances (errors, effects of situation and situation-person circumstances) and in turn allows for validation of informant's rating on the general behavioural disposition of a subject. Cinite *et al.* (2009) have tested validity of measure developed with AFA using SEM (Structural Equation Modelling). These researchers explain that AFA is an exploratory methodology best used to understand behaviours governing a phenomenon, whereas SEM is confirmatory methodology used to validate the measure.

3.3.1 CRITIQUES OF AFA METHODOLOGY

AFA methodology has received several critiques (Vollmer, 1993; Cooper, 1990; Dyke, 1990; Block, 1989; Moser, 1989). Critiques of AFA methodology found in the literature are predominantly related to the use of the methodology in measuring personal traits. As it was argued earlier that AFA is a behavioural methodology that can also be successfully utilized to measure organizational behaviours (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Cinite *et al.*, 2009; Szamosi and Duxbury, 2002; Russel, 2001; Bhar, 1995; Allen, 1993; Cooper *et al.*, 1990), and as the particular application of AFA methodology in this research is to measure organizational behaviours, only critiques found in the academic literature criticizing measuring organizational behaviours through AFA methodology are discussed. In particular, Block (1989) provides in depth critique of AFA methodology in the context of the organizational behaviour.

Block (1989) in his critique of the AFA methodology argues that subjects might have recollection issues while inquired to identify past organizational behaviours. Dyke (1990) argues that such recollection bias is also an issue with traditional methodologies. Buss and Craik (1984) argue that self-reporting behaviours are in fact applicable as previous academic research indicates convergence of observed and reported. This was subsequently confirmed by Angleitner and Demotroder (1998) who were successful in replicating the results of the original research by Buss and Craik (1983a, 1984b, 1983c). Research by Vazire and Mehi (2008) based on the AFA methodology has shown through use of triangulation methodology that in fact self-reported behaviours match those of peer-reported and are verified with use of unobtrusive electronic surveillance that was recording subject's actual real-life behaviours. This particular critique by Block (1989) should be of no influence on this research, as any inaccurate behaviour reported shall be eliminated in the prototypicality ratings phase of the AFA methodology. The purpose of the prototypicality ratings phase is to build a consensus amongst participants on which individual behaviours are associated to the domain researched. As such, if there is an inaccurate recollection on behaviour from one of the subjects, the consensus on that particular inaccurate behaviour shall not be built, and such particular behaviour are eliminated from further testing in the prototypicality ratings phase.

In addition, Block (1989) critiques that situation specific behaviours cannot be measured through AFA, as the methodology does not consider specifics of situations in which acts occur. Research by Reif (2012) and Schimmack (2010) both independently conducted with different approaches propose enhancements to the AFA methodology to improve on measuring situation specific behaviours. It should however be noted that theoretical work by Reif (2012) and Schimmack (2010) still needs further progress as they conclude that measuring situation specific behaviours still shows limited success. Block's (1989) critique of AFA's inability to measure situation specific behaviours is not applicable to this study, as AFA methodology shall be used to test non-situation specific support and non-support to innovation outcome and characteristics of interorganizational relationships. Furthermore, in order to avoid sampling of situation specific behaviours, the questions in the research instrument shall be formulated such that they do not contain conditions, therefore eliminating possible multiple situations \ circumstances in which those behaviours might occur.

Dyke (1990) refutes Block's (1989) argument that AFA methodology provides less value than traditional evaluation methodologies through arguing that AFA methodology provides very important imperial approach towards developing measurement scales. Dyke (1990) also points out that traditional evaluation methodologies eliminate redundancies from the pool of items first during the selection phase, whereas in the AFA phase I, a large pool of items is first selected, and then eliminated in the AFA phase II, which most likely will produce a more exhaustive sampling of the domain researched.

While Vazire and Mehi (2008) have positively assessed and utilized AFA methodology and have proven that self-reporting of behaviours is accurate, these researchers have in addition found out that qualitative peer reporting is also independently accurate in predicting behaviours. This indicates a different point of view believing that utilizing AFA through engaging external subjects to the behavioural experience might also provide novel insights into the researched subject. This should have no consequence to this research as both self and peer reporting are found to be independently accurate in predicting behaviours and creating the measure utilizing AFA (Vazire and Mehi, 2008). However, it should be a noted methodological limitation that this particular research will be based on the self-reporting of behaviours in creating the measure as a more proven and utilized research method (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Cinite *et al.*, 2009; Szamosi and Duxbury, 2002; Russel, 2001; Bhar, 1995; Allen, 1993; Cooper *et al.*, 1990).

In application of AFA methodology to this study limitations and assumptions of the methodology, as discussed above are understood. AFA methodology overall is generally applicable and valid for the purpose of this research. It is therefore plausible to believe that AFA methodology can be used to successfully map supportive and non-supportive behaviours of KT and IOR to innovation outcome.

3.4 Field Research

The field research phase was used to develop the research instrument and to evaluate behavioural support for successful and unsuccessful innovation outcomes, knowledge transfer and characteristics of interorganizational relationships, to test the validity and reliability of the measures and to evaluate consequences of supportive and unsupportive organizational behaviours to innovation outcomes using the AFA methodology. The field research consisted of developing the measure in the first two phases of AFA methodology: AFA I phase - act nominations (interviews), AFA II phase - prototypicality ratings (survey data), and testing the measure in the third AFA III phase of the field research through a large-scale field survey.

3.4.1 Target Sample

The target sample of this research are highly skilled individuals working on producing innovative software in companies located in the geopolitical region of South-eastern Europe (SEE) surrounding the Balkan Peninsula (Aspridis, 2012), consisting of the following countries: Bulgaria, Greece, Romania, Slovenia, Albania, Bosnia and Herzegovina, Croatia, North Macedonia, Serbia and Montenegro.

In reaching out to the largest possible and most diversified target sample, the researcher has used public directories of SEE accelerators, clusters and technology parks in reaching out to software companies in SEE with an invitation to participate in the study. In support, empirical studies on innovation and software companies in SEE (GIZ 2015; OECD, 2018; OECD 2019) indicate that majority of software companies in SEE are members of an association, cluster or a technology park. The specific public directories (ICT clusters, accelerators, technology parks and chambers of commerce) for software companies in countries of SEE the researcher has used to reach out to are listed in Table 18, also indicating the total number of companies the researcher has reached out to.

Country	Organization name	Type	Member companies
Bulgaria	Eleven	Accelerator	68
	Burgas ICT cluster	Cluster	37
	Plovdiv ICT cluster	Cluster	9
	Bulgaria telecommunications cluster	Cluster	6
	Sofia knowledge city	Technology park	14
Greece	GI Cluster	Cluster	33
	HAMAC - Mobile application companies	Association	15
Romania	Transilvania IT cluster	Cluster	47
	Different angle cluster	Cluster	9
	Smart Alliance	Association	20
	IT&C Cluster	Cluster	18
	Control IT	Association	4
	Romanian association of electronics and software industry	Association	10
Slovenia	ABC Accelerator	Accelerator	85
	ICT network Slovenia	Association	15
	Technology park Ljubljana	Technology park	326
Albania	AITA - Albanian ICT association	Association	61
Bosnia & Herzegovina	BIT alliance - cluster	Cluster	54
	INTERA Technology park	Technology park	-
	Mostar software city	Technology park	11
	Innovation Centre Banja Luka	Accelerator	15
Croatia	Technology park Varazdin	Technology park	15
	Međimurski IT cluster	Cluster	10
	Croatian cluster of competitiveness of ICT industry	Cluster	-
North Macedonia	MACES - Macedonian Cluster for Export of Software and IT Services	Cluster	10
	MASIT - Macedonian Chamber of Information and Communication Technologies	Association	77
Serbia	StartIt centre	Accelerator	-
	ICT Hub	Accelerator	-
	Vojvodina cluster	Cluster	29
	IKT central Serbia	Cluster	15
Montenegro	IT Cluster MNE	Cluster	-
	ICT Association Board of the Chamber of Economy of Montenegro	Association	54
		Total	**1067 companies**

Table 18 – Public directories used to reach out to software companies SEE

Using the public directories of software company associations in SEE, the researcher was able to reach out to 1067 companies directly. In cases of INTERA Technology park, StartIt centre, ICT Hub and IT Cluster MNE where no online membership directories of companies existed, the researcher has reached out directly to these associations to forward the invitation to their members to participate in the study.

To expand and diversify the sample, the researcher has also accessed participants through chambers of commerce, social forums discussing innovation topics on LinkedIn and Facebook, and through personal contacts in software industry in SEE. The researcher has made in total over 3,000 contacts to reach out to the target sample – managers and individuals working on innovation activities in companies in SEE, as summarized in Table 19.

Sample recruitment pool	Sample size (est.)
Public directories of ICT clusters, accelerators, technology parks	> 1,000 companies reached through 33 directories
Chambers of commerce	> 1,000 companies reached through 10 directories
Social forums on innovation on LinkedIn	> 800 members reached in 5 forums
Social groups on innovation on Facebook	> 500 members reached in 3 forums
Personal contacts in software industry in SEE	> 50 personal contacts reached

Table 19 – Sample recruitment pool used

To extend the reach in recruiting participants, the researcher has used the snowballing sampling technique illustrated in Figure 28. This technique leverages existing research participants to recommend colleagues from their network who might be beneficial to the study. To take advantage of this, the researcher has through qualitative field research (interviews) asked participants to recommend colleagues from the industry for the study. For the quantitative field research (surveys), the researcher has included an invitation in the introduction section of the research to recommend this study to others in the industry. As researcher has personally reached out to more than 3000 participants, in each email sent, the researcher has asked for participants to recommend their colleagues from the software industry in SEE who might be beneficial for the study.

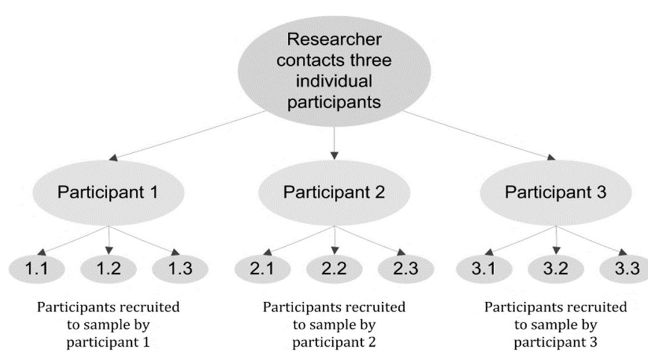

Figure 28 – Snowballing sampling technique

It should be noted that research instruments constructed for this study have included qualification questions whereas respondents needed to indicate if they are working in software companies in SEE, and if they are working on innovation. This filter was included as necessary to include only participations meeting qualification criteria in the analysis of this study.

As the target sample of this research are software companies in SEE, these companies are used to using technology, as such communicating via emails, social media and online surveys was chosen as a primary method of recruiting participants for this study. Research (Hardey, 2009) finds that utilizing technology to reach out to participants provides better than traditional (offline) means of reaching the target population in terms of the level of access, speed of access and the overall ability to reach a wider sample group.

Demographics of the data sample collected provide a strong support of capturing a highly relevant and educated sample in software companies in SEE (AFA I phase – 63% undergraduate and 27% Master's degree; AFA II phase – 28.33% undergraduate, 48.33% Master's degree and 11.67% PhDs; AFA III phase 33.79% undergraduate, 53.79% Master's degree and 7.59% PhDs), as summarized in Table 20, with the highest values are highlighted.

Participant Demographics		**AFA I phase** **N = 30 participants** Interviews (qualitative)	**AFA II phase** **N = 60 participants** Surveys (quantitative)	**AFA III phase** **N = 145 participants** Surveys (quantitative)
Gender	Male	97%	83.33%	82.76%
	Female	3%	16.67%	17.24%
Age	20-29 years of age	10%	8.33%	20.00%
	30-39 years of age	50%	53.33%	44.14%
	40-49 years of age	37%	30.00%	28.28%
	> 50 years of age	3%	8.33%	7.59%
Education	High school	10%	11.67%	8.28%
	Undergraduate (B.Sc.)	63%	28.33%	33.79%
	Master's degree	27%	48.33%	53.79%
	PhD	-	11.67%	4.14%
Position	Software developers and tech. roles	27%	48.30%	44.83%
	Middle management	53%	26.67%	16.55%
	Senior managers	20%	25.00%	38.62%
Professional experience	< 1 year of experience	-	-	1.38%
	1-5 years of experience	7%	16.67%	15.17%
	6-10 years of experience	43%	23.33%	27.59%
	11-15 years of experience	17%	26.67%	22.07%
	16-20 years of experience	27%	18.33%	17.24%
	> 20 years of experience	7%	15.00%	16.55%
Country of residence	How many countries covered in SEE by the research	**8 countries of SEE** (Serbia, Bulgaria, Romania, Croatia, Greece, Slovenia,	**9 countries of SEE** (Serbia, Slovenia, Bulgaria, Romania, Bosnia & Herz., Albania, Croatia,	**11 countries of SEE** (Serbia, Romania, Slovenia, Bulgaria, Croatia, FRYOM,

	Montenegro, Bosnia & Herz.)*	North Macedonia, Montenegro)*	Greece, Albania, Bosnia & Herz., Kosovo, Montenegro)*

Table 20 – Participant demographics for collected data for all three stages of the field research (AFA I, AFA II, AFA III)

Sampled individuals work in roles important to innovation in software SEE companies: software developers, middle management and senior managers with average 6-10 years of professional experience. Demographics information on the sample collected indicate that the sample obtained for this research study is a high-quality sample from individuals with relevant experience innovating in software companies in SEE.

3.4.2 Developing Measures

Development of measures and research instrument is discussed in this section, including application of the chosen methodology. The sampling procedure used for all three phases of AFA methodology (AFA I, II, III) is illustrated in Figure 29 and described in the further text.

For the first AFA I phase (act nominations) of the field research consisting of qualitative sampling (interviews), the researcher has made direct contacts with software companies randomly chosen from the sample pool. Following the interview confirmations, interviews were conducted with subjects over the phone and Skype. Interviews were used as an opportunity to execute snowballing sample technique to ask participants to recommend additional participants with similar qualifications to conduct interviews with. Invitations to interview, and the interviews were conducted until the AFA I phase sample objectives was satisfied, that is until two consequent interviews did not result in new behavioural acts identified. This has resulted in collecting the sample of N = 30 interviews for AFA I phase of the research.

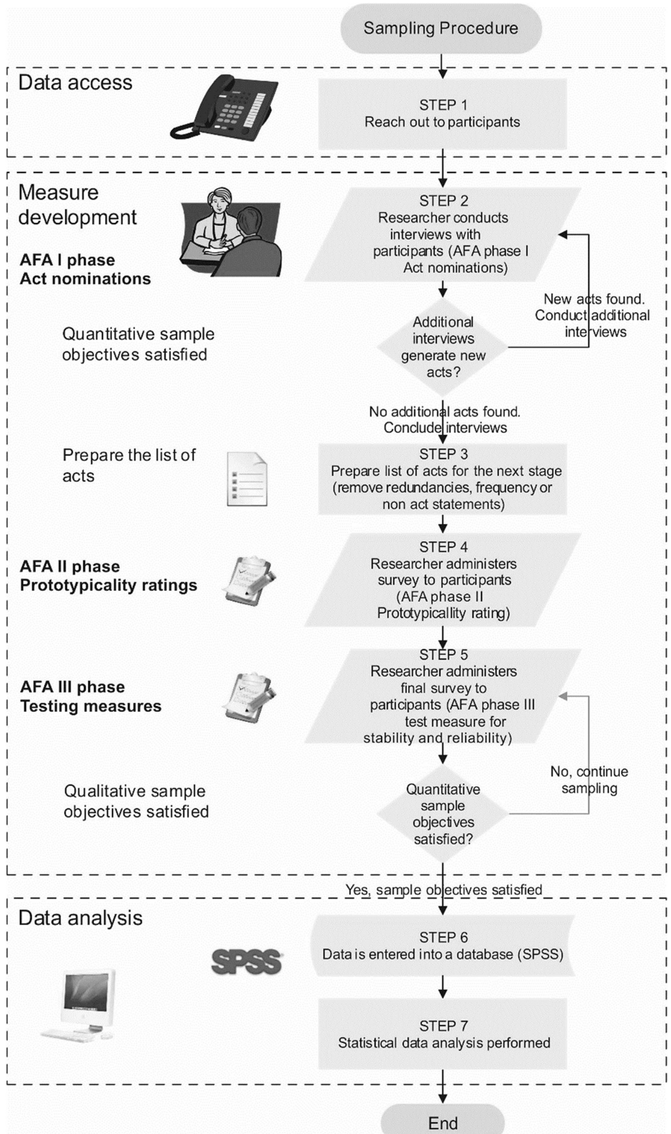

Figure 29 – Field research sampling procedure

The next AFA II and AFA III phases of the field research have consisted of two online surveys (quantitative sampling). Participants were recruited through reaching out to more than 3,000 individual companies found in the public directories in targeted countries of SEE, social media and personal contacts. Data collection for the AFA II phase quantitative survey (the prototypicality ratings phase) conducted online has resulted in data collection of N = 60 valid responses. The final AFA III phase of the field research has consisted of quantitative survey (used to validate the measures) resulting in data collection of N = 145 valid responses across eleven countries of SEE. The next section will provide deeper insights into methodology applied in each of the three phases of the field research.

3.4.2.1 AFA I PHASE – ACT NOMINATIONS (QUALITATIVE METHODOLOGY)

In AFA I phase "act nominations" (organizational behaviours) were collected through conducting field interviews. Identification of acts (organizational behaviours) was accomplished through conducting field interviews with subjects on a stratified random sample containing historical knowledge of organizational behaviours in their workplaces. Interviews were conducted in person, via phone and Skype. Participants were presented with participant information sheet and consent form and asked for approval to participate in the research and record interviews for anonymous analysis of responses.

Semi structured interview guide was used for this phase of the field study. The interview guide is available in Appendix XIII: Research Instrument- Interview Guide for AFA I Phase. Total of N=30 interviews was conducted in this phase. Sampling was ended at the time when two subsequent interviews (29^{th} and 30^{th} interview) did not identify any new organizational behaviours – as per the AFA methodology. Interviews were transcribed into electronic files on a computer and stripped away from any personally identifiable information. Files were stored in a secure location protected with a password known to the researcher only. Interviews were loaded into NVivo software and keyworded.

Behavioural acts captured through interviews in AFA I phase were classified into four groups: KT+, KT- (positive and negative behavioural acts of knowledge transfer to innovation outcomes) and IOR+ and IOR- (positive and negative behavioural acts of interorganizational relationships to innovation outcomes), and in accordance with the measures being developed. The analysis phase has included elimination of duplicate acts, non-act statements, frequency related and vague statements from the list of organizational behaviours collected in the interviews. This process has resulted in identification of n=139 unique behavioural acts identified that participants believe attribute to innovation outcome, out of which: 43 behavioural acts of KT+, 25 behavioural acts of KT-, 45 behavioural acts of IOR+, and 26 behavioural acts of IOR-.

The behavioural acts collected were further categorized into hierarchies – 1^{st} and 2^{nd} order items to help uncover new concepts for which there is no existing, or only scarce existing knowledge using qualitative methodology, based on the work of Gioa *et al* (2013). These individual acts were re-worded in the forms of statements and used as an input to build the questionnaire for the AFA II phase of the field research to be tested for prototypicality ratings (degree to which participants agree or disagree with the statement) on a 7-point Likert scale.

Snowballing technique was used to reach additional participants for the next phase of the field research. This included asking participants of AFA I phase of the field research to provide a lead to another professional and organization who in their opinion would be suitable for this research. Almost half of the participants in this phase have provided at least one new contact to reach out to. This has helped increase the response rate and to diversity participation across IT companies and countries of SEE.

3.4.2.2 AFA II PHASE – PROTOTYPICALITY RATINGS (QUANTITATIVE METHODOLOGY)

In the second phase of the field research "prototypicality ratings" for identified behavioural acts from AFA I phase were identified through a quantitative study. Input for this phase was the compiled list of identified behavioural acts from AFA I phase which was used to develop research instrument, a questionnaire for AFA II phase consisting of identified behavioural acts (*n*=139) in the form of a statement included along a 7-point Likert scale. The survey scale ranged from "1. Strongly Disagree" to "7. Strongly Agree" with the aim to measure the degree to which participants agree or disagree that a particular behaviour of KT and IOR represents positive or negative influence to innovation outcomes. Example of the 7-point Likert scale used in the survey is provided with Figure 30.

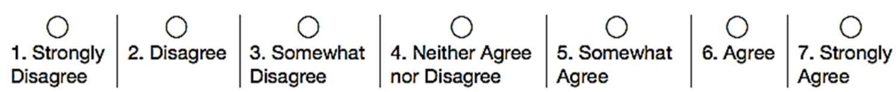

Figure 30 – 7-point Likert scale used in the survey

The survey has also included demographics questions on participants and their companies for vetting the sample and analysis of the responses. Due to the large size of the survey, control questions - one for each major page of the survey were introduced. For example, one of such control questions was "Select 6 on the scale 1-7" to ensure that participants are not randomly providing responses. This has proved useful as it has helped filter out 15 invalid responses in the analysis phase. The survey used for AFA II phase is available in Appendix XIV: Research Instrument - Questionnaire for AFA II Phase.

The questionnaire was built online using SurveyMonkey web site and used to collect the responses. The entire AFA II phase data collection was conducted 100% online. The online survey has also included the electronic version of the participant information sheet and participant consent form. SurveyMoneky web site was also used as a tool to measure the participant response rate.

Data from the AFA II online survey was collected from SurveyMonkey web site and loaded into SPSS file for analysis. The purpose of the analysis of the prototypicality ratings for AFA II phase was to determine the participant level of agreement to each of the nominated behavioural acts and to determine how many factors should be included for each of the four scales: KT+, KT-, IOR+ and IOR-.

The first step in determining how many behaviour acts is to be included for the four scales (KT+, KT-, IOR+ and IOR-) was through performing means calculations to identify participant's consensus on the highest rated behavioural acts on the 7-point Likert scale. An example of the analysis performed four times separately for each scale is shown in Figure 31.

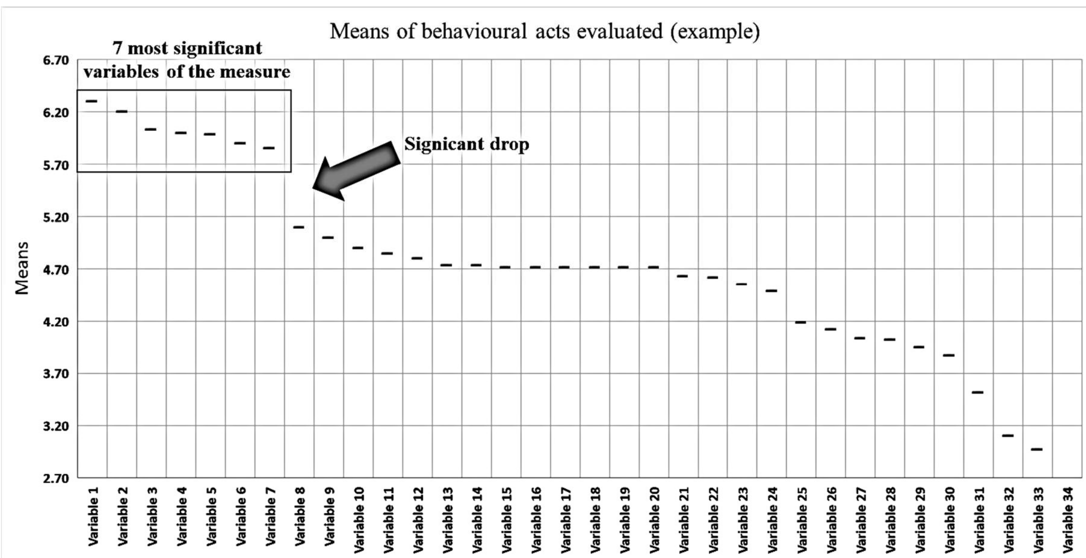

Figure 31 – Means plot evaluation for variables of the measure with clear cut-off point

The plotted diagram shows mean scores on the Y scale (mean responses on the 7-point Likert scale from all participants) for each variable shown on the X scale. The research instrument was coded on a 7-point Likert scale with the following distribution: 1. Strongly disagree, 2. Disagree, 3. Somewhat disagree, 4. Neither agree nor disagree (neutral), 5. Somewhat agree, 6. Agree and 7. Strongly agree. This means that all variables with means of 5 and above indicate that participants have Somewhat agreed, means of 6 and above indicate that participants have Agreed, and all means of 7 indicate that participants have Strongly agreed with evaluating an individual variable (question) from the scale. From the example shown it is clear that there exists a large drop point between the first 7 variables, and the next 8th variable. This indicates that the first 7 variables are the most significant variables of the measure. This analysis is used as the first step to quickly understand where the drop off point of the measure might be.

However, in some circumstances this might not straightforward as individual points could be very close to each other, as shown in Figure 32. In this example variables of the measure are too close one to another such that it is not possible to make a clear determination of how many variables should be included in the measure as the most significant.

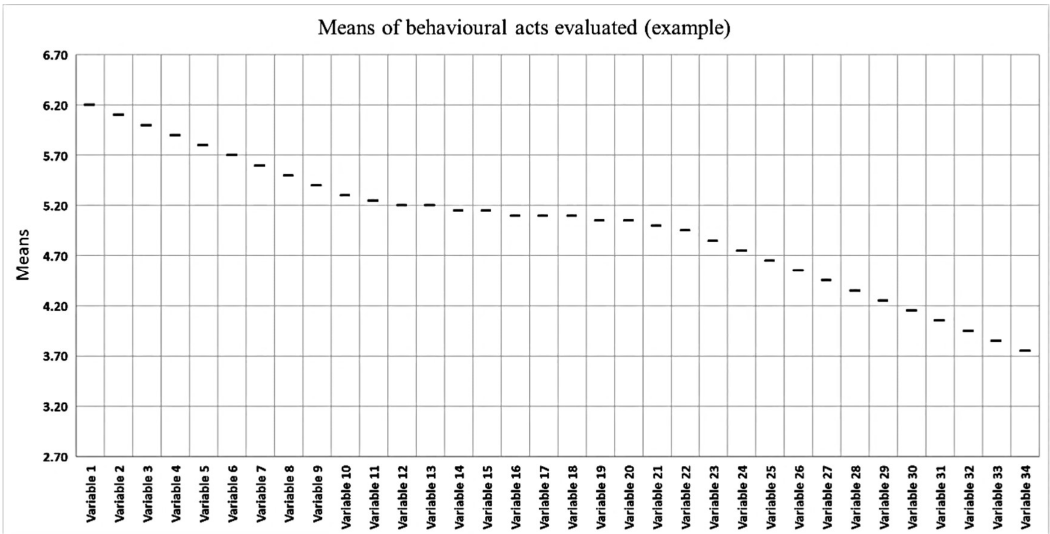

Figure 32 – Means plot evaluation for variables of the measure with no clear cut-off point

To address this concern and to ensure that the appropriate number of variables measures the scale, one of the most used statistical tests is Principal Component Analysis (PCA) used in the early steps of developing composite measures. PCA is a statistical variable reduction statistical procedure that reduces variables into smaller number of components that account for most of the variance in the set of the observed variables (SAS, 2017; Jolliffe and Cadima, 2016). PCA has been proven as generalizable and used in a wide variety of areas studied for reduction of large data sets and measure developments (Jolliffe and Cadima, 2016). Complementary technique to PCA is CFA (Confirmatory Factor Analysis), however CFA being a confirmatory methodology is better used for confirmation of measures, rather than early measure development for which PCA is better suited (Coste *et al.*, 2005). As the nature of this research is exploratory in understanding influence of KT and IOR to innovation outcome and not confirmation of the measure, PCA is selected as the appropriate methodology for variable dimension reduction, that is statistically determining which variables best describing the measure need to be included in the scales being developed (SAS, 2017; Jolliffe and Cadima, 2016; Coste *et al.*, 2005).

Calculation of PCA in SPSS software produces a number of components that account for most of the variance in the set of the observed variables, see example in Table 21. The first component calculated in PCA represents the maximum number of variances of the observed variables. The second component represents the maximum number of variances not covered by the first component. The second component is also not in a correlation with the first component. This stands true for every next principal component extracted. The end result is a set of components that have zero (0) correlations between them, and they represent the maximum number of observed variances. The PCA also calculates eigenvalue for each principal component extracted. This means that weights produced by eigen equations are the optimal set of weights that for the given set of data there is no other set of weights that could produce a set of components that are more successful in accounting for variance of the variables.

In determining which components to include in the scale using PCA, one of the straightforward techniques to use is eigenvalue assessment. With each principal component extracted, the test also outputs eigen value. According to Kaiser criterion (SAS 2017; Kaiser, 1960) all eigenvalues above 1.00 can be included in the measure. This is because eigenvalue of 1.00 or above is accounting for a greater variance that has been contributed by a single value, therefore such component is accounting for meaningful amount of variance and should be included in the scale. This analysis can be conducted with a scree test showing relationship between extracted principal components and eigenvalues. However, Keiser criterion (SAS 2017; Kaiser, 1960) is a simplified one and it does not account for cases when there are principal components extracted with less than eigenvalue 1.00 and are however significant to the measure as their proportion of the overall variance is significant. To address this, the next step is performed in calculating proportion of variance of data set with the following formula (automated in SPSS software when conducting PCA test):

$$proportion = \frac{Eigenvalue\ of\ a\ component}{Total\ eigenvalues\ of\ the\ correlation\ matrix}$$

The acceptable proportions from such calculations in including the variables in the scale are if the proportion is at least 5% or for a higher confidence 10% or more of the total variance (SAS, 2017). Sample table of extracted principal components with calculated proportions of total eigenvalues of the correlation matrix in the column "Initial Eigenvalues % of Variance" as outputted from SPSS software is shown in Table 21.

PCA analysis example

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.597	37.100	37.100	2.597	37.100	37.100	1.743	24.893	24.893
2	1.177	16.818	53.917	1.177	16.818	53.917	1.438	20.547	45.440
3	.976	13.937	67.855	.976	13.937	67.855	1.087	15.530	60.970
4	.866	12.366	80.220	.866	12.366	80.220	1.076	15.372	76.342
5	**.765**	**10.933**	**91.154**	**.765**	**10.933**	**91.154**	**1.037**	**14.812**	**91.154**
6	.379	5.416	96.569						
7	.240	3.431	100.000						

Extraction Method: Principal Component Analysis.

Table 21 – PCA analysis example

From this assessment we can see that principal components were extracted with eigenvalue less than 1.00, but also with more than 10% of the total variance, and these are the first 5 components of the measure as shown in the above example. This type of analysis therefore indicates that in constructing the measure principal components of eigenvalue of 1.00 can be included in the measure, but also principal components with less than 1.00 eigenvalue if the proportion of the variance is at least 5% or more than 10% for a higher confidence (SAS, 2017). PCA analysis observing the eigenvalues and total proportion of the variance was used in this phase of the field research to help decide which variables of the scale to include in measures of KT+, KT-, IOR+ and IOR- that account for most variance and are therefore statistically the most significant to be included in the scale.

The last step in developing the scales was to ensure they are stable and reliable. In ensuring that measure is stable, all principal components of the measure need to be verified to have a meaningful factor loading with the threshold of .40 or higher in the magnitude in the rotated component matrix as recommended for the social sciences (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). Example of rotated component matrix is shown in Table 22.

Rotated Component Matrix example (PCA)	Component				
	1	2	3	4	5
Learn from customers in order to develop my innovation	.923				
Seek to understand the way customers use my products and/or services	.872				
Have flexibility in discovering new knowledge useful to my innovation		.838			
Actively combine multiple sources of knowledge to acquire new knowledge		.804			
Use IT infrastructure for knowledge management activities			.914		
Use rich communication media (e.g., video, presentation, animations) that were not text-only				.955	
Proactively apply the new knowledge acquired					.983

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations.

Table 22 – Rotated component matrix example (PCA)

For each principal component in the example shown it can be seen that all components have meaningful loading of more than .40 and they have a simple structure. Simple structure pattern has to have the characteristics of variables having a high factor loading (> .40) on a single component, and near zero loadings on other components.

As the final step, Cronbach alpha statistical tests of internal consistency were conducted for each of the four scales (KT+, KT-, IOR+ and IOR-) to ensure reliability of the measure. All variables tested with Cronbach alpha test of internal consistency had to meet the threshold of being .50 or higher (Manerikar *et al.* 2015) with interpretation shown in Table 23.

Cronbach's alpha	Internal consistency
α = 0.9	Excellent (High-Stakes testing)
0.7 = α < 0.9	Good (Low-Stakes testing)
0.6 = α < 0.7	Acceptable
0.5 = α < 0.6	Poor
α < 0.5	Unacceptable

Table 23 – Cronbach alpha interpretation table (Manerikar *et al.* 2015)

Cronbach alpha values of α = .50-.60 indicated measure would be poor in its internal consistency, values from α = .60-.70 are considered as acceptable, values from α = .70-.90 are considered as good, and values greater than α > .90 indicate excellent internal consistency of measures tested. The higher Cronbach alpha value is, the more reliable the measure is.

Using the methodology outlined in this section, analysis in the AFA II phase of the field research has resulted in reducing the initially nominated n = 139 behavioural acts from the first AFA I phase of the field research to n = 30 highest rated behavioural acts by participants in AFA II phase making up the measure of KT and IOR to innovation outcomes. The output of this phase was development of measures of positive and negative behavioural acts of KT and IOR to innovation outcomes based on highest rated behavioural acts, as shown in Table 24.

Variables making up the measure	Test of stability and reliability
7 variables for KT+ measure	The measure consists of 5 distinct principal components (PCA) with strong factor loadings > .804 (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). The measure's internal consistency is good (Manerikar *et al.*, 2015) with Cronbach α = .700.
7 variables for KT- measure	The measure consists of 3 distinct principal components with strong factor loadings > .811 (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). The measure's internal consistency is excellent (Manerikar *et al.*, 2015) with Cronbach α = .904.
9 variables for IOR+ measure	The measure consists of 4 distinct principal components with strong factor loadings > .716 (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). The measure's internal consistency is excellent (Manerikar *et al.*, 2015) with Cronbach α = .906.
7 variables for IOR- measure	The measure consists of 4 principal components with meaningful factor loadings > .535 (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). The measure's internal consistency is good (Manerikar *et al.*, 2015) with Cronbach α = .795.

Table 24 – Summary of scales of KT and IOR to innovation outcomes developed in AFA II phase

With completion of the AFA II phase, the measure of KT and IOR to innovation outcomes was constructed. The output from this phase is taken as an input into the next phase AFA III which was used to test the measure through the third and final stage of the field research.

3.4.3 Testing Measures

3.4.3.1 AFA III phase – Testing measures (Quantitative methodology)

In the third and final AFA III phase of the field research measures were tested for validity and reliability. Development of quantitative research instrument was based on n = 30 behavioural measures of KT and IOR to innovation outcomes developed in AFA II phase as an input for this phase of the field research. The AFA III survey consisted of 7 variables of KT+ measure, 7 variables of KT- measure, 9 variables of IOR+ measure and 7 variables of IOR measure on a 7-point Likert scale. The questionnaire was enhanced with demographics and additional questions required for the data analysis phase. The survey used for AFA III phase is available in Appendix XV: Research Instrument - Questionnaire for AFA III Phase.

The questionnaire was built online using SurveyMonkey web site and used to collect the responses. The entire AFA III phase data collection was conducted 100% online. The online survey has also included the electronic version of the participant information sheet and participant consent form. SurveyMoneky web site was also used as a tool to measure the participant response rate. Data from the AFA III online survey was collected from SurveyMonkey web site and loaded into SPSS file for analysis. The purpose of the analysis was to test measures developed for validity, stability and reliability .

3.4.3.2 AFA III phase – Analysis

Testing of measures for validity, stability and reliability was performed in several phases. Similar to the earlier described process in AFA II phase, all four (4) measures of KT+, KT-, IOR+ and IOR- were evaluated with PCA (Principal Component Analysis) using eigenvalue of more than 1.00 and also less than 1.00 in cases of existence of more than 10% of the total variance (SAS, 2017). The purpose of this analysis was to ensure stability and reliability of the measure with all factors loading of more than the threshold of > .40 in the magnitude on the rotated component matrix as recommended for the social sciences (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). This was indeed the case, all four scales (KT+, KT-, IOR+ and IOR-) had meaningful loadings > .40. The loadings for the scales of KT+, KT- and IOR- were clean, whereas two variables for the measure of IOR+ were cross-loaded in AFA III phase.

In case of items that are cross loaded to multiple principal components, the sanitization of the scale was evaluated in three steps. First, all cross-loaded items that are not significant with significant factor loading < .40 can be eliminated (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009).

Second, if there exist cross-loaded items having a high factor loading (> .40) and there exists a gap between the two cross loaded items of more than > .20, then the lower value item can be removed from the scale (Matsunaga, 2010). In many social studies two cross-loaded variables with a lower item removed of .5/.2 or .6/.3 constitutes a rule, although .6/.4 criterion is also not uncommon (Henson and Roberts, 2006). Third, if there exists a sufficiently large discrepancy (typically .3-.4) between the primary and secondary factor loadings, items can be retained. In case there exit cross-loading items which were not cleansed through his process, they can be kept for theoretical reasons based on the researcher's discretion, whereas the primary (higher) loading item needs to be associated to an individual principal component (Matsunaga, 2010).

Similar to the earlier described process in AFA II phase, all four (4) measures of KT+, KT-, IOR+ and IOR- were evaluated with Cronbach alpha statistical tests of internal consistency. Each of the four scales was evaluated for acceptable internal consistency based on guidance by Manerikar *et al.* (2015) shown in Table 23. Cronbach alpha values of $\alpha = .50\text{-}.60$ indicated measure would be poor in its internal consistency, values from $\alpha = .60\text{-}.70$ are considered as acceptable, values from $\alpha = .70\text{-}.90$ are considered as good, and values greater than $\alpha > .90$ indicate excellent internal consistency of measures tested. The higher Cronbach alpha value is, the more reliable the measure is.

In addition to PCA and Cronbach alpha analysis used both in AFA II and AFA III phases, an additional analysis in AFA III phase has consisted of one-way ANOVA (Analysis of Variance) statistical tests to understand if there existed statistically significant differences between demographics groups. This evaluation was needed to understand the reliability and stability of measures. ANOVA test was chosen over T-test, as T-test can compare means across two groups, whereas ANOVA can make means comparison across multiple groups (Park, 2009). As the research questionnaire has included 13 demographics questions, ANOVA was the appropriate statistical test to test across multiple demographics groups. The null hypothesis of the ANOVA test is that all level means are the same. Alternative hypothesis is that one or more means of the population differ amongst each other (Zanobini *et al*, 2016). Upon execution of ANOVA tests, in cases where there existed statistically significant differences between demographics groups, an additional post-hoc test was performed to understand between which demographics groups this difference existed. In case there existed a small variability between demographics groups, this would be a good indicator that measure has a property of repeatability (Zanobini *et al*, 2016), meaning it is stable to use for all demographic groups.

As an additional analysis beyond the original prescription of AFA methodology (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017) performed was correlations statistical test between four different measures of KT and IOR (KT+, KT-, IOR+, IOR-) to understand relationships between the measures for theory development purposes. In case there existed strong statistical positive or negative correlations between any two measures, this understanding was used for theoretical interpretation of the relationships between KT and IOR. To consider correlations between any of the four measures (KT+, KT-, IOR+, IOR) as indicative, either positive or negative correlations with value of .5 or higher will be taken into consideration (Hinkle *et al.*, 2003). The scale shown in Table 25 was used for interpretation of this statistical test.

Size of Correlation	Interpretation
.90 to 1.00 (−.90 to −1.00)	Very high positive (negative) correlation
.70 to .90 (−.70 to −.90)	High positive (negative) correlation
.50 to .70 (−.50 to −.70)	Moderate positive (negative) correlation
.30 to .50 (−.30 to −.50)	Low positive (negative) correlation
.00 to .30 (.00 to −.30)	negligible correlation

Table 25 – Correlations interpretation table (Hinkle *et al.*, 2003)

The output of this phase was confirmation of measure stability and validity development of measures of positive and negative behavioural acts of KT and IOR to innovation outcomes based on highest rated behavioural acts. Application of AFA methodology in this research consisted of utilizing multi-methodology approach using qualitative and quantitative inquiry. Detailed findings from the field study are discussed in the Chapter IV – Findings of this thesis and discussed in accordance with the academic literature in Chapter V – Conclusions.

3.5 Research Ethics

This study was governed by ethics principles and guidelines as prescribed by the University of Sheffield. In particular, the researcher ensured to fully abide by the following ethical guidelines:

- Participation in the study involved providing *informed consent* to the researcher, namely:
    - Each participant was provided with the participant information sheet outlining details of the study, participant involvement information, data usage and ethical information. Participant information sheet has included contact information of the researchers and his mentors for any further follow up or questions.
    - Consent was obtained from each participant through a consent form to participate in the study prior to collecting data.
    - Participants were informed that they can and were able to withdraw from the study at any point without any questions asked.
    - Participant information form and consent form used in the study is available along with the research instruments provided in the appendices of this thesis:
        - Appendix XIII: Research Instrument- Interview Guide for AFA I Phase
        - Appendix XIV: Research Instrument - Questionnaire for AFA II Phase
        - Appendix XV: Research Instrument - Questionnaire for AFA III Phase
- Privacy and anonymity of participation in the study was fully respected.
- Correspondence with participants was kept confidential.
- Data collected was stripped off any personally identifiable information.
- Data was stored in a secure manner and was password protected with access credentials only known to the researcher.
- Only cumulative and anonymous data was used and presented in the findings of this thesis.

Researcher affirms that this study was conducted with the highest regards of ethics, integrity and professionalism.

3.6 Summary

Chapter III of this study has disclosed the methodology used for conducting this research. The researcher has reviewed the fundamental philosophical stances of epistemology, ontology and related paradigms and has taken the position of multi-methodology pragmatism believing it to be most suitable to provide the acceptable new knowledge. Multi-methodology devised for this research consists of desk research, AFA methodology consisting of qualitative and quantitative methodologies for developing the research instrument, developing scales of KT and IOR to innovation outcomes, and for testing the scales for validity and reliability.

Methodology chosen for the research is believed to be best suitable to answer the research objectives set forth in Chapter I - Introduction of this study, and to address the overall aim of this research of developing measures of KT and IOR to innovation outcomes in order to map this area and provide novel insights and contributions to knowledge.

4 INTRODUCTION

This chapter discloses findings from the three phases of the field research based on AFA (Act Frequency Approach) methodology used to develop scales to understand impact of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes - as the overall aim of this research. The scales developed provide measures of knowledge transfers positive (KT+), knowledge transfer negative (KT-), interorganizational relationships positive (IOR+) and interorganizational relationships negative (IOR-) behaviours influencing innovation outcomes.

The chapter is structured in two major sections: development of measures (4.1) and testing of measures (4.2). Measures were developed through two phases of the field research – AFA I and AFA II. The first AFA I phase discloses findings of qualitative study for Act nominations, that is KT and IOR organizational behaviours, that participants believed influence innovation outcomes. In this phase the total of *n*=139 organizational KT and IOR behavioural acts was identified on a qualitative sample of N=30 participants. The second AFA II phase was used for prototypicality ratings, that is for rating the earlier identified behavioural acts for agreement or disagreement of participants on influencing innovation outcomes on a 7-point Likert scale. In this phase the list of behavioural acts was reduced to *n*=30 highest rated behavioural acts for which participants had built consensus through a quantitative sample of N=60 participants. These identified organizational behavioural acts are measures of KT and IOR's influence to innovation outcomes.

The chapter continues disclosing findings on testing the measures in AFA III phase of the field research. Scales were tested on a quantitative sample of N=145 participants across 11 countries of SEE for reliability and stability. Data collected was used for statistical analysis in SPSS to identify principal components of the measure (Principal Component Analysis), internal consistency of the measure (Cronbach alpha), differences between demographics groups (ANOVA) in order to understand the reliability and stability of measures. Structure of the findings chapter is illustrated with Figure 33.

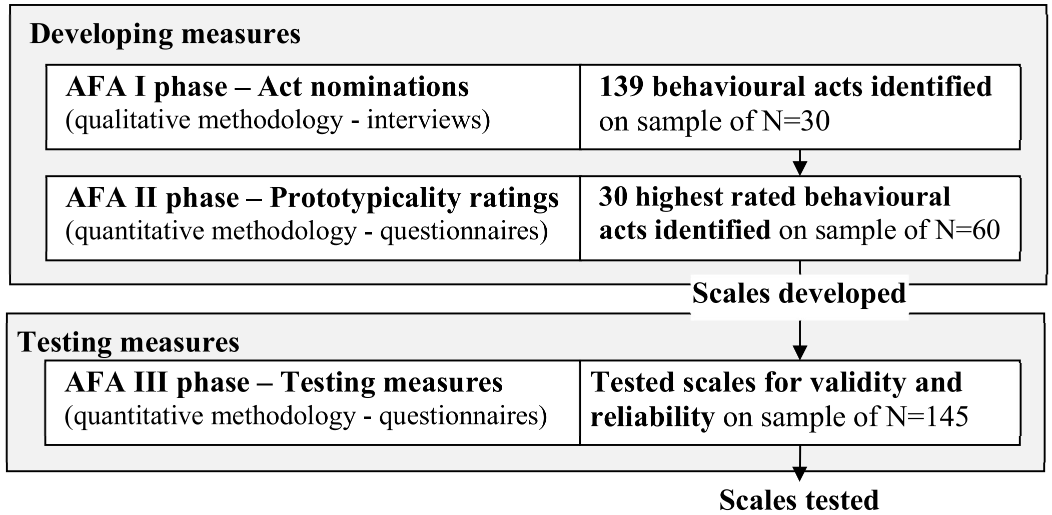

Figure 33 – Structure of chapter IV – Developing and testing scales to address identified knowledge gaps

In the last section of the chapter (4.3), findings on relationships between KT and IOR are disclosed, and in accordance with the research gaps identified. The chapter concludes with overview of findings from the three phases of the field research (AFA I, II and III) and leads into the final Chapter V – Conclusions with discussions.

4.1 Developing measures - AFA I and AFA II phases

4.1.2 Demographics (AFA I phase)

The sample size obtained for AFA I phase consisted of N=30 participants innovating in IT companies in SEE. Overwhelming majority of participants are mid-career professionals 30-39 years of age (50%), and 40-49 years of age (37%). These individuals are highly educated - majority with undergraduate degrees (63%) and some with postgraduate degrees (27%). Majority of participants are in middle management positions (53%), followed by software developers and technical roles (27%), and senior management (20%). These individuals have a considerable professional experience divided mostly between individuals with 6-10 years of experience (43%), and individuals with 11-20 years of experience (43%). Majority of participants have experience innovating 2-5 times a year (37%), followed by individuals innovating 6-10 times a year (30%).

These individuals work predominantly for small companies (63%) with up to 50 employees, followed by working for large companies (33%) with more than 250 employees. Large number of companies (53%) employs a person dedicated to work on innovation activities. Majority of companies have a dedicated R&D department (67%), out of which a large majority of individuals from the sample (50%) works in R&D.

Innovation produced by these companies is predominantly in software (83%). Novelty of innovation produced is largely only for the country they work in (63%) denoting application of existing global innovation to the local environments while on the other hand more than a third of participants has indicated they produce globally novel innovation originating in SEE (37%). In terms of the type of innovation produced, it predominantly seems to be incremental innovation (80%) denoting improvement of existing solutions in short development cycles, whereas a smaller number of companies (20%) produces radical innovation delivered in longer development cycles.

It seems that majority of companies execute innovation through a relatively small teams of 1-5 people (53%), some employ somewhat larger teams of 6-10 people (10%), and some companies employ very large teams 51-100 for innovation projects (13%).

Demographic findings seem to indicate that individuals participating in AFA I phase are all highly educated IT professionals with considerable innovation experience on local and international innovation projects. These individuals practice both incremental and radical innovation in small and large teams, also spanning across small and large organizations. Demographics data provides a strong support that these were the right people with adequate experience and spread to talk to in exploring innovation behaviours in IT companies in SEE. Detailed overview of demographics data for AFA I phase of the research is disclosed in Appendix IV – Demographics for AFA I Phase.

4.1.3 Identified Behavioural Acts (AFA I phase)

Behavioural acts were captured through interviews in AFA I phase and were classified into four measures KT+, KT-, IOR+, and IOR- identifying the total of *n*=139 unique behavioural acts, as follows:

- KT+ identified 43 behavioural acts
- KT- identified 25 behavioural acts
- IOR+ identified 45 behavioural acts
- IOR- identified 26 behavioural acts

To help uncover new concepts for which there is no existing, or only scarce existing knowledge using qualitative methodology, based on the work of Gioa *et al* (2013) identified participant behavioural acts are listed as 1st order concepts, followed by researcher work in grouping those concepts in themes, and then connecting themes in aggregate dimensions for all four measures (KT+, KT-, IOR+, and IOR-). This approach helps construct data structure connecting the qualitative data into concepts, themes and dimensions that could be mapped to the existing literature to help identify new concepts for which there doesn't seem to exist adequate theoretical references.

Identified behavioural acts of KT+, that is behavioural acts of knowledge transfer that participants have reported positively influence innovation outcomes in AFA I phase are listed in Table 26.

Knowledge Transfer positive behavioural acts (KT+)		
Behavioural acts identified (1st order concepts)	**2nd order themes**	**Aggregate dimensions**
Plan for the type of knowledge I needed to acquire Focus on acquiring specific knowledge	Knowledge acquisition planning	Knowledge to acquire
Clearly understand my innovation objectives Understand the big picture of the innovation problems I needed to solve	Having clarity of innovation objectives	
Strive to enable unlimited access to corporate knowledge for my team Strive to understand the original source of knowledge Reach out directly to sources of knowledge without intermediaries	Access to knowledge	Sourcing knowledge
Learn from customers in order to develop my innovation Seek to understand the way customers use my products and/or services Obtain feedback from pilot group testing Obtain feedback from academia Obtain feedback from investors Obtain feedback from the local government	Customer market research	
Exchange knowledge face to face Use informal channels to source knowledge	Social relationships	
Engage experts from various fields in knowledge transfer activities	Communities of Practice	
Have flexibility in discovering new knowledge useful to my innovation Openly accept feedback from unexpected sources	Being flexible in acquiring knowledge	Knowledge transfer
Acquire knowledge regularly from external sources Source information on the latest industry trends Actively source knowledge from a large network of partners Actively source knowledge from other industries Practice frequent knowledge transfer activities Regularly organize formal knowledge exchange events	Regular knowledge acquisition	
Use a standardized process for knowledge transfer activities Use simplified processes for knowledge transfer activities	Knowledge transfer process	
Information security	Encrypt information exchanged with others	
Engage highly educated employees to work on my innovation	Educated employees	Knowledge absorption
Regularly improve knowledge transfer activities based on my own experiences Strive to understand my organization's knowledge limitations Strive to understand my organization's knowledge capabilities Strive to align my innovation team with our corporate values Strive to establish compatibility between my team and external parties	Continuous improvement	
Actively combine multiple sources of knowledge to acquire new knowledge	Combining and recombining knowledge	Applying and using knowledge
Regularly document knowledge obtained verbally Use IT infrastructure for knowledge management activities Use rich communication media (i.e., video, presentation, animations) that were not text-only	Document and manage knowledge	
Critically evaluate the knowledge acquired prior to using it	Filter information and knowledge	
Openly exchange information with external parties Frequently exchange experiences with subject matter experts Filter out communication noise in knowledge transfer activities	Open innovation	
Actively disseminate knowledge acquired from others Proactively apply the new knowledge acquired	Disseminate knowledge	

Table 26 – Summary of behavioural factors of knowledge transfer positively influencing innovation outcomes in AFA I phase

Identified behavioural acts of KT-, that is behavioural acts of knowledge transfer that participants have reported negatively influence innovation outcomes in AFA I phase are listed in Table 27.

Knowledge Transfer negative behavioural acts (KT-)		
Behavioural acts identified (1st order concepts)	**2nd order themes**	**Aggregate dimensions**
(do not) Source knowledge from multiple sources (do not) Initiate knowledge transfer activities with parties outside of my time zone	Inefficiencies in sourcing knowledge from multiple sources	Issues with knowledge transfer
(do not) Avoid communication overload situations	Inefficiencies in filtering knowledge acquired	
(do not) Strive to spend as little time as possible in meetings (do not) Avoid dealing with red tape (i.e., extensive formal approvals)	Blockers to knowledge transfer	
(do not) Regularly communicate with stakeholders (do not) Practice transparent communication with stakeholders	Not being transparent with key stakeholders	
(do not) Involve knowledgeable staff (i.e., with high level of education) in knowledge transfer activities (do not) Strive to understand my innovation team's knowledge transfer capabilities (do not) Attempt to understand the type of knowledge that I needed to acquire	Inefficiencies in knowledge absorption capacity	Issues with knowledge absorption capacity
(do not) Communicate in simple terms to non-technical personnel (do not) Strive to eliminate language barriers between parties (do not) Communicate via rich communication mediums (e.g., video, animations, multimedia) versus text-only messaging	Inefficiencies in communication	
(do not) Create a plan for the type of knowledge I needed to acquire (do not) Strive to understand my innovation objectives	Inefficiencies in knowledge acquisition planning	Issues with sourcing knowledge
(do not) Take market conditions into consideration (do not) Take customer needs into consideration (do not) Source feedback from customers who understood my products or services (do not) Mind taking into consideration feedback from external parties that seemed incorrect, inaccurate and dishonest	Inefficiencies in market research	
(do not) Document knowledge verbally sourced from external parties (do not) Strive to have a good quality of recorded knowledge (i.e., documentation)	Inefficiencies in documenting knowledge acquired	Issues with managing and using knowledge
(do not) Strive to enable unrestricted access to corporate knowledge	Inefficiencies in open access to knowledge	
(do not) Proactively apply the knowledge acquired in practice (do not) Filter out communication noise in knowledge transfer activities (do not) Strive to piece together all the components of the knowledge acquired	Inefficiencies in using knowledge acquired for innovation	

Table 27 – Summary of behavioural factors of knowledge transfer negatively influencing innovation outcomes in AFA I phase

Identified behavioural acts of IOR+, that is interorganizational relationships that participants have reported positively influence innovation outcomes in AFA I phase are listed in Table 28.

Interorganizational relationships positive behavioural acts (IOR+)		
Behavioural acts identified (1st order concepts)	**2nd order themes**	**Aggregate dimensions**
Strive to form partnerships in a large and diversified partner network Strive to form partnerships with those outside of my own industry Strive to have readily available access to a network of international partners Form partnerships with my end users (customers)	Enlarging network of partners	Expanding the network of knowledge and resources
Openly share IP (Intellectual Property) with partners Proactively and openly disseminate information to my partners	Open innovation	
Strive to ensure strong collaboration between geographically dispersed partners Regularly cooperate with partners in order to introduce novel views into my organization Invest into partnership relationships even if it was more than I got back from the partners Take care of partnership joint interests above my own interests Actively invest into my partner relationships Establish close personal relationships with individuals in a partnership Strive to create a sense of belongingness with my partners	Strengthening partner ties	Quality of interorganizational relationships
Form partnerships with compatible partners Form partnerships with partners that had approximately the same delivery capability as I did Have an alignment of business and technical objectives between partners	Compatibility alignments with partners	
Make myself open to multiple trial and error iterations in order to make the partnership work Make myself flexible to adapt to my partner's specifics	Being flexible in relationship	
Need to believe that I was dealing with a trustworthy partner Need to believe that I was dealing with a reliable partner Trust my partners from the start Make myself open to disclosing confidential information Build a good reputation as a trustworthy partner to others Honour my partnership commitments	Trust and reliability	
Have transparent communication Involve partners regarding all issues concerning them	Transparent communication	
Have a clear collaboration plan defined between partners Take responsibility for my own actions in my partnerships Have a clear delineation of responsibilities between myself and my partners Have clear expectations of my partner responsibilities	Responsibilities in partnership	Relationship governance
Have a decentralization of partnership responsibilities Have a decentralized decision-making process in my partnerships Understand my partner's decision-making process Allow sufficient time for my partners to make decisions	Decision making in partnership	
Regularly measure the values that a partner relationship was bringing to me Provide 'free of charge' value to my partners Recognize my partner's work as valuable Form partnerships with partners that had a better delivery capability than I did Have partnership interests aligned Provide a quick turnaround time to my partners Provide dedicated support to my partners Combine resources with my partner's	Relationship value	Leveraging the relationship
Openly accept partner feedback without prejudice Make myself open to learn from my partner's cultural specificities Encourage my partners to learn from each other	Learning from the relationship	

Table 28 – Summary of behavioural factors of interorganizational relationships positively influencing innovation outcomes in AFA I phase

Identified behavioural acts of IOR-, that is interorganizational relationships that participants have reported negatively influence innovation outcomes in AFA I phase are listed in Table 29.

Interorganizational relationships negative behavioural acts (IOR-)		
Behavioural acts identified (1st order concepts)	**2nd order themes**	**Aggregate dimensions**
(do not) Strive to have good access to partner networks for my partnerships (do not) Work with globally dispersed partner networks	Inefficiencies in enlarging network of partners	Issues with expanding the network of knowledge and resources
(do not) Form partnerships with compatible partners (do not) Form partnerships with partners that had a better delivery capability than my own (do not) Strive to have correct information about my partner's national or regional environments (do not) Strive to have good support from the local environment for my partnerships (do not) Understand my own capabilities prior to forming a partnership (do not) Avoid engaging with partners who had a history of being involved in damaging relationships (do not) Align technology solutions with business objectives in the partnership	Inefficiencies in compatibility alignments with partners	
(do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it (do not) Involve partners in decisions concerning them (do not) Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships (do not) Allow partners to make decisions independently without my influence	Inefficiencies in decision making in partnership	Issues with relationship governance
(do not) Clearly set expectations in my partnerships	Inefficiencies in responsibilities in partnership	
(do not) Combine resources in a partnership (do not) Provide 'free of charge' value to my partners	Inefficiencies in relationship value	Issues with leveraging partnership value
(do not) Solicit feedback for my innovation from partners (do not) Openly share Intellectual Property (IP) in my partnerships (do not) Learn from partners	Inefficiencies in open innovation	
(do not) Have an understanding of the business problems in partnerships (do not) Involve senior management in partner relationships (do not) Have stable communications with my partner network	Inefficiencies in strengthening partner ties	Issues with strengthening of interorganizational relationships
(do not) Trust partners freely from the start of a relationship (do not) Take responsibility for problems or failures in the partnership (do not) Avoid making judgements on my partner relationships based on what my partners said to me (do not) Strive to deliver on committed promises to my partners	Inefficiencies in trust and reliability	

Table 29 – Summary of behavioural factors of interorganizational relationships negatively influencing innovation outcomes in AFA I phase

Behavioural acts *n*=139 (43 for KT+, 25 for KT-, 45 for IOR+ and 26 for IOR-) identified qualitatively in AFA I phase were used as an input into AFA II phase of the field research. These behavioural acts were transferred to a questionnaire and rated on a 7-point Likert scale for agreement or disagreement on their influence to innovation outcomes in AFA II phase.

4.1.4 DEMOGRAPHICS (AFA II PHASE)

The sample size obtained for AFA II phase consisted of N=60 participants innovating in IT companies from 9 countries of SEE. These individuals are predominantly male (83.33%) and are mature mid-careers professionals 30-39 years of age (53.33%), and 40-49 years of age (30%). These individuals are highly educated – majority with master's (48.33%) and undergraduate degrees (28.33%), and some PhDs (11.67%). Majority of participants are in software developer and technical roles (48.33%) working on building innovative technology, with remainder of the sample almost equally divided between middle management (26.67%) and senior management (25%). These individuals have considerable work experience, most with 11-15 years (26.67%), followed by 6-10 years (23.33%), and 16-20 years (18.33%) of professional experience. The sample includes also young professionals with 1-5 years (16.67%) of experience, and senior professionals with more than 20 years of experience (15%).

Innovation produced by these individuals is predominantly own software, cloud and R&D (48.33%) development, followed by software produced for others (31.67%) through IT professional services. The innovation is developed in large by companies being fully owned in SEE (36.67%), followed by entirely foreign owned (31.67%) companies operating in SEE, and with reminder of mixed-ownership companies operating in SEE. Innovation seem to be predominantly developed in large companies with more than 250 employees (48.33%), followed by small companies with less than 50 employees (40%), and lastly medium size companies with 51-250 employees (11.67%). These are mature organizations with majority being in business for more than 10 years (65%), and 6-10 years (16.67%) in existence. The sample also includes young organizations and start-ups with less than 5 years in existence (18.33%).

Demographic findings seem to indicate that individuals participating in AFA II phase represent exceptionally educated workforce in IT sector in SEE with a strong professional mid-career experience, but also covering all career stages in the sample. Participant demographics include both individuals producing innovation and middle and senior management in an almost equal balance. Companies represented in the sample range from small to large companies, and from being fully locally to fully foreign owned. Demographics data provides a strong support that participants in AFA II phase were highly capable to provide prototypicality ratings of the nominated behavioural acts for the measures developed. Detailed overview of demographics data for AFA II phase of the research is disclosed in Appendix VI – Demographics for AFA II Phase.

4.1.5 Data preparation for Analysis (AFA II phase)

Following observation of demographics data collected for AFA II phase sample, the following categories were collapsed in the process of data preparation for analysis:

- Participant's age – collapsed from 7 categories to 5 categories
- Company size – collapsed from 5 categories to 3 categories
- Company age – collapsed from 4 categories to 3 categories

Categories were collapsed to achieve even sample rates and logical break points for the practical purposes of the analysis. Detailed overview of data preparation for analysis is available in Appendix V – Data Preparation for AFA II Phase.

4.1.6 Analysis of Prototypicality Ratings (AFA II phase)

The purpose of the analysis of the prototypicality ratings in AFA II phase was to determine participants' level of agreement to each of nominated behavioural acts and to determine how many of the highest rated acts should be taken as a measure for each of the four scales (KT+, KT-, IOR+, IOR-). The AFA I phase has produced *n*=139 behavioural acts. Through the analysis process in AFA II phase these were reduced to *n*=30 behavioural acts believed to measure the influence of knowledge transfer and interorganizational relationships to innovation outcomes. The analysis used to complete building measures involved a combination statistics tests outlined in Table 30.

Statistical analysis methods applied	Purpose
Descriptive analysis	Understand the highest-rated behavioural acts influencing KT and IOR.
PCA (Principal Component Analysis)	Understand the highest-rated behavioural acts, number of principal components making up measures. Indicates distinct measures.
Cronbach alpha analysis	Understand internal consistency of measures. Indicates reliability of the measure.

Table 30 – Statistical analysis methods used to determine the number of behavioural acts to be used for scales in AFA II phase

Means for participant responses of the prototypicality ratings (level of agreement on the 7-point Likert scale) from the AFA II questionnaire for each of the four categories measured were outputted to tables using SPSS and outputted to graphs for visual analysis. Through these means, the researcher has observed highest rated prototypically ratings, that is behavioural acts to which there existed a strong consensus amongst participants that they influence knowledge transfer and interorganizational relationship.

4.1.7 MEASURE DEVELOPMENT FOR KT+ (AFA II PHASE)

The objective of the analysis was to select the highest rated variables to make the KT+ scale. To understand which behavioural acts out of 43 identified for KT+ in AFA I phase are the highest rated in measuring positive influence of knowledge transfer to innovation outcomes, means of sampled data are shown in Table 31. These behavioural acts were rated by participants for prototypicality ratings (a degree to which participants agree with each question) on a 7-point Likert scale with the following distribution: 1. Strongly disagree, 2. Disagree, 3. Somewhat disagree, 4. Neither agree nor disagree (neutral), 5. Somewhat agree, 6. Agree and 7. Strongly agree. Mean scores are provided in descending order in the table. Highest means at the top of the table represent variables with the highest rated participant consensus and therefore are the most significant variables of the measure. The last column of the table provides difference between the mean on the current line, and the next mean below it. Understanding differences between the means will help determine cut off point for the number of variables making up the scale. The means were also plotted on a graph for visual analysis of the highest rated behavioural acts, drop off points between the means and visualisation of the measure's tail, see Figure 34.

Findings indicate that the highest rated behavioural act for KT+ was rated M=6.30. The first two top means are highly rated above the others with a large drop of d = 0.1667 between the second and third highest rated behavioural act. Thereafter there exist a relatively large drop off point between the sixth and seventh mean d = 0.0667. Starting from the eight variable and onwards there seems to be a tail forming. See graph in Figure 34 for visual confirmation.

Prototypicality rated behavioural acts for KT+

Behavioural acts (KT+)	N	Minimum	Maximum	Mean	Std. Deviation	Diff. with previous mean
1. Seek to understand the way customers use my products and/or services	60	2.00	7.00	6.3000	1.03006	0.1000
2. Have flexibility in discovering new knowledge useful to my innovation	60	4.00	7.00	6.2000	0.77678	0.1667
3. Learn from customers in order to develop my innovation	60	2.00	7.00	6.0333	1.14931	0.0333
4. Use rich communication media (e.g., video, presentation, animations) that were not text-only	60	3.00	7.00	6.0000	0.95669	0.0167
5. Actively combine multiple sources of knowledge to acquire new knowledge	60	3.00	7.00	5.9833	1.01667	0.0833
6. Proactively apply the new knowledge acquired	60	2.00	7.00	5.9000	0.91503	0.0500
7. Use IT infrastructure for knowledge management activities	60	4.00	7.00	5.8500	1.02221	0.0667
8. Strive to enable unlimited access to corporate knowledge for my team	60	2.00	7.00	5.7833	1.10610	0.0167
9. Focus on acquiring specific knowledge	60	1.00	7.00	5.7667	1.11030	0.0667
10. Reach out directly to sources of knowledge without intermediaries	60	2.00	7.00	5.7000	1.16880	0.0500
11. Exchange knowledge face to face	60	3.00	7.00	5.6500	1.10200	0.0500
12. Understand the big picture of the innovation problems I needed to solve	60	2.00	7.00	5.6000	1.19604	0.0667

13. Obtain feedback from pilot group testing	60	1.00	7.00	5.5333	1.66180	0.0000
14. Source information on the latest industry trends	60	3.00	7.00	5.5333	0.99943	0.0167
15. Clearly understand my innovation objectives	60	3.00	7.00	5.5167	1.06551	0.0167
16. Strive to understand my organization’s knowledge limitations	60	1.00	7.00	5.5000	1.14240	0.0000
17. Critically evaluate the knowledge acquired prior to using it	60	2.00	7.00	5.5000	1.30838	0.0167
18. Strive to understand my organization’s knowledge capabilities	60	1.00	7.00	5.4833	1.21421	0.0167
19. Use informal channels to source knowledge	60	3.00	7.00	5.4667	1.11183	0.0000
20. Plan for the type of knowledge I needed to acquire	60	1.00	7.00	5.4667	1.17122	0.0167
21. Engage experts from various fields in knowledge transfer activities	60	1.00	7.00	5.4500	1.37070	0.0833
22. Filter out communication noise in knowledge transfer activities	60	2.00	7.00	5.3667	1.16396	0.0333
23. Practice frequent knowledge transfer activities	60	2.00	7.00	5.3333	1.08404	0.0000
24. Regularly improve knowledge transfer activities based on my own experiences	60	2.00	7.00	5.3333	1.21665	0.0333
25. Strive to establish compatibility between my team and external parties	60	2.00	7.00	5.3000	1.18322	0.0000
26. Acquire knowledge regularly from external sources	60	2.00	7.00	5.3000	1.21153	0.0167
27. Strive to understand the original source of knowledge	60	2.00	7.00	5.2833	1.23634	0.0333
28. Strive to align my innovation team with our corporate values	60	2.00	7.00	5.2500	1.24363	0.0000
29. Frequently exchange experiences with subject matter experts	60	2.00	7.00	5.2500	1.34826	0.1167
30. Openly accept feedback from unexpected sources	60	1.00	7.00	5.1333	1.46677	0.0167
31. Engage highly educated employees to work on my innovation	60	2.00	7.00	5.1167	1.48543	0.0667
32. Actively disseminate knowledge acquired from others	60	1.00	7.00	5.0500	1.15605	0.0667
33. Use simplified processes for knowledge transfer activities	60	1.00	7.00	4.9833	1.35911	0.3000
34. Actively source knowledge from a large network of partners	60	1.00	7.00	4.6833	1.46706	0.0667
35. Openly exchange information with external parties	60	1.00	7.00	4.6167	1.35411	0.0833
36. Regularly organize formal knowledge exchange events	60	1.00	7.00	4.5333	1.64128	0.0167
37. Actively source knowledge from other industries	60	1.00	7.00	4.5167	1.44377	0.0667
38. Regularly document knowledge obtained verbally	60	1.00	7.00	4.4500	1.37070	0.0833
39. Obtain feedback from investors	60	1.00	7.00	4.3667	1.85003	0.3500
40. Use a standardized process for knowledge transfer activities	60	1.00	7.00	4.0167	1.68233	0.4167
41. Obtain feedback from academia	60	1.00	7.00	3.6000	1.58596	0.1333
42. Encrypt information exchanged with others	60	1.00	7.00	3.4667	1.65157	0.5667
43. Obtain feedback from the local government	60	1.00	6.00	2.9000	1.72420	
Valid N (listwise)	60					

Table 31 – Prototypicality rated behavioural acts for knowledge-transfer positives (KT+) in AFA II phase

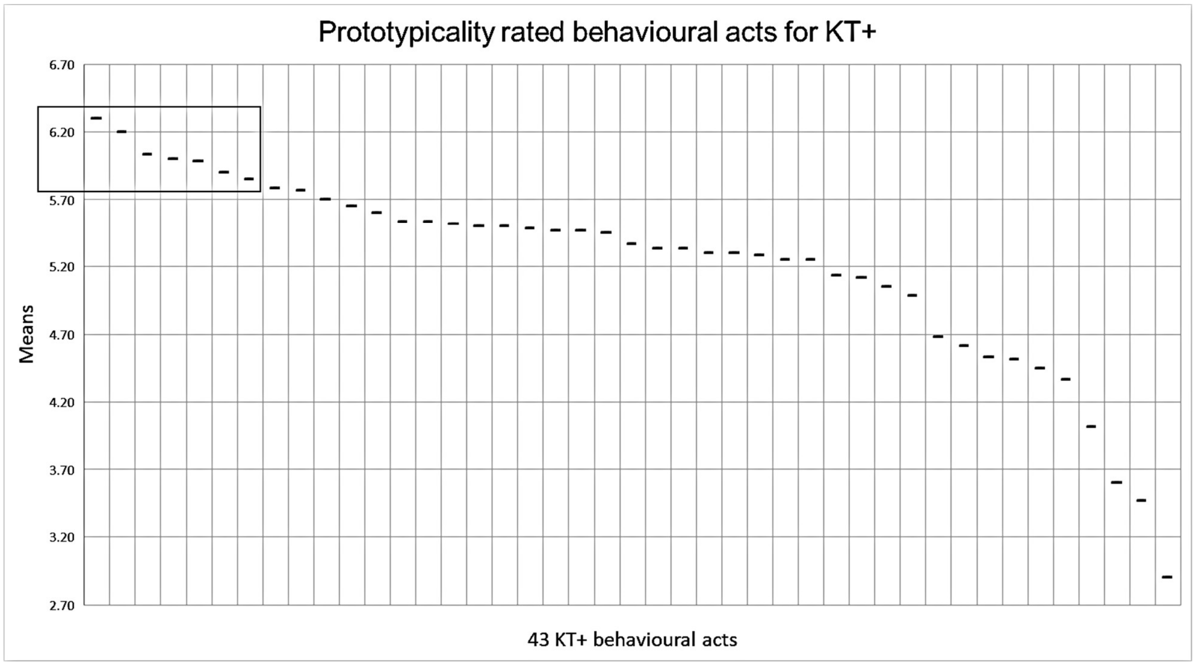

Figure 34 – Highest prototypicality rated behavioural acts (1-43) for KT+ in AFA II phase

The analysis of means indicate that the first 7 highest rated variables are the highest rated variables to measure KT+. See Appendix IX – PCA and Cronbach α for the First 12 Variables of KT+ and KT- for additional data. Further confirmation was performed with PCA test for 7-variable model as shown in Table 32, indicating the measure consists of 5 principal components, with a high cumulative variance (91.154%) explained (Hair *et al.*, 2010).

PCA for 7 variables for KT+

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.597	37.100	37.100	2.597	37.100	37.100	1.743	24.893	24.893
2	1.177	16.818	53.917	1.177	16.818	53.917	1.438	20.547	45.440
3	.976	13.937	67.855	.976	13.937	67.855	1.087	15.530	60.970
4	.866	12.366	80.220	.866	12.366	80.220	1.076	15.372	76.342
5	**.765**	**10.933**	**91.154**	**.765**	**10.933**	**91.154**	**1.037**	**14.812**	**91.154**
6	.379	5.416	96.569						
7	.240	3.431	100.000						

Extraction Method: Principal Component Analysis.

Table 32 – PCA for 7 variables of KT+ from SPSS in AFA II phase

Rotated component matrix from PCA analysis in Table 33 shows 7 questions loaded independently to 5 principal components. Questions loadings ranged from .804 to .983 indicating strong meaningful loadings > .40 (Matsunaga, 2010; Stevens, 2009). The scree test indicates that eigenvalue for 7 variables of the measure is has more than 10.933% of the measure variance supporting inclusion of these variables in the scale (SAS, 2017). Additional analysis with PCA therefore supports the 7-variable model for the measure of KT+.

Rotated Component Matrix[a] (KT+)

	Component				
	1	2	3	4	5
2nd order themes	Customer market research	Being flexible in acquiring knowledge and combining and recombining knowledge	Document and manage knowledge	Document and manage knowledge	Disseminate knowledge
Aggregate dimensions	**Sourcing knowledge (customers)**	**Knowledge transfer and applying knowledge**	**Applying and using knowledge**	**Applying and using knowledge**	**Applying and using knowledge**
Behavioural acts (variables) for KT+ measure					
Learn from customers in order to develop my innovation	.923				
Seek to understand the way customers use my products and/or services	.872				
Have flexibility in discovering new knowledge useful to my innovation		.838			
Actively combine multiple sources of knowledge to acquire new knowledge		.804			
Use IT infrastructure for knowledge management activities			.914		
Use rich communication media (e.g., video, presentation, animations) that were not text-only				.955	
Proactively apply the new knowledge acquired					.983

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations.

Table 33 – Components identified for 7 variables of KT+ from SPSS in AFA II phase

To understand the reliability of KT+ measure Cronbach alpha statistical test validating internal consistency of variables measured indicates that for all 7 variables of the measure there exists good internal consistency (Manerikar *et al.*, 2015) of measures with Cronbach α = .700.

Internal consistency (KT+)

Cronbach's Alpha	N of Items
.700	7

Table 34 – Internal consistency of all KT+ measured variables (AFA II phase)

The analysis provides support for 7-variable model for measure of KT+. The measure consists of 5 distinct principal components with strong factor loadings > .804 (Matsunaga, 2010; Stevens, 2009). The measure's internal consistency is good (Manerikar *et al.*, 2015) with Cronbach α = .700. This indicates that 7 questions listed in Table 35 are suitable to make up the measure of KT+.

KT+ measure variables for the scale

Use this scale to **measure positive influence of knowledge transfer to innovation outcomes** on 7-point Likert scale.

Answer the following: Thinking back about my innovation activities on knowledge transfer with others that were SUPPORTIVE of my innovation: I DID ….

1. Seek to understand the way customers use my products and/or services	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
2. Have flexibility in discovering new knowledge useful to my innovation	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
3. Learn from customers in order to develop my innovation	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
4. Use rich communication media (e.g., video, presentation, animations) that were not text-only	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
5. Actively combine multiple sources of knowledge to acquire new knowledge	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
6. Proactively apply the new knowledge acquired	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
7. Use IT infrastructure for knowledge management activities	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree

Table 35 – Variables of KT+ measure (AFA II phase)

4.1.8 MEASURE DEVELOPMENT FOR KT- (AFA II PHASE)

The objective of the analysis was to select the highest rated variables to make the KT- scale. To understand which behavioural acts out of 25 identified for KT- in AFA I phase are the highest rated in measuring negative influence of knowledge transfer to innovation outcomes, means of sampled data are shown in Table 36. These behavioural acts were rated by participants for prototypicality ratings (a degree to which participants agree with each question) on a 7-point Likert scale with the following distribution: 1. Strongly disagree, 2. Disagree, 3. Somewhat disagree, 4. Neither agree nor disagree (neutral), 5. Somewhat agree, 6. Agree and 7. Strongly agree. Mean scores are provided in descending order in the table. Highest means at the top of the table represent variables with the highest rated participant consensus and therefore are the most significant variables of the measure. The last column of the table provides difference between the mean on the current line, and the next mean below it. Understanding differences between the means will help determine cut off point for the number of variables making up the scale. The means were also plotted on a graph for visual analysis of the highest rated behavioural acts, drop off points between the means, and visualisation of the measure's tail, see Figure 35.

Findings indicate that the highest rated behavioural act for KT- was rated M=3.90. There seems to exist a larger drop of d = 0.1667 between the first and the second highest rated behavioural act.

Thereafter there seem to be two relatively high drops of $d = 0.0500$ between the second and third, and fifth and sixth highest rated behavioural act. It should be noted that starting from the eighth variable and onwards there starts a consecutive flattening in mean difference with $d = 0.0167$ between eight and ninth and ninth and tenth variable. This indicates that the measure's tail starts forming from the eight variable of the measure and onwards. See graph in Figure 35 for visual confirmation.

Prototypicality rated behavioural acts for KT-

Behavioural acts (KT-)	N	Minimum	Maximum	Mean	Std. Deviation	Diff. with previous mean
1. Document knowledge verbally sourced from external parties	60	1.00	7.00	3.9000	1.76309	0.1167
2. Strive to have a good quality of recorded knowledge (i.e., documentation)	60	1.00	7.00	3.7833	1.66816	0.0667
3. Strive to spend as little time as possible in meetings	60	1.00	7.00	3.7167	1.85117	0.0500
4. Take market conditions into consideration	60	1.00	7.00	3.6667	1.92809	0.0000
5. Source knowledge from multiple sources	60	1.00	7.00	3.6667	2.15239	0.0500
6. Create a plan for the type of knowledge I needed to acquire	60	1.00	7.00	3.6167	1.68836	0.0167
7. Attempt to understand the type of knowledge that I needed to acquire	60	1.00	7.00	3.6000	1.91515	0.0333
8. Strive to understand my innovation team's knowledge transfer capabilities	60	1.00	7.00	3.5667	1.80739	0.0167
9. Avoid dealing with red tape (i.e., extensive formal approvals)	60	1.00	7.00	3.5500	1.74108	0.0167
10. Avoid communication overload situations	60	1.00	7.00	3.5333	1.85460	0.0333
11. Filter out communication noise in knowledge transfer activities	60	1.00	7.00	3.5000	1.71237	0.0333
12. Take customer needs into consideration	60	1.00	7.00	3.4667	2.21296	0.0333
13. Involve knowledgeable staff (i.e., with high level of education) in knowledge transfer activities	60	1.00	7.00	3.4333	1.80739	0.0000
14. Strive to piece together all the components of the knowledge acquired	60	1.00	7.00	3.4333	1.75988	0.0167
15. Proactively apply the knowledge acquired in practice	60	1.00	7.00	3.4167	1.95969	0.0167
16. Source feedback from customers who understood my products or services	60	1.00	7.00	3.4000	2.12491	0.0000
17. Strive to enable unrestricted access to corporate knowledge	60	1.00	7.00	3.4000	1.67939	0.0833
18. Communicate in simple terms to non-technical personnel	60	1.00	7.00	3.3167	1.93532	0.0167
19. Strive to eliminate language barriers between parties	60	1.00	7.00	3.3000	2.06094	0.1167
20. Regularly communicate with stakeholders	60	1.00	7.00	3.1833	1.68233	0.0333
21. Mind taking into consideration feedback from external parties that seemed incorrect, inaccurate and dishonest	60	1.00	7.00	3.1500	1.64497	0.0167
22. Strive to understand my innovation objectives	60	1.00	7.00	3.1333	1.92633	0.0667
23. Communicate via rich communication mediums (e.g., video, animations, multimedia) versus text-only messaging	60	1.00	7.00	3.0667	1.90331	0.0167
24. Practice transparent communication with stakeholders	60	1.00	7.00	3.0500	1.75079	0.0500
25. Initiate knowledge transfer activities with parties outside of my time zone	60	1.00	6.00	3.0000	1.58382	
Valid N (listwise)	60					

Table 36 – Prototypicality rated behavioural acts for knowledge-transfer negatives (KT-) in AFA II phase

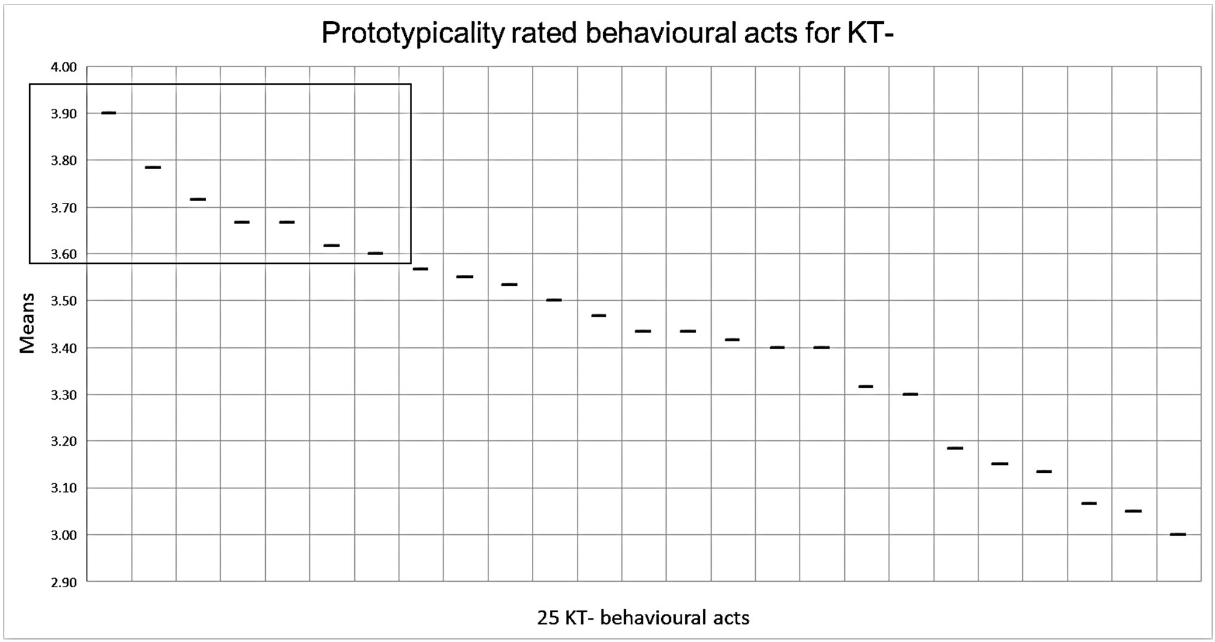

Figure 35 – Highest prototypicality rated behavioural acts (1-25) for KT- in AFA II phase

The analysis of means indicate that the first 7 highest rated variables are most likely the highest rated variables to measure KT-. See Appendix IX – PCA and Cronbach *α* for the First 12 Variables of KT+ and KT- for additional data. Further confirmation was performed with PCA test for 7-variable model as shown in Table 37, indicating the measure consists of 3 principal components, with a high cumulative variance (88.837%) explained (Hair *et al.*, 2010).

PCA for 7 variables of KT-

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.504	64.342	64.342	4.504	64.342	64.342	3.203	45.764	45.764
2	1.052	15.029	79.371	1.052	15.029	79.371	1.873	26.763	72.527
3	**.663**	**9.466**	**88.837**	**.663**	**9.466**	**88.837**	**1.142**	**16.310**	**88.837**
4	.294	4.194	93.031						
5	.254	3.634	96.665						
6	.138	1.967	98.632						
7	.096	1.368	100.000						

Extraction Method: Principal Component Analysis.

Table 37 – PCA for 7 variables of KT- from SPSS in AFA II phase

Rotated component matrix from PCA analysis in Table 38 shows 7 questions loaded independently to 3 principal components. Questions loadings ranged from .811 to .920 indicating strong meaningful loadings > .40 (Matsunaga, 2010; Stevens, 2009). The scree test indicates that eigenvalue for 7 variables of the measure is has more than 9.46% of the measure variance supporting inclusion of these variables in the scale (SAS, 2017). Additional analysis with PCA therefore supports the 7-variable model for the measure of KT-.

Rotated Component Matrix[a] (KT-)

	Component 1	Component 2	Component 3
2nd order themes	Inefficiencies in market research, sourcing knowledge from multiple sources, knowledge acquisition planning, knowledge absorption capacity	Inefficiencies in documenting knowledge acquired	Blockers to knowledge transfer
Aggregate dimensions	**Issues with sourcing knowledge and knowledge transfer**	**Issues with managing and using knowledge**	**Issues with knowledge transfer**
Behavioural acts (variables) for KT- measure			
(do not) Take market conditions into consideration	.898		
(do not) Attempt to understand the type of knowledge that I needed to acquire	.898		
(do not) Source knowledge from multiple sources	.851		
(do not) Create a plan for the type of knowledge I needed to acquire	.811		
(do not) Document knowledge verbally sourced from external parties		.920	
(do not) Strive to have a good quality of recorded knowledge (i.e., documentation)		.826	
(do not) Strive to spend as little time as possible in meetings			.910

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations.

Table 38 – Components identified for 7 variables of KT- from SPSS in AFA II phase

To understand the reliability of KT- measure Cronbach alpha statistical test validating internal consistency of variables measured indicates that for all 7 variables of the measure there seems to exist excellent internal consistency (Manerikar *et al.*, 2015) of measures with $\alpha = .904$.

Internal consistency (KT-)

Cronbach's Alpha	N of Items
.904	7

Table 39 – Internal consistency of all KT- measured variables (AFA II phase)

The analysis provides support for 7-variable model for measure of KT-. The measure consists of 3 distinct principal components with strong factor loadings > .811 (Matsunaga, 2010; Stevens, 2009). The measure's internal consistency is excellent (Manerikar *et al.*, 2015) with Cronbach α = .904. This indicates that 7 questions listed in Table 40 are suitable to make up the measure of KT-.

KT- measure variables for the scale

Use this scale to **measure negative influence of knowledge transfer to innovation outcomes** on 7-point Likert scale.

Answer the following: Thinking back about my innovation activities on knowledge transfer with others that were NOT SUPPORTIVE of my innovation: I DID NOT …

		1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
1.	Document knowledge verbally sourced from external parties	○	○	○	○	○	○	○
2.	Strive to have a good quality of recorded knowledge (i.e., documentation)	○	○	○	○	○	○	○
3.	Strive to spend as little time as possible in meetings	○	○	○	○	○	○	○
4.	Take market conditions into consideration	○	○	○	○	○	○	○
5.	Source knowledge from multiple sources	○	○	○	○	○	○	○
6.	Create a plan for the type of knowledge I needed to acquire	○	○	○	○	○	○	○
7.	Attempt to understand the type of knowledge that I needed to acquire	○	○	○	○	○	○	○

Table 40 – Variables of KT- measure (AFA II phase)

4.1.9 MEASURE DEVELOPMENT FOR IOR+ (AFA II PHASE)

The objective of the analysis was to select the highest rated variables to make the IOR+ scale. To understand which behavioural acts out of 45 identified for IOR+ in AFA I phase are the highest rated in measuring positive influence of interorganizational relationships to innovation outcomes, means of sampled data are shown in Table 41. These behavioural acts were rated by participants for prototypicality ratings (a degree to which participants agree with each question) on a 7-point Likert scale with the following distribution: 1. Strongly disagree, 2. Disagree, 3. Somewhat disagree, 4. Neither agree nor disagree (neutral), 5. Somewhat agree, 6. Agree and 7. Strongly agree. Mean scores are provided in descending order in the table. Highest means at the top of the table represent variables with the highest rated participant consensus and therefore are the most significant variables of the measure. The last column of the table provides difference between the mean on the current line, and the next mean below it. Understanding differences between the means will help determine cut off point for the number of variables making up the scale. The means were also plotted on a graph for visual analysis of the highest rated behavioural acts, drop off points between the means, and visualisation of the measure's tail, see Figure 36.

Findings indicate that the highest rated behavioural act for IOR+ was rated M=5.98. There seems to be a clear indication of the measure's tail starting to form from the tenth variable with difference in means flattening from d = 0.0000 to d = 0.0333 until the 28^{th} variable. The last largest drop before the tail seems to be present between ninth and tenth variable with $d = 0.0833$. See graph in Figure 36 for visual confirmation.

Prototypicality rated behavioural acts for IOR+

Behavioural acts (IOR+)	N	Minimum	Maximum	Mean	Std. Deviation	Diff. with previous mean
1. Take responsibility for my own actions in my partnerships	60	3.00	7.00	5.9833	0.96536	0.0833
2. Make myself open to learn from my partner's cultural specificities	60	3.00	7.00	5.9000	1.08456	0.0167
3. Build a good reputation as a trustworthy partner to others	60	3.00	7.00	5.8833	1.04300	0.0500
4. Honour my partnership commitments	60	3.00	7.00	5.8333	1.04422	0.0167
5. Need to believe that I was dealing with a trustworthy partner	60	2.00	7.00	5.8167	1.14228	0.0000
6. Recognize my partner's work as valuable	60	3.00	7.00	5.8167	0.94764	0.0667
7. Need to believe that I was dealing with a reliable partner	60	2.00	7.00	5.7500	1.18786	0.0500
8. Have transparent communication	60	1.00	7.00	5.7000	1.16880	0.0167
9. Have clear expectations of my partner responsibilities	60	3.00	7.00	5.6833	0.91117	0.0833
10. Form partnerships with compatible partners	60	2.00	7.00	5.6000	1.12295	0.0667
11. Encourage my partners to learn from each other	60	1.00	7.00	5.5333	1.37121	0.0333
12. Strive to create a sense of belongingness with my partners	60	2.00	7.00	5.5000	1.12747	0.0000
13. Form partnerships with my end users (customers)	60	1.00	7.00	5.5000	1.26892	0.0000
14. Allow sufficient time for my partners to make decisions	60	2.00	7.00	5.5000	1.01681	0.0333
15. Have a clear delineation of responsibilities between myself and my partners	60	1.00	7.00	5.4667	1.14191	0.0000
16. Understand my partner's decision-making process	60	1.00	7.00	5.4667	1.22774	0.0167
17. Involve partners regarding all issues concerning them	60	1.00	7.00	5.4500	1.25448	0.0167
18. Provide dedicated support to my partners	60	1.00	7.00	5.4333	1.25370	0.0333
19. Have partnership interests aligned	60	3.00	7.00	5.4000	1.04476	0.0167
20. Proactively and openly disseminate information to my partners	60	1.00	7.00	5.3833	1.23634	0.0167
21. Strive to form partnerships in a large and diversified partner network	60	2.00	7.00	5.3667	1.17843	0.0000
22. Actively invest into my partner relationships	60	2.00	7.00	5.3667	1.17843	0.0167
23. Provide a quick turnaround time to my partners	60	3.00	7.00	5.3500	1.02221	0.0000
24. Openly accept partner feedback without prejudice	60	2.00	7.00	5.3500	1.23268	0.0000
25. Have an alignment of business and technical objectives between partners	60	3.00	7.00	5.3500	1.08651	0.0333
26. Invest into partnership relationships even if it was more than I got back from the partners	60	2.00	7.00	5.3167	1.15702	0.0000
27. Make myself flexible to adapt to my partner's specifics	60	2.00	7.00	5.3167	1.03321	0.0333
28. Establish close personal relationships with individuals in a partnership	60	1.00	7.00	5.2833	1.24997	0.0000
29. Strive to ensure strong collaboration between geographically dispersed partners	60	1.00	7.00	5.2833	1.29001	0.0667
30. Make myself open to multiple trial and error iterations in order to make the partnership work	60	3.00	7.00	5.2167	1.02662	0.0333
31. Combine resources with my partner's	60	2.00	7.00	5.1833	1.17158	0.0833
32. Form partnerships with partners that had a better delivery capability than I did	60	1.00	7.00	5.1000	1.28485	0.0667
33. Have a clear collaboration plan defined between partners	60	1.00	7.00	5.0333	1.36502	0.0167
34. Regularly cooperate with partners in order to introduce novel views into my organization	60	1.00	7.00	5.0167	1.21421	0.0000

35. Strive to have readily available access to a network of international partners	60	1.00	7.00	5.0167	1.34658	0.0167
36. Trust my partners from the start	60	1.00	7.00	5.0000	1.39004	0.0000
37. Have a decentralization of partnership responsibilities	60	3.00	7.00	5.0000	1.08924	0.0000
38. Provide ‘free of charge’ value to my partners	60	2.00	7.00	5.0000	1.11993	0.0500
39. Strive to form partnerships with those outside of my own industry	60	1.00	7.00	4.9500	1.26792	0.3000
40. Take care of partnership joint interests above my own interests	60	1.00	7.00	4.6500	1.38790	0.0167
41. Form partnerships with partners that had approximately the same delivery capability as I did	60	1.00	7.00	4.6333	1.26178	0.0333
42. Have a decentralized decision-making process in my partnerships	60	1.00	7.00	4.6000	1.27824	0.0333
43. Regularly measure the values that a partner relationship was bringing to me	60	1.00	6.00	4.5667	1.38229	0.2167
44. Openly share IP (Intellectual Property) with partners	60	1.00	7.00	4.3500	1.59262	0.4833
45. Make myself open to disclosing confidential information	60	1.00	7.00	3.8667	1.97841	
Valid N (listwise)	60					

Table 41 – Prototypicality rated behavioural acts for interorganizational relationships positives (IOR+) in AFA II phase

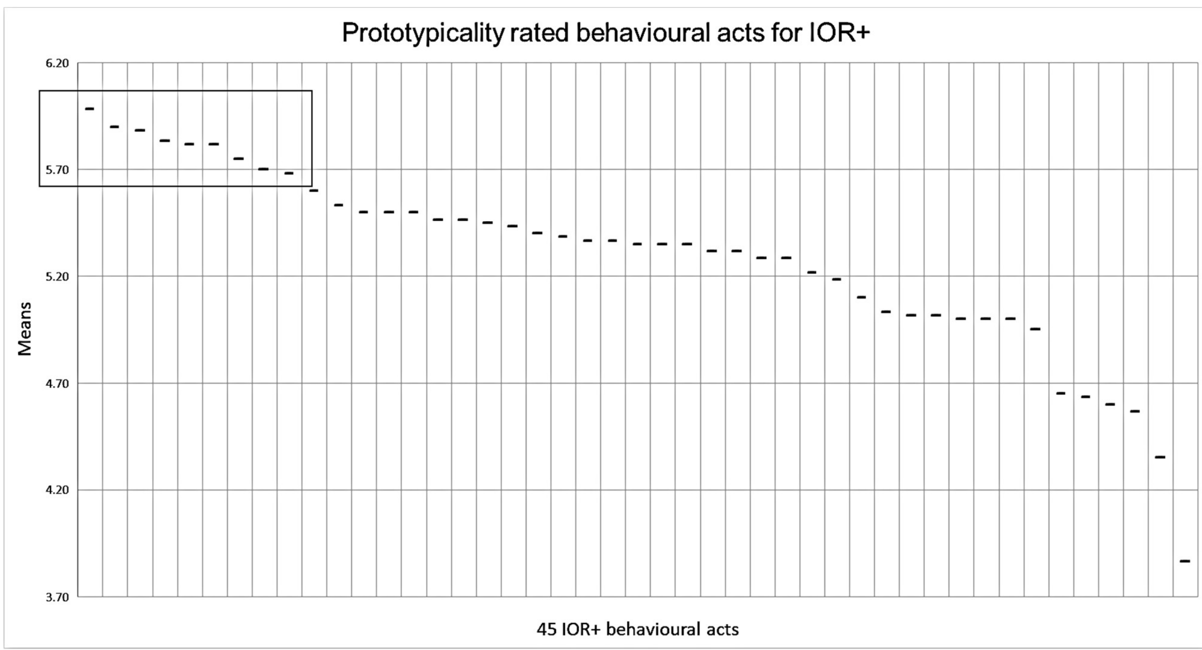

Figure 36 – Highest prototypicality rated behavioural acts (1-45) for IOR+ in AFA II phase

The analysis of means indicate that the first 9 highest rated variables are most likely the highest rated variables to measure IOR+. See Appendix X – PCA and Cronbach α for the First 12 Variables of IOR+ and IOR- for additional data. Further confirmation was performed with PCA test for 9-variable model as shown in Table 42, indicating measure consists of 4 principal components, with a high cumulative variance (83.695%) explained (Hair *et al.*, 2010).

PCA for 9 variables of IOR+

Component	Initial Eigenvalues Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings Total	% of Variance	Cumulative %	Rotation Sums of Squared Loadings Total	% of Variance	Cumulative %
1	5.201	57.792	57.792	5.201	57.792	57.792	2.843	31.585	31.585
2	1.130	12.553	70.345	1.130	12.553	70.345	1.866	20.735	52.320
3	.671	7.460	77.805	.671	7.460	77.805	1.675	18.615	70.935
4	**.530**	**5.889**	**83.695**	**.530**	**5.889**	**83.695**	**1.148**	**12.760**	**83.695**
5	.479	5.325	89.020						
6	.377	4.188	93.208						
7	.258	2.870	96.078						
8	.210	2.338	98.417						
9	.143	1.583	100.000						

Extraction Method: Principal Component Analysis.

Table 42 – PCA for 9 variables of IOR+ from SPSS in AFA II phase

Rotated component matrix from PCA analysis in Table 43 shows 9 questions loaded independently to 3 principal components. Questions loadings ranged from .716 to .869 indicating strong meaningful loadings > .40 (Matsunaga, 2010; Stevens, 2009). The scree test indicates that eigenvalue for 9 variables of the measure is has more than 5.88% of the measure variance supporting inclusion of these variables in the scale (SAS, 2017). Additional analysis with PCA therefore supports the 9-variable model for the measure of IOR+.

Rotated Component Matrix[a] (IOR+)

	Component 1	2	3	4
2nd order themes	Transparent communication, trust and reliability	Responsibilities in partnership, trust and reliability	Relationship value, learning from the relationship	Responsibilities in partnership
Aggregate dimensions	**Strength of IORs**	**Relationship governance, and strength of IORs**	**Leveraging the relationship**	**Relationship governance**
Behavioural acts (variables) for IOR+ measure				
Have transparent communication	.869			
Need to believe that I was dealing with a reliable partner	.852			
Need to believe that I was dealing with a trustworthy partner	.748			
Honour my partnership commitments	.716			
Have clear expectations of my partner responsibilities		.864		
Build a good reputation as a trustworthy partner to others		.783		
Recognize my partner's work as valuable			.801	
Make myself open to learn from my partner's cultural specificities			.801	
Take responsibility for my own actions in my partnerships				.815

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations.

Table 43 – Components identified for 9 variables of IOR+ from SPSS in AFA II phase

To understand the reliability of IOR+ measure Cronbach alpha statistical test validating internal consistency of variables measured indicates that for all 9 variables of the measure there exist excellent internal consistency (Manerikar *et al.*, 2015) of measures with Cronbach α = .906.

Internal consistency (IOR+)

Cronbach's Alpha	N of Items
.906	9

Table 44 – Internal consistency of all IOR+ measured variables (AFA II phase)

The analysis provides support for 9-variable model for measure of IOR+. The measure consists of 4 distinct principal components with strong factor loadings > .716 (Matsunaga, 2010; Stevens, 2009). The measure's internal consistency is excellent (Manerikar *et al.*, 2015) with Cronbach α = .906. This indicates that 9 questions listed in Table 45 are suitable to make up the measure of IOR+.

IOR+ measure variables for the scale

Use this scale to **measure positive influence of interorganizational relationships to innovation outcomes** on 7-point Likert scale.

Answer the following: Thinking back about my innovation activities in cooperating with others that were SUPPORTIVE of my innovation: I DID ….

		1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
1.	Take responsibility for my own actions in my partnerships	○	○	○	○	○	○	○
2.	Make myself open to learn from my partner's cultural specificities	○	○	○	○	○	○	○
3.	Build a good reputation as a trustworthy partner to others	○	○	○	○	○	○	○
4.	Honour my partnership commitments	○	○	○	○	○	○	○
5.	Need to believe that I was dealing with a trustworthy partner	○	○	○	○	○	○	○
6.	Recognize my partner's work as valuable	○	○	○	○	○	○	○
7.	Need to believe that I was dealing with a reliable partner	○	○	○	○	○	○	○
8.	Have transparent communication	○	○	○	○	○	○	○
9.	Have clear expectations of my partner responsibilities	○	○	○	○	○	○	○

Table 45 – Variables of IOR+ measure (AFA II phase)

4.1.10 MEASURE DEVELOPMENT FOR IOR- (AFA II PHASE)

The objective of the analysis was to select the highest rated variables to make the IOR- scale. To understand which behavioural acts out of 26 identified for IOR- in AFA I phase are the highest rated in measuring negative influence of interorganizational relationships to innovation outcomes, means of sampled data are shown in Table 46. These behavioural acts were rated by participants for prototypicality ratings (a degree to which participants agree with each question) on a 7-point Likert scale with the following distribution: 1. Strongly disagree, 2. Disagree, 3. Somewhat disagree, 4. Neither agree nor disagree (neutral), 5. Somewhat agree, 6. Agree and 7. Strongly agree. Mean scores are provided in descending order in the table. Highest means at the top of the table represent variables with the highest rated participant consensus and therefore are the most significant variables of the measure. The last column of the table provides difference between the mean on the current line, and the next mean below it. Understanding differences between the means will help determine cut off point for the number of variables making up the scale. The means were also plotted on a graph for visual analysis of the highest rated behavioural acts, drop off points between the means, and visualisation of the measure's tail, see Figure 37.

Findings indicate that the highest rated behavioural act for IOR- was rated M=3.95. Findings indicate a clear tail of the measure starting to form after the seventh variable with difference in means flattening from d = 0.0000 to d = 0.0167 until the fifteenth variable. The last largest drop before the tail seems to be present between seventh and eight variable with d = 0.1167. See graph in Figure 37 for visual confirmation.

Prototypicality rated behavioural acts for IOR-

Behavioural acts (IOR-)	N	Minimum	Maximum	Mean	Std. Deviation	Diff. with previous mean
1. Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships	60	1.00	7.00	3.9500	1.70169	0.1000
2. Allow partners to make decisions independently without my influence	60	1.00	7.00	3.8500	1.60323	0.0833
3. Openly share Intellectual Property (IP) in my partnerships	60	1.00	7.00	3.7667	1.73075	0.0833
4. Avoid engaging with partners who had a history of being involved in damaging relationships	60	1.00	7.00	3.6833	1.81791	0.1000
5. Trust partners freely from the start of a relationship	60	1.00	7.00	3.5833	1.64977	0.0667
6. Avoid making judgements on my partner relationships based on what my partners said to me	60	1.00	7.00	3.5167	1.70236	0.1000
7. Allow partners to make an independent decision on forming a relationship without me forcing them into it	60	1.00	7.00	3.4167	1.78783	0.1167
8. Strive to have correct information about my partner's national or regional environments	60	1.00	6.00	3.3000	1.67028	0.0167
9. Form partnerships with compatible partners	60	1.00	7.00	3.2833	1.82350	0.0167
10. Form partnerships with partners that had a better delivery capability than my own	60	1.00	7.00	3.2667	1.74537	0.0167

11. Strive to have good support from the local environment for my partnerships	60	1.00	7.00	3.2500	1.62215	0.0167
12. Provide ‘free of charge’ value to my partners	60	1.00	6.00	3.2333	1.55538	0.0000
13. Clearly set expectations in my partnerships	60	1.00	7.00	3.2333	1.88092	0.0167
14. Solicit feedback for my innovation from partners	60	1.00	7.00	3.2167	1.61656	0.0333
15. Involve senior management in partner relationship	60	1.00	6.00	3.1833	1.62075	0.0000
16. Strive to have good access to partner networks for my partnerships	60	1.00	6.00	3.1833	1.57837	0.0833
17. Have stable communications with my partner network	60	1.00	6.00	3.1000	1.66418	0.0000
18. Take responsibility for problems or failures in the partnership	60	1.00	7.00	3.1000	1.69446	0.0333
19. Align technology solutions with business objectives in the partnership	60	1.00	7.00	3.0667	1.72584	0.0167
20. Have an understanding of the business problems in partnerships	60	1.00	7.00	3.0500	1.74108	0.0000
21. Combine resources in a partnership	60	1.00	6.00	3.0500	1.62005	0.0167
22. Work with globally dispersed partner networks	60	1.00	7.00	3.0333	1.67703	0.0667
23. Involve partners in decisions concerning them	60	1.00	6.00	2.9667	1.67703	0.0167
24. Strive to deliver on committed promises to my partners	60	1.00	7.00	2.9500	1.87241	0.0333
25. Understand my own capabilities prior to forming a partnership	60	1.00	6.00	2.9167	1.57622	0.0833
26. Learn from partners	60	1.00	7.00	2.8333	1.89707	
Valid N (listwise)	60					

Table 46 – Prototypicality rated behavioural acts for interorganizational relationships negatives (IOR-) in AFA II phase

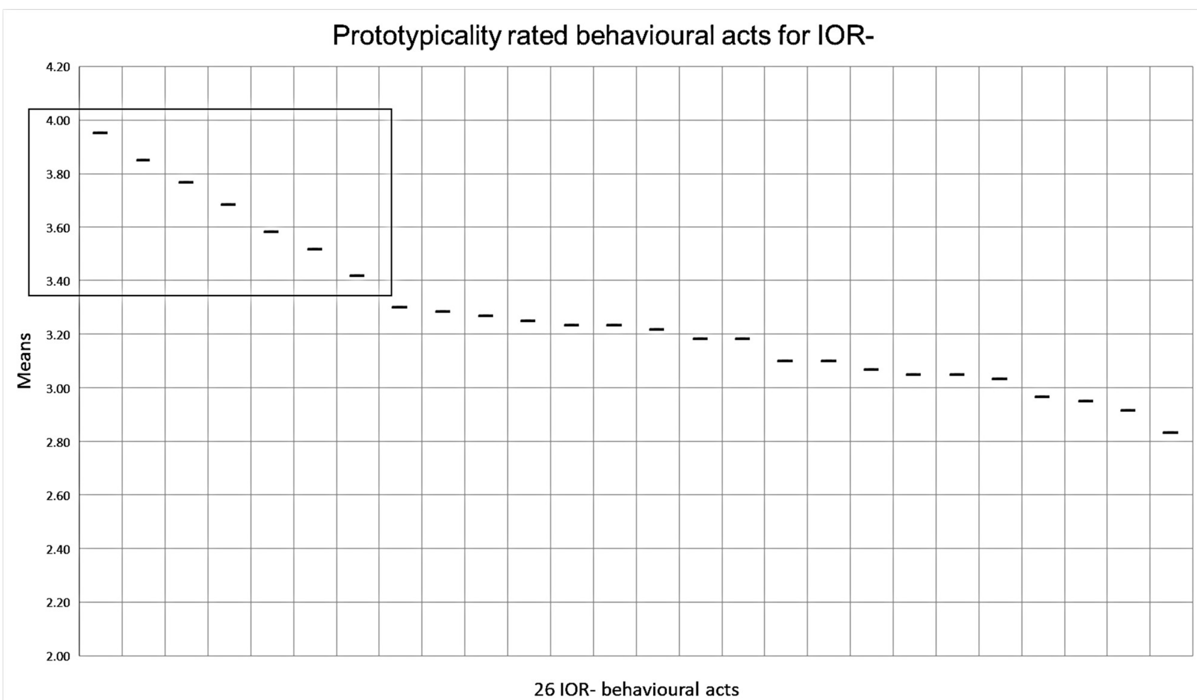

Figure 37 – Highest prototypicality rated behavioural acts (1-26) for IOR- in AFA II phase

The analysis of means indicate that the first 7 highest rated variables are most likely the highest rated variables to measure IOR+. See Appendix X – PCA and Cronbach α for the First 12 Variables of IOR+ and IOR- for additional data. Further confirmation was performed with PCA test for 7-variable model as shown in Table 47, indicating measure consists of 4 principal components, with a high cumulative variance (84.266%) explained (Hair *et al.*, 2010).

PCA for 7 variables of IOR-

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.142	44.881	44.881	3.142	44.881	44.881	1.945	27.781	27.781
2	1.219	17.421	62.302	1.219	17.421	62.302	1.711	24.438	52.219
3	.989	14.135	76.436	.989	14.135	76.436	1.152	16.450	68.669
4	.548	7.830	84.266	.548	7.830	84.266	1.092	15.597	84.266
5	.421	6.021	90.288						
6	.369	5.273	95.560						
7	.311	4.440	100.000						

Extraction Method: Principal Component Analysis.

Table 47 – PCA for 7 variables of IOR- from SPSS in AFA II phase

Rotated component matrix from PCA analysis in Table 48 shows 7 questions loaded to 4 principal components. Questions loadings ranged from .535 to .910 indicating meaningful loadings > .40 (Matsunaga, 2010; Stevens, 2009). The scree test indicates that eigenvalue for 7 variables of the measure is has more than 7.83% of the measure variance supporting inclusion of these variables in the scale (SAS, 2017). Additional analysis with PCA therefore supports the 7-variable model for the measure of IOR-.

Rotated Component Matrix[a] (IOR-)

	Component 1	2	3	4
2nd order themes	Inefficiencies in compatibility alignments with partners and with trust and reliability	Inefficiencies in decision making in partnership	Inefficiencies in open innovation	Inefficiencies in decision making in partnership
Aggregate dimensions	**Issues with expanding the network of knowledge and resources, and with strengthening IORs**	**Issues with relationship governance**	**Issues with leveraging partnership value**	**Issues with relationship governance**
Behavioural acts (variables) for IOR- measure				
(do not) Avoid engaging with partners who had a history of being involved in damaging relationships	.897			
(do not) Avoid making judgements on my partner relationships based on what my partners said to me	.710			
(do not) Trust partners freely from the start of a relationship	.683	~~.535~~		
(do not) Allow partners to make decisions independently without my influence		.863		
(do not) Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships		.780		
(do not) Openly share Intellectual Property (IP) in my partnerships			.946	
(do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it				.910

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 6 iterations.

Table 48 – Components identified for 7 variables of KT- from SPSS in AFA II phase

Single cross-loaded variable "Trust partners freely from the start of a relationship" has a strong loading for both principal components (1 and 2) of above > .40 required for interpretation in social sciences (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). The gap between the two cross loadings (.683 and .535) is .14 which is less than .20 required for association to the higher component (Matsunaga, 2010). Methodology of this research allows leaving the cross-loaded variable on the scale for the purposes of theoretical exploration (Matsunaga, 2010). As such, this variable was associated with principal component 1 having the higher primary loading and removed from the principal component 2. Cross-loading of variables was noted under limitations of this research.

To understand the reliability of IOR- measure Cronbach alpha statistical test validating internal consistency of variables measured indicates that for all 7 variables of the measure there exist a good internal consistency (Manerikar *et al.*, 2015) of measures with Cronbach $\alpha = .795$.

Internal consistency (IOR-)

Cronbach's Alpha	N of Items
.795	7

Table 49 – Internal consistency of all IOR- measured variables (AFA II phase)

The analysis provides support for 7-variable model for measure of IOR-. The measure consists of 4 principal components with meaningful factor loadings > .535 (Matsunaga, 2010; Stevens, 2009). The measure's internal consistency is good (Manerikar *et al.*, 2015) with Cronbach $\alpha = .795$. This indicates that 7 questions listed in Table 50 are suitable to make up the measure of IOR-.

IOR- measure variables for the scale

Use this scale to **measure negative influence of interorganizational relationships to innovation outcomes** on 7-point Likert scale.

Answer the following: Thinking back about my innovation activities in cooperating with others that were NOT SUPPORTIVE of my innovation: I DID NOT ….

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
1. Take responsibility for my own actions in my partnerships	○	○	○	○	○	○	○
2. Make myself open to learn from my partner's cultural specificities	○	○	○	○	○	○	○
3. Build a good reputation as a trustworthy partner to others	○	○	○	○	○	○	○
4. Honour my partnership commitments	○	○	○	○	○	○	○
5. Need to believe that I was dealing with a trustworthy partner	○	○	○	○	○	○	○
6. Recognize my partner's work as valuable	○	○	○	○	○	○	○
7. Need to believe that I was dealing with a reliable partner	○	○	○	○	○	○	○

Table 50 – Variables of IOR- measure (AFA II phase)

4.1.11 SUMMARY OF MEASURES DEVELOPED (AFA II PHASE)

In AFA II phase the original *n*=139 behavioural acts identified in AFA I phase were analysed to understand the highest rated acts for each of the four measures (KT+, KT-, IOR+ and IOR-). Principal Component Analysis (PCA) was performed for each measure to understand the number of principal components and to indicate these are distinct measures. Cronbach Alpha analysis was performed to understand internal consistency of measures indicating reliability. To support the reasoning on how many highest rated behavioural acts needs to make up each measure, further confirmation was looked into PCA and Cronbach Alpha for the first 12 top rated behavioural acts (see Appendix IX – PCA and Cronbach α for the First 12 Variables of KT+ and KT-, and Appendix X – PCA and Cronbach α for the First 12 Variables of IOR+ and IOR-)

This analysis has helped identify the total of *n*=30 behavioural acts (reduced from the original *n*=139) making up measures of individual behaviours scales for KT and IOR as follows:

- For the measure of KT+ identified 7 behavioural acts believed to reliably measure positive influence of knowledge transfer to innovation outcome
- For the measure of KT- identified 7 behavioural acts believed to reliably measure negative influence of knowledge transfer to innovation outcome
- For the measure of IOR+ identified 9 behavioural acts believed to reliably measure positive influence of interorganizational relationships to innovation outcome
- For the measure of IOR- identified 7 behavioural acts believed to reliably measure negative influence of interorganizational relationships to innovation outcome

Measures developed in AFA II phase were tested for reliability and stability in AFA III phase of the field research.

4.2 Testing Measures – AFA III phase

In the first AFA I phase of the field research a total of n=139 behavioural acts of KT and IOR that participants believed influence innovation outcomes were nominated as candidates for development of scales. In AFA II phase participants have evaluated nominated acts for prototypicality ratings, that is how much they agree or disagree on a 7-point Likert scale that each of the nominated behavioural acts positively and negatively influences innovation outcome. This has resulted in reduction of behavioural acts to n=30 highest rated used to develop four measures KT+, KT-, IOR+ and IOR-. As these acts were the highest rated it is believed they are the best suited to make up the scales.

In the last AFA III phase of the field research the four scales were tested for reliability and stability on a larger quantitative sample of N=145 participants across 11 countries in SEE. Reliability of the scale was analysed through statistical tests of PCA (Principal Component Analytics) and Cronbach alpha analysis. This has resulted in 48 PCA and 48 Cronbach Alpha tests executed (12 highest rated variables x 4 measures KT+, KT-, IOR+ and IOR-). The stability analysis of scales was performed using ANOVA one-way tests for analysis of differences between 13 different demographics groups, regarded as independent variables, and all individual questions of the four individual behavioural measures KT+ (7 questions), KT- (7 questions), IOR+ (9 questions) and IOR- (7 questions), regarded as dependent variables. This included executing 52 ANOVA one-way tests and several post-hoc tests where significant differences were indicated.

4.2.1 Data preparation for Analysis (AFA III phase)

Following observation of demographics data collected for AFA III phase sample, for demographics variables where in some categories smaller samples sizes existed, these categories were collapsed to achieve even sample rates and logical break points as follows:

- Company size – collapsed from 7 categories to 3 categories
- Company age – collapsed form 7 categories to 3 categories
- Participant education level – collapsed from 5 to 4 categories

Categories were collapsed for the practical purposes of the analysis. Detailed overview of data preparation for analysis is available in Appendix VII – Data Preparation for AFA III Phase.

4.2.2 DEMOGRAPHICS (AFA III PHASE)

The sample size obtained for AFA III phase consisted of N=145 participants innovating in IT companies in 11 countries of SEE. These individuals are predominantly male (82.76%) and are mature mid-careers professionals 30-39 years of age (44.14%), and 40-49 years of age (28.8%). These individuals are highly educated – majority with master's (53.79%) and undergraduate degrees (33.79%), and some PhDs (4.14%). Majority of participants are in software developer and technical roles (44.83%) working on building innovative technology, followed by senior management (38.62%), and middle management (16.55%). These individuals have considerable work experience, most with 6-10 years (27.59%), followed by 11-15 (22.07%), and 16-20 years (17.24%) of professional experience. The sample also includes young professionals with 1-5 years (15.17%) of experience, and senior professionals with more than 20 years of experience (16.55%).

Innovation produced by these individuals is predominantly own software, cloud and R&D (51.03%) development, followed by software produced for others (33.79%) through IT professional services. The core of innovation is being developed predominantly in SEE (43.54% entirely developed in SEE and 20.69% developed more locally and some abroad). Innovation is largely being developed in small companies with less than 50 employees (44.83%), followed by large companies with more than 250 employees (34.48%), and lastly medium size companies with 51-250 employees (20.69%). These are mature companies with majority being in business more than 16 years (44.83%), followed by companies being 6-15 years in business (30.34%). These companies are in large part fully local owned in SEE (39.31%), or fully foreign owned (37.24%), with some mixed ownership in between. The largest foreign ownership of IT companies in the sample come from the USA (18.62%), followed with local ownership from Serbia (15.17%), Slovenia (10.34%), Romania (9.66%), and others. Overwhelming majority of participants in this phase of the research have 1-5 years of innovation experience (40%), followed by individuals with 6-10 years of innovation experience (24.14%). The sample also includes junior innovators with less than 1 year of innovation experience (11.72%), and seniors with more than 20 years of innovation experience (7.59%).

Demographic findings seem to indicate that individuals participating in AFA III phase represent exceptionally educated workforce in IT sector in SEE with a strong professional mid-career experience, but also covering all career stages in the sample. Participant demographics includes both individuals producing innovation and middle and senior management. Companies represented in the sample range from small and large companies, and from being fully locally to fully foreign owned. Demographics data provides a strong support that participants in AFA III phase were highly capable to test the measure developed to understand impact of KT and IOR to innovation outcomes. Detailed overview of demographics data for AFA III phase of the research is disclosed in APPENDIX VIII – Demographics for AFA III Phase.

4.2.3 PRINCIPAL COMPONENT ANALYSIS FOR KT+ MEASURE (AFA III PHASE)

PCA analysis is used to show variability between the observed factors through a lower number of factors using statistical dimension reduction. The PCA analysis on data for the AFA III phase on the sample N=145 participants were executed in SPSS using Varimax rotation with Kaiser normalization (Kaiser, 1958).

The principal component analysis of knowledge transfer positives shows that all 7 behavioural acts come together consistently. There are 2 principal components making up the construct of knowledge transfer positives, and they are positively related. Total variance explained for knowledge transfer positive factors measured is 57.35%.

Total Variance Explained (KT+)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.901	41.445	41.445	2.901	41.445	41.445	2.017	28.812	28.812
2	1.113	15.906	57.351	1.113	15.906	57.351	1.998	28.538	57.351
3	.914	13.054	70.405						
4	.671	9.587	79.991						
5	.544	7.768	87.760						
6	.455	6.498	94.258						
7	.402	5.742	100.000						

Extraction Method: Principal Component Analysis.

Table 51 – Total variance explained for KT+ measure (AFA III phase)

Rotated component matrix for tested knowledge transfer positives shows 2 principal components identified, as shown in Table 52.

Rotated Component Matrix[a] (KT+)

	Component	
	1 **Knowledge management**	2 **Customer market research**
Aggregate dimensions	Applying and using knowledge	Sourcing knowledge - from customers, knowledge transfer
Behavioural acts (variables) for KT+ measure		
Proactively apply the new knowledge acquired	.828	
Actively combine multiple sources of knowledge to acquire new knowledge	.737	
Use rich communication media (e.g., video, presentation, animations) that were not text-only	.641	
Use IT infrastructure for knowledge management activities	.495	
Learn from customers in order to develop my innovation		.829
Seek to understand the way customers use my products and/or services		.797
Have flexibility in discovering new knowledge useful to my innovation		.702
Average	.675	.776

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 3 iterations.

Table 52 – Rotated component matrix for KT+ measure (AFA III phase)

Observing the two components that make up the measure of knowledge transfer positives, they can be described as follows:

1. **Component: Knowledge management**
    - **This component measures knowledge management activities in organizations in support of innovation outcomes.**
    - Its aggregate dimensions from AFA I qualitative analysis is: Applying and using knowledge.
    - This component is measured with the following four (4) questions:
        i. Proactively apply the new knowledge acquired
        ii. Actively combine multiple sources of knowledge to acquire new knowledge
        iii. Use rich communication media (e.g., video, presentation, animations) that were not text-only
        iv. Use IT infrastructure for knowledge management activities
    - Managing knowledge in organizations in the above described way seems to positively influence innovation outcomes.

2. **Component: Customer market research**
    - **This component measures market research activities companies are using to understand customer needs in support of innovation outcomes.**
    - Its aggregate dimensions from AFA I qualitative analysis are: Sourcing knowledge (from customers) and knowledge transfer.
    - This component is measured with the following three (3) questions:
        i. Learn from customers in order to develop my innovation
        ii. Seek to understand the way customers use my products and/or services
        iii. Have flexibility in discovering new knowledge useful to my innovation
    - Obtaining market knowledge in organizations in the above described way seems to positively influence innovation outcomes.

The PCA analysis indicates that all 7 behavioural acts come together consistently. The analysis indicates there are 2 logical principal components making up the measured construct with 57.35% of the total cumulative variance explained.

4.2.4 Cronbach Alpha for KT+ Measure (AFA III phase)

To understand the reliability of the KT+ measure to innovation outcomes, Cronbach alpha statistical test validating internal consistency of variables measured was deployed. The internal consistency for all 7 variables of the KT+ measure was found to be good (Manerikar *et al.*, 2015) with $\alpha = 0.752$.

Internal consistency (KT+) all components

Cronbach's Alpha	N of Items
.752	7

Table 53 – Internal consistency of all KT+ measured variables (AFA III phase)

The internal consistency of principal component 1 measuring knowledge management activities with 4 questions was found to be good (Manerikar *et al.*, 2015) with $\alpha = 0.653$.

Internal consistency

Component 1: Knowledge management

Cronbach's Alpha	N of Items
.653	4

Table 54 – Internal consistency of KT+ component of knowledge transfer activities (AFA III phase)

The internal consistency of principal component 2 measuring customer market research activities with 3 questions was found to be good (Manerikar *et al.*, 2015) with $\alpha = 0.732$.

Internal consistency

Component 2: Customer market research

Cronbach's Alpha	N of Items
.732	3

Table 55 – Internal consistency of KT+ component of customer market research activities (AFA III phase)

Findings indicate that KT+ scale consists of two principal components with good internal consistency ($\alpha = 0.752$) for all 7 variables of the measure.

4.2.5 PRINCIPAL COMPONENT ANALYSIS FOR KT- MEASURE (AFA III PHASE)

The principal component analysis of knowledge transfer negatives shows that all 7 behavioural acts come together consistently. There is only one (1) principal component making up the construct of knowledge transfer positives, with the total of 60.91% total variance explained.

Total Variance Explained (KT-)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.264	60.919	60.919	4.264	60.919	60.919
2	.822	11.744	72.663			
3	.707	10.102	82.765			
4	.440	6.289	89.054			
5	.386	5.515	94.569			
6	.228	3.264	97.833			
7	.152	2.167	100.000			

Extraction Method: Principal Component Analysis.

Table 56 – Total variance explained for KT- measure (AFA III phase)

Rotated component matrix for tested knowledge transfer positives shows 1 principal component identified, as shown in Table 57.

Component Matrix[a] (KT-)

	Component
	1 **Knowledge mismanagement**
Aggregate dimensions	Issues with sourcing, knowledge transfer and managing knowledge
Behavioural acts (variables) for KT- measure	
(do not) Attempt to understand the type of knowledge that I needed to acquire	.878
(do not) Source knowledge from multiple sources	.849
(do not) Take market conditions into consideration	.844
(do not) Create a plan for the type of knowledge I needed to acquire	.837
(do not) Strive to have a good quality of recorded knowledge (i.e. documentation)	.775
(do not) Document knowledge verbally sourced from external parties	.630
(do not) Strive to spend as little time as possible in meetings	.602
Average	.774

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Table 57 – Rotated component matrix for KT- measure (AFA III phase)

The single component for measuring knowledge transfer negatives, can be described as follows:

1. **Component: Knowledge mismanagement**
    - **This component measures mismanaged knowledge management activities in organizations that in turn negatively affect innovation outcomes.**
    - Its aggregate dimensions from AFA I qualitative analysis are: Issues with sourcing, knowledge transfer and managing knowledge.
    - This component is measured with the following seven (7) questions:
        i. (do not) Attempt to understand the type of knowledge that I needed to acquire
        ii. (do not) Source knowledge from multiple sources
        iii. (do not) Take market conditions into consideration
        iv. (do not) Create a plan for the type of knowledge I needed to acquire
        v. (do not) Strive to have a good quality of recorded knowledge (i.e. documentation)
        vi. (do not) Document knowledge verbally sourced from external parties
        vii. (do not) Strive to spend as little time as possible in meetings
    - Managing knowledge in organizations in the above described way seems to negatively influence innovation outcomes.

The PCA analysis indicates that all 7 behavioural acts come together consistently. The analysis indicates there is a single principal component making up the measured construct with 60.91% of the total variance explained.

4.2.6 CRONBACH ALPHA FOR KT- MEASURE (AFA III PHASE)

To understand the reliability of the KT- measure to innovation outcomes, Cronbach alpha statistical test validating internal consistency of variables measured was deployed. Taking into consideration that PCA test has outputted only a single principal component for KT- measure, the Cronbach alpha for internal consistency was executed on all 7 variables of the measure. The internal consistency for all 7 variables of the KT- measure was found to be good (Manerikar *et al.*, 2015) with $\alpha = 0.891$.

Internal consistency (KT-):

Knowledge mismanagement

Cronbach's Alpha	N of Items
.891	7

Table 58 – Internal consistency of all KT- measured variables (AFA III phase)

Findings indicate that KT- scale consists of a single principal component with good internal consistency ($\alpha = 0.891$) for all 7 variables of the measure.

4.2.7 PRINCIPAL COMPONENT ANALYSIS FOR IOR+ MEASURE (AFA III PHASE)

The principal component analysis of interorganizational relationships positives on 9 behavioural acts measured show there are 2 principal components making up the construct of interorganizational relationships positives, and they are positively related. Total variance explained for interorganizational relationships positive factors measured is 66.51%.

Total Variance Explained (IOR+)

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.852	53.906	53.906	4.852	53.906	53.906	3.291	36.571	36.571
2	1.135	12.613	66.519	1.135	12.613	66.519	2.695	29.948	66.519
3	.800	8.889	75.408						
4	.687	7.629	83.037						
5	.436	4.844	87.881						
6	.400	4.448	92.329						
7	.306	3.400	95.729						
8	.239	2.652	98.382						
9	.146	1.618	100.000						

Extraction Method: Principal Component Analysis.

Table 59 – Total variance explained for IOR+ measure (AFA III phase)

Rotated component matrix for tested interorganizational relationships positives shows 2 components identified, as shown in Table 60.

Rotated Component Matrix[a] (IOR+)

	Component	
	1 **What partners do for us**	2 **What do we do for partners**
Aggregate dimensions	Relationship governance, and strength of IORs	Leveraging the relationship, relationship governance and strength of IORs
Behavioural acts (variables) for IOR+ measure		
Need to believe that I was dealing with a reliable partner	.871	
Need to believe that I was dealing with a trustworthy partner	.858	
Have clear expectations of my partner responsibilities	.735	
Have transparent communication	.696	
Recognize my partner's work as valuable	~~.497~~	.633
Honour my partnership commitments	.572	~~.528~~
Take responsibility for my own actions in my partnerships		.814
Make myself open to learn from my partner’s cultural specificities		.798
Build a good reputation as a trustworthy partner to others		.698
Average	.705	.694

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Table 60 – Rotated component matrix for IOR+ measure (AFA III phase)

Two variables on the scale “Honour my partnership commitments” and “Recognize my partner's work as valuable” are cross loaded to factors in principal components 1. What partners do for us and 2. What do we do for partners. Both cross-loaded variables “Honour my partnership commitments” and “Recognize my partner's work as valuable” have strong loadings for both principal components of above > .40 required for interpretation in social sciences (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). For the variable “Honour my partnership commitments” the gap between the two cross loadings (.572 and .528) is very small .04, and for the variable “Recognize my partner's work as valuable” the gap between the two cross loadings (.497 and .633) is also small 0.136. To remove the smaller of the two items cross loaded, the gap between the two items needs to be at least > .20 or more to ensure that an item belongs in majority to one of the principal components (Matsunaga, 2010), which is not the case for items cross-loaded for IOR+ principal components.

As the purpose of this study was exploratory - understanding influence of KT and IOR to innovation outcomes, research methodology allows leaving the cross-loaded variables on the scale for the purposes of theoretical exploration (Matsunaga, 2010). In such case, items with the primary loading (higher factor of the two cross-loaded) need to be associated with their respective principal component to avoid duplications in the scale. Item “Recognize my partner's work as valuable” was associated to the principal component 1. “What do we do for partners” due to its primary (higher) loading, and the item “Honour my partnership commitments” was associated to the principal component 2. “What partners do for us” due to its primary (higher) loading on the IOR+ scale. Cross-loading of the two variables was noted under limitations of this research.

In addition, literature (Cinite and Duxbury, 2018; Matsunaga, 2010; Cinite *et al.*, 2009) suggests that further validation of the scales in case of existence of cross-loaded variables can be performed with confirmatory methodologies (such are CFA or SEM). The reader is reminded that the nature of this study was to explore and understand influence of KT and IOR to innovation outcomes, and non-objective of this research was to validate and predict outcomes of the scales using confirmatory methodologies. Validating scales using confirmatory methodologies is noted as a future research opportunity in Chapter V – Conclusions.

Observing the two components that make up the measure of interorganizational relationships positives, they can be described as follows:

1. **Component: What partners do for us**
    - **This component measures set of activities in a partner relationship that relate to perception of what partners do for us in the relationship.**
    - Its aggregate dimensions from AFA I qualitative analysis are: Relationship governance, and strength of IORs.
    - This component is measured with the following six (6) questions:
        i. Need to believe that I was dealing with a reliable partner
        ii. Need to believe that I was dealing with a trustworthy partner
        iii. Have clear expectations of my partner responsibilities
        iv. Have transparent communication
        v. Recognize my partner's work as valuable
    - Organization’s own activities that ensure the above activities are performed in a partner relationship to ensure what the partner is doing for us seem to positively influence innovation outcomes.

2. **Component: What do we do for partners**
    - **This component measures set of activities in a partner relationship that relate to what do we do for the partner in relationship.**
    - Its aggregate dimensions from AFA I qualitative analysis are: Leveraging the relationship, relationship governance and strength of IORs.
    - This component is measured with the following five (5) questions:
        i. Honour my partnership commitments
        ii. Take responsibility for my own actions in my partnerships

iii. Make myself open to learn from my partner's cultural specificities
iv. Build a good reputation as a trustworthy partner to others

- Organization's own activities that ensure the above activities are performed for a partner in relationship seem to positively influence innovation outcomes.

The PCA analysis indicates that all 9 behavioural acts come together consistently. The analysis indicates there are 2 logical principal components making up the measured construct with 66.51%. of the total variance explained.

4.2.8 CRONBACH ALPHA FOR IOR+ MEASURE (AFA III PHASE)

To understand the reliability of the IOR+ measure to innovation outcomes, Cronbach alpha statistical test validating internal consistency of variables measured was deployed. The internal consistency for all 9 variables of the IOR+ measure was found to be good (Manerikar *et al.*, 2015) with $\alpha = 0.888$.

Internal consistency (IOR+)

for all components

Cronbach's Alpha	N of Items
.888	9

Table 61 – Internal consistency of all IOR+ measured variables (AFA III phase)

The internal consistency of the principal component 1 measuring activities of what partners do for us with 6 questions was found to be good (Manerikar *et al.*, 2015) with $\alpha = 0.878$.

Internal consistency

Component 1: What partners do for us

Cronbach's Alpha	N of Items
.878	6

Table 62 – Internal consistency of IOR+ component "what do partners do for us" (AFA III phase)

The internal consistency of the principal component 2 measuring activities of what do we do for partners with 5 questions was found to be good (Manerikar *et al.*, 2015) with $\alpha = 0.836$.

Internal consistency

Component 2: What do we do for partners

Cronbach's Alpha	N of Items
.836	5

Table 63 – Internal consistency of IOR+ component "what do we do for the partner" (AFA III phase)

Findings indicate that IOR+ scale consists of two principal components with good internal consistency (Cronbach $\alpha = 0.888$) for all 9 variables of the measure.

4.2.9 PRINCIPAL COMPONENT ANALYSIS FOR IOR- MEASURE (AFA III)

The principal component analysis of interorganizational relationships negatives indicate that 7 behavioural acts come together consistently. There are 2 principal components making up the construct of interorganizational relationships negatives, and they are positively related. Total variance explained for interorganizational relationships negative factors measured is 58.38%.

Total Variance Explained (IOR-)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.011	43.013	43.013	3.011	43.013	43.013	2.626	37.514	37.514
2	1.076	15.371	58.384	1.076	15.371	58.384	1.461	20.870	58.384
3	.918	13.120	71.504						
4	.648	9.264	80.768						
5	.577	8.244	89.012						
6	.442	6.308	95.320						
7	.328	4.680	100.000						

Extraction Method: Principal Component Analysis.

Table 64 – Total variance explained for IOR- measure (AFA III phase)

Rotated component matrix for tested interorganizational relationships negatives shows 2 principal components identified, as shown in Table 65.

Rotated Component Matrix[a] (IOR-)

	Component	
	1 **Mismanaged trust and openness**	2 **Mismanaged decision making**
Aggregate dimensions	Issues with expanding the network of knowledge and resources, strengthening of IORs, relationship governance, leveraging partnership value)	Issues with relationship governance
Behavioural acts (variables) for IOR- measure		
(do not) Avoid making judgements on my partner relationships based on what my partners said to me	.843	
(do not) Trust partners freely from the start of a relationship	.802	
(do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it	.697	
(do not) Openly share Intellectual Property in my partnerships	.630	
(do not) Avoid engaging with partners who had a history of being involved in damaging relationships	.517	
(do not) Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships		.892
(do not) Allow partners to make decisions independently without my influence		.669
Average	.698	.781

Table 65 – Rotated component matrix for IOR- measure (AFA III phase)

Observing the two components that make up the measure of interorganizational relationships negatives, they can be described as follows:

- **Component: Mismanaged trust and openness**
  - **This component measures mismanaged trust and openness activities in organizations that in turn negatively affect innovation outcomes.**
  - Its aggregate dimensions from AFA I qualitative analysis are: Issues with expanding the network of knowledge and resources, strengthening of IORs, relationship governance, leveraging partnership value.
  - This component is measured with the following five (5) questions:
    i. (do not) Avoid making judgements on my partner relationships based on what my partners said to me
    ii. (do not) Trust partners freely from the start of a relationship
    iii. (do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it
    iv. (do not) Openly share Intellectual Property in my partnerships
    v. (do not) Avoid engaging with partners who had a history of being involved in damaging relationships
  - Managing interorganizational relationships in the above described way seems to negatively influence innovation outcomes.

- **Component: Mismanaged decision making**
  - **This component measures mismanaged decision making activities in organizations that in turn negatively affect innovation outcomes.**
  - Its aggregate dimension from AFA I qualitative analysis is: Issues with relationship governance.
  - This component is measured with the following two (2) questions:
    i. Make decisions based on ‘gut’ feeling (intuition) without due diligence in my partnerships
    ii. Allow partners to make decisions independently without my influence
  - Managing interorganizational relationships in the above described way seems to negatively influence innovation outcomes.

The PCA analysis indicates that all 7 behavioural acts come together consistently. The analysis indicates there are 2 logical principal components making up the measured construct with 58.38% of the total variance explained.

4.2.10 CRONBACH ALPHA FOR IOR- MEASURE (AFA III PHASE)

To understand the reliability of the IOR- measure to innovation outcomes, Cronbach alpha statistical test validating internal consistency of variables measured was executed. The internal consistency for all 7 variables of IOR- measure was found to be good (Manerikar *et al.*, 2015) with $\alpha = 0.768$.

Internal consistency (IOR-) for all components

Cronbach's Alpha	N of Items
.768	7

Table 66 – Internal consistency of all IOR- measured variables (AFA III phase)

The internal consistency of the principal component 1 measuring mismanaged trust and openness with 5 questions of the measure was found to be good (Manerikar *et al.*, 2015) with $\alpha = 0.766$.

Internal consistency
Component 1: Mismanaged trust and openness

Cronbach's Alpha	N of Items
.766	5

Table 67 – Internal consistency of IOR- component "trust and openness" (AFA III phase)

The internal consistency of the principal component 2 measuring mismanaged decision-making with 2 questions of the measure was found to poor (Manerikar *et al.*, 2015) with $\alpha = 0.506$.

Internal consistency

Component: Mismanaged decision making

Cronbach's Alpha	N of Items
.506	2

Table 68 – Internal consistency of IOR- component "decision making" (AFA III phase)

Findings indicate that IOR- scale consists of two principal components with good internal consistency ($\alpha = 0.768$) for all 7 variables of the measure.

4.2.11 Summary of Scales Reliability (AFA III phase)

Reliability of scales was tested through executing statistical tests PCA (Principal Component Analysis) and Cronbach alpha for all four measures of the scale (KT+, KT-, IOR+ and IOR-). PCA tests were used to identify the number of principal components in each of the four measures of the scale, and Cronbach alpha test was used to validate internal consistency of each of the principal components identified. PCA tests for each of the four measures indicate there exist only up to 2 principal components (2 for KT+, 1 for KT-, 2 for IOR+ and 2 for IOR-) making up an individual measure. All principal components coefficients are positively loaded with averages well above the minimal threshold for interpretation of > .40 (Matsunaga, 2010; Hervé and Lynne, 2010; Stevens, 2009). Cronbach alpha tests indicate there exists a good internal consistency (Manerikar *et al.*, 2015) for all variables of individual measures being above > .700 (KT+ $\alpha = .752$, KT- $\alpha = .891$, IOR+ $\alpha = .888$, and IOR- $\alpha = .768$). Findings therefore indicate that scales developed in AFA II phase and tested in AFA III phase seem reliable in measuring influence of knowledge transfer and interorganizational relationships to innovation outcomes.

4.2.12 ANOVA Findings for KT+ Measure (AFA III phase)

Analysis of variance (ANOVA) one-way tests were executed in SPSS to identify statistically significant differences between 13 independent demographics variables (gender, age, education level, job position, innovation experience, company size, company age, company primary activity, company ownership, company country of residence, participant country of residence, location where the core of innovation was developed) against all 7 dependent variables making up the knowledge transfer positives (KT+) measure.

Summarized findings for ANOVA tests between demographic groups and questions measuring KT+ are provided in Table 69. Differences between the groups with $p < .05$ are indicated. Questions from the questionnaire are numbered with “q” and a numerical (for example “q0010”) matching AFA III questionnaire available in Appendix XV: Research Instrument - Questionnaire for AFA III Phase.

KT+ measure ANOVA analysis (knowledge transfer positives)	
Demographics – 13 groups (independent variables)	**Test results** for all 7 questions of knowledge transfer positives (dependent variables).
1. **Gender** (q0010)	**No differences found** across all 7 questions asked.
2. **Age** (q0011)	**No differences found** across all 7 questions asked.
3. **Education level** (q0012)	**No differences found** across all 7 questions asked.
4. **Job position** (q0013)	**No differences found** across all 7 questions asked.
5. **Professional experience** (q0014)	**No differences found** across all 7 questions asked.
6. **Innovation experience** (q0015)	Significant differences[19] $p < .05$ were found for the following 2 questions asked (out of 7): i. Question (q0017_002): "*Have flexibility in discovering new knowledge useful to my innovation*", $p = .002$ ii. Question (q0017_006): "*Proactively apply the new knowledge acquired*", $p = .014$
7. **Company size** (q0007_coll)	**No differences found** across all 7 questions asked.
8. **Company age** (q0009)	**No differences found** across all 7 questions asked.
9. **Company's primary activity** (q0008_flat_coll)	**No differences found** across all 7 questions asked.
10. **Company ownership – locally or foreign owned organization** (q0003)	**No differences found** across all 7 questions asked.
11. **Organization's country of residence** (q0004)	**No differences found** across all 7 questions asked.
12. **Participant's country of residence** (q0005)	**No differences found** across all 7 questions asked.
13. **Location where the core of innovation is developed - locally or foreign** (q0006_0001)	Significant differences $p < .05$ were found for the following 2 questions asked (out of 7): i. Question (q0017_006): "*Proactively apply the new knowledge acquired*", $p = .039$ ii. Question (q0017_007): "*Use IT infrastructure for knowledge management activities*", $p = .036$

Table 69 – Summary of ANOVA one-way tests for all demographics and knowledge transfer positives (KT+)

Post-hoc tests were executed for questions for which statistically significant differences $p < .05$ were indicated to understand demographic groups and categories between which these differences existed.

4.2.12.1.1 Innovation Experience and KT+ (AFA III phase)

Participants' innovation experience demographics (independent variable) was tested with dependent variables of KT+ for group differences. Participants were classified in 6 categories based on their innovation experience: 1) < 1 year, 2) 1-5 years, 3) 6-10 years, 4) 11-15 years, 5) 16-20 years, and 6) > 20 years of innovation experience. ANOVA one-way test has indicated statistically significant (p

[19] There exists at least one group mean different to another group mean.

< .05) differences between categories of the demographic group tested for the following 2 questions (out of 7 questions tested):

i. Question (q0017_002): "*Having flexibility in discovering new knowledge useful to my innovation*", $p = .002$
ii. Question (q0017_006): "*Proactively applying new knowledge acquired*", results from ANOVA test: $F(5, 139) = 2.186$, $p = .014$.

Post-hoc (Tukey) test was executed to understand between which demographic groups differences existed for these two questions. The post-hoc test has indicated there existed difference between a single category of participants with less than 1 year of innovation experience and almost all other more experienced participants for both questions, as indicated in Table 70.

Question: Having flexibility in discovering new knowledge useful to my innovation (q0017_002)		
Demographic: Innovation experience		
Difference between the group	**and groups**	**Post hoc sig.**
< 1 year of innovation experience	1-5 years of innovation experience	$p = .005$
	6-10 years of innovation experience	$p = .002$
	11-15 years of innovation experience	$p = .031$
	16-20 years of innovation experience	$p = .006$

Question: Proactively applying new knowledge acquired (q0017_006)		
Demographic: Innovation experience		
Difference between the group	**and groups**	**Post hoc sig.**
< 1 year of innovation experience	1-5 years of innovation experience	$p = .004$
	6-10 years of innovation experience	$p = .000$
	16-20 years of innovation experience	$p = .002$
	> 20 years of innovation experience	$p = .015$

Table 70 – Post-hoc test showing variance between innovation experience groups (q0015) and having flexibility in discovering new knowledge (q0017_002) and applying new knowledge acquired (q0017_006)

Understanding difference between participants with less than one year of innovation experience and participants with more than one-year experience requires further research.

4.2.12.1.2 LOCATION OF INNOVATION DEVELOPMENT AND KT+ (AFA III PHASE)

Participant's location (locally vs. abroad) where the core of innovation is typically developed demographics (independent variable) was tested with dependent variables of KT+ for group differences. Locations were classified in 5 categories as follows: 1) Developed entirely locally, 2) More locally and some abroad, 3) 50/50 locally and abroad, 4) More abroad and some locally, and 5) Entirely developed abroad. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following 2 questions (out of 7 questions tested):

i. Question (q0017_006): "*Proactively apply the new knowledge acquired*", results from ANOVA test: $F(4, 140) = 2.59$, $p = 0.39$

ii. Question (q0017_007): "*Use IT infrastructure for knowledge management activities*", results from ANOVA test: $F(4,140) = 2.65$, $p = 0.36$

Post-hoc (Tukey) test was executed to understand between which demographic groups differences existed for these two questions. The post-hoc test for the first question "*Proactively apply new knowledge acquired*" has indicated there existed statistically significant differences ($p = 0.20$) between respondent groups "50/50 locally and abroad" and "More abroad and some locally". Means analysis for this question indicate that responses for both demographic groups all fall into "Agree" rating on 7-point Likert scale (data available in Appendix XI – Means for KT+ and KT- Measures). Understanding difference between participants proactively applying knowledge acquired if they are 50/50 owned locally abroad and participants who are more abroad and some locally owner requires further research.

Question: Proactively apply the new knowledge acquired (q0017_006)		
Demographic: Location of innovation development		
Difference between the group	**and groups**	**Post hoc sig.**
50/50 locally and abroad	More abroad and some locally	$p = .020$

Table 71 – Post-hoc test showing variance between groups of where the core innovation was developed (q0006_001), and proactively apply the new knowledge acquired (q0017_006)

Post-hoc (Tukey) test against the second question "*Use IT infrastructure for knowledge management activities*" indicates that there existed statistically significant differences ($p = 0.13$) between two respondent groups "More locally and some abroad" and "More abroad and some locally".

Question: Use IT infrastructure for knowledge management activities (q0017_007)		
Demographic: Location of innovation development		
Difference between the group	**and groups**	**Post hoc sig.**
More abroad, some locally	More locally, some abroad	$p = .013$

Table 72 – Post-hoc test showing variance between groups of where the core innovation was developed (q0006_001), and use IT infrastructure for knowledge management activities (q0017_007)

Means analysis for this question indicates that companies whose core innovation was developed more abroad and some locally had somewhat lower scoring with "Somewhat agree" on using IT knowledge for knowledge management, whilst all other groups "Agree" on 7-point Likert scale (data available in Appendix XI – Means for KT+ and KT- Measures). Understanding difference in use of IT infrastructure between participants who develop innovation more abroad versus more locally requires further research.

4.2.13 ANOVA Findings for KT- Measure (AFA III phase)

Analysis of variance (ANOVA) one-way tests were executed in SPSS to identify statistically significant differences between 13 independent demographics variables (gender, age, education level, job position, innovation experience, company size, company age, company primary activity, company ownership, company country of residence, participant country of residence, location where the core of innovation was developed) against all 7 dependent variables making up the knowledge transfer negatives (KT-) measure.

Summarized findings for ANOVA tests between demographic groups and questions measuring KT- are provided in Table 73. Differences between the groups with $p < .05$ are indicated. Questions from the questionnaire are numbered with "q" and a numerical (for example "q0010") matching AFA III questionnaire available in Appendix XV: Research Instrument - Questionnaire for AFA III Phase.

KT- measure ANOVA analysis (knowledge transfer negatives)	
Demographics – 13 groups (independent variables)	**Test results** for all 7 questions of knowledge transfer negatives (dependent variables)
1. **Gender** (q0010)	**No differences found** across all 7 questions asked.
2. **Age** (q0011)	**No differences found** across all 7 questions asked.
3. **Education level** (q0012)	Significant differences $p < .05$ were found for the following single question (out of 7): i. (q0018_006) "*Create a plan for the type of knowledge I needed to acquire*", $p = .010$
4. **Job position** (q0013)	**No differences found** across all 7 questions asked.
5. **Professional experience** (q0014)	**No differences found** across all 7 questions asked.
6. **Innovation experience** (q0015)	**No differences found** across all 7 questions asked.
7. **Company size** (q0007_coll)	Significant differences $p < .05$ were found for the following single question (out of 7): i. (q0018_001) "*Document knowledge verbally sourced from external parties acquire*", $p = .008$
8. **Company age** (q0009)	**No differences found** across all 7 questions asked.
9. **Company's primary activity** (q0008_flat_coll)	**No differences found** across all 7 questions asked.
10. **Company ownership – locally or foreign owned organization** (q0003)	**No differences found** across all 7 questions asked.
11. **Organization's country of residence** (q0004)	**No differences found** across all 7 questions asked.
12. **Participant's country of residence** (q0005)	**No differences found** across all 7 questions asked.
13. **Location where the core of innovation is developed - locally or foreign** (q0006_0001)	**No differences found** across all 7 questions asked.

Table 73 – Summary of ANOVA one-way tests for all demographics and knowledge transfer negatives (KT-)

Post-hoc tests were executed for questions for which statistically significant differences $p < .05$ were indicated to understand demographic groups and categories between which these differences existed.

4.2.13.1.1 Participants' Education Level and KT- (AFA III phase)

Demographic participants' education level (independent variable) was tested with dependent variables of KT- for group differences. Education levels were classified in 4 groups as follows: 1) High school, 2) Undergraduate degree, 3) Master's degree, and 4) PhD. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following single question (out of 7 questions tested):

i. Question (q0018_006): "*Create a plan for the type of knowledge I needed to acquire*" (for my innovation), results from ANOVA test: $F(4, 140) = 2.43$, $p = 0.10$.

Post-hoc (Tukey) test was executed to understand for which demographic groups differences existed for this question. The post-hoc test indicated there existed statistically significant differences (p = 0.04) between participants' educational level groups "High school" and "PhD".

Question: Create a plan for the type of knowledge I needed to acquire (q0018_006)		
Demographic Education level		
Difference between the group	**and groups**	**Post hoc sig.**
High school	PhD	$p = .004$

Table 74 – Post-hoc test showing variance between groups of educational level (q0012), and create a plan for the type of knowledge I need to acquire (q0018_006)

In helping to provide possible explanation for difference between these two groups, means analysis for this question indicates that participants with High school education believe that not planning for knowledge acquisition might negatively influence innovation outcomes, versus PhD's who believe that might not be the case (data available in Appendix XI – Means for KT+ and KT- Measures). Understanding difference between participants with the highest level of education with high school who are inclined to create a plan for the type of knowledge to acquire for innovation, versus PhD who are inclined to discover knowledge for innovation requires further research.

4.2.13.1.2 Company Size and KT- (AFA III phase)

Demographics of company size (independent variable) were tested with dependent variables of KT- for differences between the groups. Company size was classified in 3 categories as follows: 1) < 50 employees (small companies), 2) 51-250 employees (medium size companies) and 3) > 250 employees (large companies). ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following single question for KT- measure (out of 7 questions tested):

i. Question (q0018_001): "*Document knowledge verbally sourced from external parties*", results from ANOVA test: $F(2, 142) = 4.98$, $p = .008$

Post-hoc (Tukey) test indicates statistically significant differences between two groups - small companies with less than 50 employees and large companies with more than 250 employees.

Question: Document knowledge verbally sourced from external parties (q0018_001)		
Demographic: Company size		
Difference between the group	**and groups**	**Post hoc sig.**
< 50 employees (small companies)	> 250 employees (large companies)	$p = .009$

Table 75 – Post-hoc test showing variance between groups of company sizes (q0007_coll), and document knowledge verbally sourced from external parties (q0018_001)

Understanding difference between small and large size organizations in their inclination to document verbally sources knowledge from external parties requires further analysis.

4.2.14 ANOVA Findings for IOR+ Measure (AFA III phase)

Analysis of variance (ANOVA) one-way tests were executed in SPSS to identify statistically significant differences between 13 independent demographics variables (gender, age, education level, job position, innovation experience, company size, company age, company primary activity, company ownership, company country of residence, participant country of residence, location where the core of innovation was developed) against all 9 questions making up the interorganizational transfer positives (IOR+) measure.

Summarized findings for ANOVA tests between demographic groups and questions measuring IOR+ are provided in Table 76. Differences between the groups with $p < .05$ are indicated. Questions from the questionnaire are numbered with "q" and a numerical (for example "q0010") matching the AFA III questionnaire available in Appendix XV: Research Instrument - Questionnaire for AFA III Phase.

IOR+ ANOVA analysis (Interorganizational relationships positives)	
Demographics – 13 groups (independent variables)	**Test results** for all 9 questions[20] of interorganizational relationships positives (dependent variables).
1. **Gender** (q0010)	Significant differences[21] $p < .05$ were found for the following 1 question (out of 9): i. (q0019_005) "*Honour my partnership commitments*", $p = .031$
2. **Age** (q0011)	**No differences found** across all 9 questions asked.
3. **Education level** (q0012)	Significant differences $p < .05$ were found for the following 3 questions (out of 9): i. (q0019_005) "*Honour my partnership commitments*", $p = .048$. ii. (q0019_006) "*Need to believe that I was dealing with a trustworthy partner*", $p = .033$ iii. (q0019_007) "*Need to believe that I was dealing with a reliable partner*", $p = .046$
4. **Job position** (q0013)	Significant differences $p < .05$ were found for the following 3 questions (out of 9): i. (q0019_001) "*Take responsibility for my own actions in my partnerships*", $p = .005$. ii. (q0019_002) "*Make myself open to learn from my partner's cultural specificities*", $p = .001$ iii. (q0019_003) "*Build a good reputation as a trustworthy partner to others*", $p = .013$
5. **Professional experience** (q0014)	Significant differences $p < .05$ were found for the following 2 questions (out of 9): i. (q0019_001) "*Take responsibility for my own actions in my partnerships*", $p = .004$ ii. (q0019_004) "*Recognize my partner's work as valuable*", $p = .026$
6. **Innovation experience** (q0015)	Significant differences $p < .05$ were found for the following 1 question (out of 9): i. (q0019_003) "*Build a good reputation as a trustworthy partner to others*", $p = .020$
7. **Company size** (q0007_coll)	**No differences found** across all 9 questions asked.
8. **Company age** (q0009)	**No differences found** across all 9 questions asked.
9. **Company's primary activity** (q0008_flat_coll)	**No differences found** across all 9 questions asked.
10. **Company ownership – locally or foreign owned organization** (q0003)	**No differences found** across all 9 questions asked.
11. **Organization's country of residence** (q0004)	Significant differences $p < .05$ were found for the following 1 question (out of 9): i. (q0019_003) "*Build a good reputation as a trustworthy partner to others*", $p = .026$
12. **Participant's country of residence** (q0005)	**No differences found** across all 9 questions asked.
13. **Location where the core of innovation is developed - locally or foreign** (q0006_0001)	Significant differences $p < .05$ were found for the following 2 questions (out of 9): i. (q0019_002) "*Make myself open to learn from my partner's cultural specificities*", $p = 0.41$ ii. (q0019_008) "*Have transparent communication*", $p = .024$

Table 76 – Summary of ANOVA one-way tests for all demographics and interorganizational relationships positives (IOR+)

[20] Participants have responded to questions on a 7-point Likert scale.
[21] There exists at least one group mean different to another group mean.

Post-hoc tests were executed for questions for which statistically significant differences $p < .05$ were indicated to understand demographic groups and categories between which these differences existed.

4.2.14.1.1 Gender and IOR+ (AFA III phase)

Gender group demographics (independent variable) was tested with dependent variables of IOR+ measure for group variances. Gender was classified in two categories: 1) male and 2) female. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following single question (out of 9 questions tested):

i. Question (q0019_005): "*Honour my partnership commitments*", results from ANOVA test: $F(1, 143) = 4.73$, $p = .031$

Understanding differences between genders in honouring partnership commitments requires further analysis.

4.2.14.1.2 Education Level and IOR+ (AFA III phase)

Participants' highest education level demographics (independent variable) were tested with dependent variables of IOR+ for group variances. Education levels were classified in 4 categories as follows: 1) High school, 2) Undergraduate degree (University), 3) Master's degree, and 4) PhD. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following 3 questions (out of 8 questions tested):

i. Question (q0019_005): "*Honour my partnership commitments*", results from ANOVA test: $F(3, 141) = 3.25$, $p = .024$
ii. Question (q0019_006): "*Need to believe that I was dealing with a trustworthy partner*", results from ANOVA test: $F(3, 141) = 3.12$, $p = .028$
iii. Question (q0019_007): "*Need to believe that I was dealing with a reliable partner*", results from ANOVA test: $F(3, 141) = 3.62$, $p = .015$

Post-hoc (Tukey) test was executed to understand between which demographic groups differences existed for these questions. The post-hoc test has indicated there existed statistically significant differences between participant group with undergraduate education for all three questions and participants with masters and high school as the highest level of education, as shown in Table 77.

Question: Honour my partnership commitments (q0019_005)
Demographic: Education level

Difference between the group	and groups	Post hoc sig.
Undergraduate degree (university)	Master's degree	*p* = .016

Question: Need to believe that I was dealing with a trustworthy partner (q0019_006)		
Demographic: Education level		
Difference between the group	**and groups**	**Post hoc sig.**
Undergraduate degree (university)	High school	*p* = .032

Question: Need to believe that I was dealing with a reliable partner (q0019_007)		
Demographic: Education level		
Difference between the group	**and groups**	**Post hoc sig.**
Undergraduate degree (university)	High school	*p* = .016

Table 77 – Post-hoc test showing variance between education level groups (q0012), and five questions of IOR+ (q0019_004-007)

Means analysis for these three questions do not show any significant differences. No correlations could be found for participants with undergraduate degree and other extra questions from the survey used for interpretation of the results. Understanding differences between university educated participants and other groups in honouring partnership commitments requires further analysis.

4.2.14.1.3 Job Position and IOR+ (AFA III phase)

Participants' job position demographics (independent variable) were tested with dependent variables of IOR+ for group variances. Participants were classified in 3 job categories 1) Software developers and technical roles, 2) Middle management, and 3) Senior managers. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following 3 questions (out of 9 questions tested):

i. Question (q0019_001): "*Take responsibility for my own actions in my partnerships*", results from ANOVA test: $F(2, 142) = 5.56$, $p = .005$
ii. Question (q0019_002): "*Make myself open to learn from my partner's cultural specificities*", results from ANOVA test: $F(2, 142) = 7.81$, $p = .001$
iii. Question (q0019_003): "*Build a good reputation as a trustworthy partner to others*", results from ANOVA test: $F(2, 142) = 4.52$, $p = .013$

Post-hoc (Tukey) test was executed to understand between which demographic groups differences existed for these questions. The post-hoc test has indicated there existed statistically significant differences between respondent groups "Software developers and technical roles" and "Senior managers" which are the same for all three questions, as shown in Table 78.

Question: Take responsibility for my own actions in my partnerships (q0019_001)
Demographic: Job position

Difference between the group	and groups	Post hoc sig.
Software developers and technical roles	Senior managers	*p* = .007

Question: Make myself open to learn from my partner's cultural specificities (q0019_002)		
Demographic: Job position		
Difference between the group	**and groups**	**Post hoc sig.**
Software developers and technical roles	Senior managers	*p* = .001

Question: Build a good reputation as a trustworthy partner to others (q0019_003)		
Demographic: Job position		
Difference between the group	**and groups**	**Post hoc sig.**
Software developers and technical roles	Senior managers	*p* = .009

Table 78 – Post-hoc test showing variance between job position groups (q0013), and three questions of IOR+ (q0019_001, 002, 004)

Means analysis shows that for all 3 questions middle and senior managers are scoring somewhat higher (although a minor difference) compared to participants working in software and other technical roles for all 3 questions out of 9 tested for IOR+ (supporting data is available in Appendix XII – Means for IOR+ and IOR- Measures). Janssen *et al.* (2011) suggest there exist differences between managers and employees regarding measuring innovation performance. As the question asked in the survey was in relationship to innovation outcomes, perhaps in this research as well managers and employees had a different view on measures of innovation outcomes. Understanding this difference in details requires further research.

4.2.14.1.4 Professional Experience and IOR+ (AFA III phase)

Participants' years of professional experience demographics (independent variable) was tested with dependent variables of IOR+ for group variances. Professional experience was classified in 6 categories as follows: 1) < 1 year of professional experience. 2) 1-5 years of professional experience, 3) 6-10 years of professional experience, 4) 11-15 years of professional experience, 5) 16-20 years of professional experience, and 6) > 20 years of professional experience. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following 2 questions (out of 9 questions tested):

i. Question (q0019_001): "*Take responsibility for my own actions in my partnerships*", results from ANOVA test: $F(5, 139) = 2.40$, $p = .004$
ii. Question (q0019_004): "*Recognize my partner's work as valuable*", results from ANOVA test: $F(5, 139) = 2.64$, $p = .026$

Post-hoc (Tukey) test for both questions indicates similar results indicating these exist differences between groups with the least professional experience – less than 1 year, and 1-5 years, and the group with the most professional experience – more than 20 years, as shown in Table 79.

Question: Take responsibility for my own actions in my partnerships (q0019_001)		
Demographic: Professional experience		
Difference between the group	**and groups**	**Post hoc sig.**
< 1 year of professional experience	> 20 years of professional experience	*p* = .047
1-5 years of professional experience	> 20 years of professional experience	*p* = .008

Question: Recognize my partner's work as valuable (q0019_004)		
Demographic: Professional experience		
Difference between the group	**and groups**	**Post hoc sig.**
< 1 year of professional experience	> 20 years of professional experience	*p* = .036

Table 79 – Post-hoc test showing variance between groups of various professional experience (q0014), and three questions of IOR+ (q0019_001, 003, 004)

The difference found is between young professional and ones in mature careers. Understanding the difference between participants with less than 5 years of professional experience and participants with more than 20 years of innovation experience in taking responsibility for own actions in partnerships and recognizing partner's work as valuable requires further research.

4.2.14.1.5 Innovation Experience and IOR+ (AFA III phase)

Participants' innovation experience demographics (independent variable) was tested with dependent variables of IOR+ for group variances. Innovation experience group was classified in 6 categories as follows: 1) < 1 year of innovation experience, 2) 1-5 years, 3) 6-10 years, 4) 11-15 years, 5) 16-20 years and 6) > 20 years of innovation experience. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following 2 questions (out of 9 questions tested):

i. Question (q0019_003): "*Build a good reputation as a trustworthy partner to others*", results from ANOVA test: $F(5, 139) = 2.79$, $p = .020$

Post-hoc (Tukey) test for this question indicate differences between groups with less than 1 year of innovation experience with 11-15 years of innovation experience, as shown in Table 80.

Question: Build a good reputation as a trustworthy partner to others (q0019_003)		
Demographic: Innovation experience		
Difference between the group	**and groups**	**Post hoc sig.**
< 1 year of innovation experience	11-15 year of innovation experience	*p* = .043

Table 80 – Post-hoc test showing variance between the groups of innovation experience (q0015), and two questions of IOR+ (q0019_002, 003)

Difference between participants with less than 1 year of innovation experience and participants with 11-15 years of innovation experience in building a good reputation as trustworthy partners to others requires further research.

4.2.14.1.6 Organization's Country and IOR+ (AFA III phase)

Organization's primary country of residence demographics (independent variable) was tested with dependent variables of IOR+ for group variances. Countries for company residence were based on the survey response classified to 6 groups 1) USA, 2) Serbia, 3) Slovenia, 4) Romania, and 5) Others. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following single questions (out of 9 questions tested):

i. Question (q0019_003): "*Build a good reputation as a trustworthy partner to others*", results from ANOVA test: $F(4, 140) = 2.45$, $p = .049$

Post-hoc (Tukey) test for this question indicates differences between group of participants whose company's primary country of residence are "USA" and "Serbia", see Table 81.

Question: Build a good reputation as a trustworthy partner to others (q0019_003)		
Demographic: Country of origin		
Difference between the group	**and groups**	**Post hoc sig.**
USA	Serbia	p = .033

Table 81 – Post-hoc test showing variance between the countries of organizational residence (q0004_coll_org_residence), and question Build a good reputation as a trustworthy partner to others (q0019_003)

Means for data for this question is available in Appendix XII – Means for IOR+ and IOR- Measures. Difference in opinions between locally owned companies from Serbia and internationally owned companies from USA on building a good reputation as a trustworthy partner to others requires further research.

4.2.14.1.7 Location of Innovation Development and IOR+ (AFA III phase)

Location where the core of innovation was developed demographics (independent variable) was tested with dependent variables of IOR+ for group variances. Location of innovation development group was classified in 5 location categories as follows: 1) Developed entirely locally, 2) More locally, some abroad, 3) 50/50 locally and abroad, 4) More abroad, some locally, and 5) Entirely developed abroad. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following 2 questions (out of 9 questions tested):

i. Question (q0019_002): "*Make myself open to learn from my partner's cultural specificities*", results from ANOVA test: $F(4, 140) = 2.56$, $p = .041$
ii. Question (q0019_008): "*Have transparent communication*", results from ANOVA test: $F(4, 140) = 2.90$, $p = .024$

Post-hoc (Tukey) analysis for the two questions indicates the same differences for both questions between participant groups whose core of innovation was developed "More locally, some abroad" and participants whose core innovation was developed "More abroad, some locally", see Table 82.

Question: Make myself open to learn from my partner's cultural specificities (q0019_002)		
Demographic: Location of innovation development		
Difference between the group	**and groups**	**Post hoc sig.**
More locally, some abroad	More abroad, some locally	$p = .026$

Question: Have transparent communication (q0019_008)		
Demographic: Location of innovation development		
Difference between the group	**and groups**	**Post hoc sig.**
More locally, some abroad	More abroad, some locally	$p = .027$

Table 82 – Post-hoc test showing variance between the location of where innovation was developed groups (q0006_001), and two questions of IOR+ (q0019_002, 008)

Means analysis for both questions indicate a slightly weaker support for participants who develop core of their innovation more abroad and less locally for both questions. There also existed a slightly stronger support for both questions in cases where the core of innovation was developed more locally and less abroad (data available in Appendix XII – Means for IOR+ and IOR- Measures). Understanding differences between companies who develop their innovation more locally in SEE and more abroad in terms of being open to partner's cultural specificities and having transparent communication requires further research.

4.2.15 ANOVA Findings for IOR- Measure (AFA III phase)

Analysis of variance (ANOVA) one-way tests were executed in SPSS to identify statistically significant differences between 13 independent demographics variables (gender, age, education level, job position, innovation experience, company size, company age, company primary activity, company ownership, company country of residence, participant country of residence, location where the core of innovation was developed) against all 7 questions making up the interorganizational transfer negatives (IOR-) measure.

Summarized findings for ANOVA tests between demographic groups and questions measuring IOR- are provided in Table 83. Differences between groups with $p < .05$ are indicated. Questions from the questionnaire are numbered with "q" and a numerical (for example "q0010") matching the AFA III questionnaire available in Appendix XV: Research Instrument - Questionnaire for AFA III Phase.

IOR- ANOVA analysis (Interorganizational relationships negatives)	
Demographics – 13 groups (independent variables)	**Test results** for all 7 questions[22] of interorganizational relationships negatives (dependent variables).
1. **Gender** (q0010)	Significant differences[23] $p < .05$ were found for the following 3 questions (out of 7): i. (q0020_003) "*Openly share Intellectual Property in my partnerships*", $p = .012$ ii. (q0020_004) "*Avoid engaging with partners who had a history of being involved in damaging relationships*", $p = .025$ iii. (q0020_005) "*Trust partners freely from the start of a relationship*", $p = .045$
2. **Age** (q0011)	**No differences found** across all 7 questions asked.
3. **Education level** (q0012)	**No differences found** across all 7 questions asked.
4. **Job position** (q0013)	**No differences found** across all 7 questions asked.
5. **Professional experience** (q0014)	**No differences found** across all 7 questions asked.
6. **Innovation experience** (q0015)	Significant variances $p < .05$ were found for the following 1 question (out of 7): i. (q0020_001) "*Make decisions based on 'gut' feeling without due diligence in my partnerships*", $p = .001$
7. **Company size** (q0007_coll)	**No differences found** across all 7 questions asked.
8. **Company age** (q0009)	Significant differences $p < .05$ were found for the following 1 question (out of 7): i. (q0020_002) "*Allow partners to make decisions independently without my influence*", $p = .001$
9. **Company's primary activity** (q0008_flat_coll)	**No differences found** across all 7 questions asked.
10. **Company ownership** – **locally or foreign owned organization** (q0003)	**No differences found** across all 7 questions asked.
11. **Organization's country of residence** (q0004)	**No differences found** across all 7 questions asked.
12. **Participant's country of residence** (q0005)	**No differences found** across all 7 questions asked.
13. **Location where the core of innovation is developed - locally or foreign** (q0006_0001)	**No differences found** across all 7 questions asked.

Table 83 – Summary of ANOVA one-way tests for all demographics and interorganizational relationships negatives (and IOR-)

[22] Participants have responded to questions on a 7-point Likert scale.
[23] There exists at least one group mean different to another group mean.

Post-hoc tests were executed for questions for which statistically significant differences $p < .05$ were indicated to understand demographic groups and categories between which these differences existed.

4.2.15.1.1 GENDER AND IOR- (AFA III PHASE)

Gender group (demographics independent variable) was tested with dependent variables of IOR- for group variances. Gender was classified in two categories: 1) Male and 2) Female. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following 3 questions (out of 7 questions tested):

i. Question (q0020_003): "*Openly share Intellectual Property in my partnerships*", results from ANOVA test: $F(1, 143) = 6.44$, $p = .012$
ii. Question (q0020_004): "*Avoid engaging with partners who had a history of being involved in damaging relationships*", results from ANOVA test: $F(1, 143) = 5.15$, $p = .025$
iii. Question (q0020_005): "*Trust partners freely from the start of a relationship*", results from ANOVA test: $F(1, 143) = 4.09$, $p = .045$

Means for all questions indicate that female participants show somewhat lower agreement with the stated (see data in Appendix XII – Means for IOR+ and IOR- Measures). Understanding this difference between gender groups requires further analysis.

4.2.15.1.2 INNOVATION EXPERIENCE AND IOR- (AFA III PHASE)

Participants' innovation experience (independent variable) was tested with dependent variables of IOR- for group variances. Innovation experience group was classified in 6 categories as follows: 1) < 1 year, 2) 1-5 years, 3) 6-10 years, 4) 11-15 years, 5) 16-20 years and 6) > 20 years of innovation experience. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following single questions (out of 7 tested):

i. Question (q0020_001): "*Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships*", results from ANOVA test: $F(5, 139) = 4.61$, $p = .001$

Post-hoc (Tukey) analysis for this question has indicated differences between the groups of < 1 year of innovation experience, 6-10 years of innovation experience and > 20 years of innovation experience, as outlined in the Table 84.

Question: Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships (q0020_001)
Demographic: Innovation experience

Difference between the group	and groups	Post hoc sig.
16-20 years of innovation experience	< 1 year of innovation experience	*p* = .013
	6-10 years of innovation experience	*p* = .005
	> 20 years of innovation experience	*p* = .001

Table 84 – Post-hoc test showing variance between innovation experience groups (q0015), and making decisions based on intuition (q0020_001)

Means analysis from this research indicate that as innovation experience increases, opinion that making decisions based on the gut feeling is negatively influencing innovation outcomes is also growing (see data in Appendix XII – Means for IOR+ and IOR- Measures). Understanding the difference between participants with various number of innovation experience years and making decisions based on gut feeling without due diligence in partnerships requires further research.

4.2.15.1.3 COMPANY AGE AND IOR- (AFA III PHASE)

Participants' company age (independent variable) was tested with dependent variables of IOR- measure for group variances. Company age group was classified in 3 age categories as follows: 1) < 5 years, 2) 6-15 years, and > 16 years in existence. ANOVA one-way test has indicated statistically significant ($p < .05$) differences between categories of the demographic group tested for the following single questions (out of 7 tested):

i. Question (q0020_002): "*Allow partners to make decisions independently without my influence*", results from ANOVA test: $F(2, 142) = 7.84$, $p = .001$

Post-hoc (Tukey) analysis for this question has indicated differences between the groups of companies with less than < 5 years in existence and 6-15 years in existence, see Table 85.

Question: Allow partners to make decisions independently without my influence (q0020_002)		
Demographic: Company age		
Difference between the group	**and groups**	**Post hoc sig.**
6-15 years in existence	< 5 years in existence	*p* = .016
	> 16 years in existence	*p* = .001

Table 85 – Post-hoc test showing variance between company age groups (q0009), and allowing partners to make decisions independently (q0020_002)

Means analysis indicates that companies with 6-15 years in existence differ from the other groups in agreeing that not allowing partners to make decisions independently might negatively influence innovation outcomes (see data in Appendix XII – Means for IOR+ and IOR- Measures). Understanding of company age (years in existence) and allowing partners to make decision independently without influence requires further research.

4.2.16 Summary of Scales Stability (AFA III phase)

Findings indicate that for demographics variables: participant age, company's primary activity, company ownership (local vs. foreign) and participant's country of residence, no statistically significant differences were found for any of the four measures (KT+, KT-, IOR+ and IOR-).

Summary of findings of differences between demographic groups (ANOVA one-way statistical tests) for the measure of knowledge transfer measure (KT+ and KT-) are provided in Table 86.

KT+ measure stability
Difference found for only 3 questions out of 91 question combinations. Total tested: 13 demographics variables x 7 questions for the measure = 91 question combinations. Out of these, statistically significant difference was wound only for 2 demographics variables: • Innovation experience – difference found for 2 questions out of 7 • Location innovation development – difference found for 1 question out of 7
KT- measure stability
Difference found for only 2 questions out of 91 question combinations. Total tested: 13 demographics variables x 7 questions for the measure = 91 question combinations. Out of these, statistically significant difference was wound only for 2 demographics variables: • Education level – difference found for 1 question out of 7 • Company size – difference found for 1 question out of 7

Table 86 – Summary of ANOVA analysis of differences between demographic groups and KT+ and KT- measures

As there existed differences for only 3 questions out 91 question combinations possible for KT+ measure (13 demographics variables x 7 questions), and as there existed differences for only 2 questions out of 91 questions possible for KT- measure, this indicates minor differences found and provides support that overall measure of knowledge transfer seems stable.

Summary of findings of differences between demographic groups (ANOVA one-way statistical tests) for the measure of interorganizational relationships (IOR+ and IOR-) are provided in Table 87.

IOR+ measure stability
Difference found for only 13 questions out of 117 question combinations. Total tested: 13 demographics variables x 9 questions for the measure = 117 question combinations. Out of these, statistically significant difference was wound for these demographic variables: • Gender – difference found for 1 question out of 9 • Education level – difference found for 3 questions out of 9 • Job - position – difference found for 3 questions out of 9 • Professional experience – difference found for 2 questions out of 9 • Innovation experience – difference found for 1 question out of 9 • Organization's country of residence – difference found for 1 question out of 9 • Location innovation core was developed – difference found for 2 questions out of 9
IOR- measure stability
Difference found for only 5 questions out of 91 question combinations. Total tested: 13 demographics variables x 7 questions for the measure = 91 question combinations. Out of these, statistically significant difference was wound only for 3 demographic variables: • Gender – difference found only for 3 questions out of 7 • Innovation experience – difference found only for 1 question out of 7 • Company age – difference found only for 1 question out of 7

Table 87 – Summary of ANOVA analysis of differences between demographic groups and IOR+ and IOR- measures

As there existed differences for only 13 questions out 117 question combinations possible for IOR+ measure (13 demographics variables x 9 questions), and as there existed differences for only 5 questions out of 91 questions possible for KT- measure (13 demographics variables x 7 questions), this indicates minor differences found and provides support that overall measure of interorganizational relationships seems stable.

Analysis of differences between demographic groups and measures of KT and IOR seem to provide support that scales (KT+, KT-, IOR+, and IOR-) developed in AFA II phase and tested in AFA III phase seem to be stable measures. This indicates that scales developed might be used to measure influence of knowledge transfer and interorganizational relationships to innovation outcomes regardless of demographics such are age, employee position, company size, country of residence, etc. This addresses the overall aim of this research to develop scales to understand impact of knowledge transfer and interorganizational relationships to innovation outcomes.

4.3 Correlations Between KT and IOR

Analysis of correlations between the four measures (KT+, KT-, IOR+, and IOR-) addresses the research objective of understanding relationships between IOR and KT. For the purpose of this analysis two statistical tests were performed. The first test analyses correlations between all four components of the scales KT+, KT-, IOR+ and IOR- to indicate existence of correlations within the overall scale. The second test analyses correlations between positive and negative components of each measure, that is existence of correlations between KT+ and KT-, and between IOR+ and IOR- to indicate if negative variables of each measure are a mirror of positive variables of the measure.

Statistical test on correlations between all four components of the measure (KT+, KT-, IOR+ and IOR-) indicate there exist a significant positive correlation between positive measures of KT+ and IOR+ (r = .531), and a significant positive correlation between negative measures of KT- and IOR- (r = .443), as shown in Table 88.

Correlations between KT and IOR (the overall scale)

		KT+	KT-	IOR+	IOR-
KT+	Pearson Correlation	1	-.037	.531**	.027
	Sig. (2-tailed)		.659	.000	.746
	N	145	145	145	145
KT-	Pearson Correlation	-.037	1	.049	.443**
	Sig. (2-tailed)	.659		.559	.000
	N	145	145	145	145
IOR+	Pearson Correlation	.531**	.049	1	.084
	Sig. (2-tailed)	.000	.559		.313
	N	145	145	145	145
IOR-	Pearson Correlation	.027	.443**	.084	1
	Sig. (2-tailed)	.746	.000	.313	
	N	145	145	145	145

**. Correlation is highly significant at the 0.01 level (2-tailed).

Table 88 – Correlations between knowledge transfer and interorganizational relationships variables

Positive correlation between KT+ and IOR+ indicates a positive influence of knowledge transfer to interorganizational relationship and vice versa. This finding is supportive of indication that positive interorganizational relationships seem to have a positive influence on knowledge transfer. On the other hand, positive correlation between KT- and IOR- indicates a finding that negative interorganizational relationships seem to negatively influence knowledge transfer.

Significant correlations between KT and IOR found provide further support to the overall objective of this thesis on the need to address the knowledge gap on understanding impact of KT and IOR to innovation outcomes. It seems that KT and IOR are strongly linked in their support and non-support to innovation outcomes.

Statistical test on correlations between positive and negative components of KT measure indicate there exist no significant correlations (> .3) between KT+ and KT-, as shown in Table 89. All correlations in the range .00 - .30 are considered as negligible (Hinkle *et al.*, 2003). This finding indicates that variables measuring negative component KT- do not seem to be a mirror of positive component of KT+, as if that were the case, there would have existed a strong negative correlation between negative and positive measures of KT. This finding indicates that positive measure KT+ independent from the negative measure KT-.

Correlations between positive and negative measures KT+ and KT-

	(KT-) Document knowledge verbally sourced from external parties	(KT-) Strive to have a good quality of recorded knowledge (i.e. documentation)	(KT-) Strive to spend as little time as possible in meetings	(KT-) Source knowledge from multiple sources	(KT-) Take market conditions into consideration	(KT-) Create a plan for the type of knowledge I needed to acquire	(KT-) Attempt to understand the type of knowledge that I needed to acquire
(KT+) Seek to understand the way customers use my products and/or services	-.075	-.045	-.056	.080	.028	-.030	.039
(KT+) Have flexibility in discovering new knowledge useful to my innovation	-.151	-.040	.118	-.019	.043	.055	.005
(KT+) Learn from customers in order to develop my innovation	-.010	.027	-.104	-.038	.050	.057	-.016
(KT+) Actively combine multiple sources of knowledge to acquire new knowledge	-.026	-.041	.032	.029	-.036	-.028	-.001
(KT+) Use rich communication media (e.g., video, presentation, animations) that were not text-only	-.032	-.028	-.131	-.068	-.083	-.083	-.126
(KT+) Proactively apply the new knowledge acquired	-.122	-.154	-.040	.000	-.126	-.131	-.100
(KT+) Use IT infrastructure for knowledge management activities	.057	-.040	.117	.060	.048	.038	.072

Table 89 – Correlations between positive and negative measures KT+ and KT-

Statistical test on correlations between positive and negative components of IOR measure indicate there exist no significant correlations (> .3) between IOR+ and IOR-, as shown in Table 90. All correlations in the range .00-.30 are considered as negligible (Hinkle *et al.*, 2003). This finding indicates that variables measuring negative component IOR- do not seem to be a mirror of positive component of IOR+, as if that were the case, there would have existed a strong negative correlation between negative and positive measures of IOR. This finding therefore indicates that positive measure IOR+ is independent from the negative measure IOR-.

Correlations between positive and negative measures IOR+ and IOR-

	(IOR-) Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships	(IOR-) Allow partners to make decisions independently without my influence	(IOR-) Openly share Intellectual Property in my partnerships	(IOR-) Avoid engaging with partners who had a history of being involved in damaging relationships	(IOR-) Trust partners freely from the start of a relationship	(IOR-) Avoid making judgements on my partner relationships based on what my partners said to me	(IOR-) Allow partners to make an independent decision on forming a relationship without me forcing them into it
(IOR+) Take responsibility for my own actions in my partnerships	.161	.051	.046	.110	-.076	.059	.089
(IOR+) Make myself open to learn from my partner's cultural specificities	.125	.051	-.048	.178	-.048	.042	.114
(IOR+) Build a good reputation as a trustworthy partner to others	.070	.072	-.014	.040	.015	.124	.154
(IOR+) Recognize my partner's work as valuable	.107	.049	-.041	.054	-.062	.109	.067
(IOR+) Honour my partnership commitments	.038	-.060	-.116	-.081	-.142	.056	-.049
(IOR+) Need to believe that I was dealing with a trustworthy partner	.129	.019	-.064	.157	.048	.129	.147
(IOR+) Need to believe that I was dealing with a reliable partner	.038	.017	-.056	.066	-.012	.132	.043
(IOR+) Have transparent communication	.125	.007	-.113	.002	-.083	-.034	.078
(IOR+) Have clear expectations of my partner responsibilities	.211	.063	-.056	.046	.071	.138	.052

Table 90 – Correlations between positive and negative measures KT+ and KT-

Non-existence of significant correlations between positive and negative measures KT+ and KT-, and between positive and negative measures IOR+ and IOR- supports the duality nature of measures influencing innovation outcome. This indicates that factors positively influencing innovation outcome can co-exist in parallel with factors negatively influencing innovation outcome. This finding provides novel insights in the area of innovation research.

4.4 Measures of KT and IOR to Innovation Outcome

This section summarizes findings disclosed in this chapter on developed measures of KT+, KT-, IOR+ and IOR- being the main aim of this study. Measures of KT and IOR to innovation outcome are summarized in Table 91 with indication of correlations found and discussed in the previous section.

KT+ measure

Component	Statements to evaluate on Likert scale
Knowledge management	• Actively combine multiple sources of knowledge to acquire new knowledge • Use IT infrastructure for knowledge management activities • Use rich communication media (e.g., video, presentation, animations) that were not text-only • Proactively apply the new knowledge acquired
Customer market research	• Learn from customers in order to develop my innovation • Seek to understand the way customers use my products and/or services • Have flexibility in discovering new knowledge useful to my innovation

Positive correlation KT+ IOR+

IOR+ measure

Component	Statements to evaluate on Likert scale
What partners do for us	• Need to believe that I was dealing with a trustworthy partner • Need to believe that I was dealing with a reliable partner • Have transparent communication • Have clear expectations of my partner responsibilities • Recognize my partner's work as valuable
What do we do for partners	• Build a good reputation as a trustworthy partner to others • Honour my partnership commitments • Take responsibility for my own actions in my partnerships • Make myself open to learn from my partner’s cultural specificities

No correlation KT+ KT-

No correlation IOR+ IOR-

KT- measure

Component	Statements to evaluate on Likert scale
Knowledge mismanagement	• (do not) Source knowledge from multiple sources • (do not) Strive to spend as little time as possible in meetings • (do not) Attempt to understand the type of knowledge that I needed to acquire • (do not) Create a plan for the type of knowledge I needed to acquire • (do not) Take market conditions into consideration • (do not) Document knowledge verbally sourced from external parties • (do not) Strive to have a good quality of recorded knowledge (i.e. documentation)

Positive correlation KT- IOR-

IOR- measure

Component	Statements to evaluate on Likert scale
Mismanaged trust and openness	• (do not) Avoid engaging with partners who had a history of being involved in damaging relationships • (do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it • (do not) Openly share Intellectual Property in my partnerships • (do not) Trust partners freely from the start of a relationship • (do not) Avoid making judgements on my partner relationships based on what my partners said to me
Mismanaged decision- making	• (do not) Make decisions based on ‘gut’ feeling (intuition) without due diligence in my partnerships • (do not) Allow partners to make decisions independently without my influence

Table 91 - Measures of KT and IOR and their correlations

The scales to measure influence of KT and IOR to innovation outcome are provided in Table 92. The scales developed are the main aim of this study. Academics and practitioners are advised to perform measurements by **asking participants to agree or disagree** with each of the **behavioural statements** on a **7-point Likert scale**.

KT+ measure

Use this scale to **measure positive influence of KT to innovation outcomes.**

Answer the following: Thinking back about my innovation activities on knowledge transfer with others that were SUPPORTIVE of my innovation: I DID ….

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
1. Seek to understand the way customers use my products and/or services	○	○	○	○	○	○	○
2. Have flexibility in discovering new knowledge useful to my innovation	○	○	○	○	○	○	○
3. Learn from customers in order to develop my innovation	○	○	○	○	○	○	○
4. Use rich communication media (e.g., video, presentation, animations) that were not text-only	○	○	○	○	○	○	○
5. Actively combine multiple sources of knowledge to acquire new knowledge	○	○	○	○	○	○	○
6. Proactively apply the new knowledge acquired	○	○	○	○	○	○	○
7. Use IT infrastructure for knowledge management activities	○	○	○	○	○	○	○

KT- measure

Use this scale to **measure negative influence of KT to innovation outcomes.**

Answer the following: Thinking back about my innovation activities on knowledge transfer with others that were NOT SUPPORTIVE of my innovation: I DID NOT …

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
1. Document knowledge verbally sourced from external parties	○	○	○	○	○	○	○
2. Strive to have a good quality of recorded knowledge (i.e., documentation)	○	○	○	○	○	○	○
3. Strive to spend as little time as possible in meetings	○	○	○	○	○	○	○
4. Take market conditions into consideration	○	○	○	○	○	○	○
5. Source knowledge from multiple sources	○	○	○	○	○	○	○
6. Create a plan for the type of knowledge I needed to acquire	○	○	○	○	○	○	○
7. Attempt to understand the type of knowledge that I needed to acquire	○	○	○	○	○	○	○

IOR+ measure

Use this scale to **measure positive influence of IORs to innovation outcomes.**

Answer the following: Thinking back about my innovation activities in cooperating with others that were SUPPORTIVE of my innovation: I DID ….

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
1. Take responsibility for my own actions in my partnerships	○	○	○	○	○	○	○
2. Make myself open to learn from my partner's cultural specificities	○	○	○	○	○	○	○
3. Build a good reputation as a trustworthy partner to others	○	○	○	○	○	○	○
4. Honour my partnership commitments	○	○	○	○	○	○	○
5. Need to believe that I was dealing with a trustworthy partner	○	○	○	○	○	○	○
6. Recognize my partner's work as valuable	○	○	○	○	○	○	○
7. Need to believe that I was dealing with a reliable partner	○	○	○	○	○	○	○
8. Have transparent communication	○	○	○	○	○	○	○
9. Have clear expectations of my partner responsibilities	○	○	○	○	○	○	○

IOR- measure

Use this scale to **measure negative influence of IORs to innovation outcomes.**

Answer the following: Thinking back about my innovation activities in cooperating with others that were NOT SUPPORTIVE of my innovation: I DID NOT ….

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
1. Take responsibility for my own actions in my partnerships	○	○	○	○	○	○	○
2. Make myself open to learn from my partner's cultural specificities	○	○	○	○	○	○	○
3. Build a good reputation as a trustworthy partner to others	○	○	○	○	○	○	○
4. Honour my partnership commitments	○	○	○	○	○	○	○
5. Need to believe that I was dealing with a trustworthy partner	○	○	○	○	○	○	○
6. Recognize my partner's work as valuable	○	○	○	○	○	○	○
7. Need to believe that I was dealing with a reliable partner	○	○	○	○	○	○	○

Table 92 - Measures of KT and IOR to Innovation Outcomes

4.5 Summary

Chapter IV of this study has disclosed findings from the three phases AFA I, II and III of the field research used to develop, test and validate measures of KT and IOR. Developing measures was the overall aim of this research required to understand impact of knowledge transfer and interorganizational relationships to innovation outcomes, and to close the existing knowledge gap in this area.

Measure was developed through AFA I and AFA II phases and tested in AFA III phase. In the first AFA I phase participants (N=30) have nominated *n*=139 behavioural acts believed to positively and negatively influence innovation outcome. In the second AFA II phase participants (N=60) have rated the nominated behavioural acts on a 7-point Likert scale for prototypicality ratings – the participants' degree of agreement or disagreement to a question, resulting in coming down to *n*=30 highest rated behavioural acts for the measures. In the third AFA III phase of the field research measures were tested on a larger sample of participants (N=145) across 11 countries of SEE.

Findings from statistical analysis in AFA III phase (based on PCA, Cronbach alpha and ANOVA statistical tests) indicate scales seem to be reliable and stable in measuring knowledge transfers positive (KT+), knowledge transfer negative (KT-), interorganizational relationships positive (IOR+) and interorganizational relationships negative (IOR-) behaviours influencing innovation outcomes. This addresses the overall aim of this research to develop scales to understand impact of knowledge transfer and interorganizational relationships to innovation outcomes.

The chapter uncovers there also exists a strong correlation between positive measures KT+ and IOR+, and a strong correlation between measures KT- and IOR- supporting importance of understanding influence of KT and IOR to innovation outcome. This addresses the research objective of understanding impact of KT and IOR to innovation outcomes.

Findings presented in this chapter are discussed and reflected upon existing knowledge and knowledge gaps uncovered by this research in the final chapter of this study Chapter V – Conclusions.

5 INTRODUCTION

This chapter focuses on how each of the research objectives presented in the first chapter was addressed through this research as contribution of the study. To reiterate, the overall aim of this research was to develop scales to understand impact of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes. This chapter connects academic knowledge presented in chapter two with findings of the field research presented in chapter four, and it provides discussion on new knowledge and further research opportunities as an outcome of this study on understanding influence of KT and IOR to innovation outcomes. Practical and theoretical implications of new knowledge for both academics and practitioners in helping facilitate models of innovation effectiveness are discussed. Research limitations are discussed. The chapter is concluded with final remarks and unique contributions of this study.

5.1 ADDRESSING THE RESEARCH OBJECTIVES

Research objectives with the aim to contribute addressing identified knowledge gaps disclosed in the Chapter I - Introduction of this thesis are listed in Table 93 showing how each of these research objectives was addressed and contribution delivered through this research.

Research objectives	How was it addressed
i. Explore concepts of KT and IOR through innovation outcomes	• Concepts of KT and IOR were explored through qualitative study in AFA I phase of the field research. Interviews with participants have revealed concepts of KT and IOR to innovation outcomes through the eyes of those people who have already gone through the innovation process and have gained valuable experience. This is also how the sample was vetted to include only participants with practical experience innovating in IT companies in SEE. • Outcome of this exploration were nominated behavioural acts describing concepts of KT and IOR presented in Chapter IV - Findings.
ii. Develop KT and IOR scales based on innovation outcomes	• Developing scales to understand impact of KT and IOR to innovation outcomes was the overall aim of this research sought to bridge identified gaps in academic knowledge. Scales were developed based on AFA methodology devised in Chapter III – Methodology. • Development of scale was completed through AFA II phase of the field research through building participants' consensus on

	behavioural acts of KT and IOR that were the highest rated for their positive and negative influence to innovation outcomes. • Outcome of this activity are scales developed and presented in Chapter IV - Findings.
iii. Test the validity and reliability of the KT and IOR scales developed	• Scales were tested for validity, stability and reliability in a larger quantitative study across eleven countries of SEE in the final AFA III phase of the field research. Testing of scales was performed using statistical tests to identify principal components (PCA) of measures, internal consistency of measures (Cronbach alpha), and analysis of variance (ANOVA) between demographics groups. • Outcome of these activities are scales developed to measure KT+, KT-, IOR+ and IOR- presented in Chapter IV - Findings.
iv. **Analyse relationships between KT and IOR to innovation outcome, and in accordance with the research gaps identified**	• Relationships between KT and IOR to innovation outcome were analysed with statistical tests. These have indicated there exist highly significant positive correlations between measures of KT+ and IOR+, and between KT- and IOR- further supporting importance of understanding their joint impact to innovation outcomes. • Outcome of this activity are correlations identified and presented in Chapter IV - Findings.
v. Understand individual behaviours in organizations to help facilitate models of innovation effectiveness	• Developed scales help measure internal dynamics of KT and IOR to innovation outcome due to which the scales could be used in helping facilitate models of innovation effectiveness. • Theoretical implications of scales developed to enhance models of innovation are discussed in this Chapter V – Conclusions.

Table 93 – Research objectives and how they were addressed in this thesis

Discussion in this chapter will address the following objectives in relationship to the academic knowledge:

- **Development of KT and IOR scales based on innovation outcomes**
- **Analyse relationships between KT and IOR to innovation outcomes**
- **Help facilitate models of innovation effectiveness**

5.1.1 DISCUSSION ON DEVELOPED SCALES OF KT AND IOR TO INNOVATION OUTCOMES

Developing scales to understand impact of KT and IOR to innovation outcomes was the overall aim of this research sought to bridge identified gaps in academic knowledge. Scales were developed based on the AFA methodology devised in chapter three given the lack of existing or comparable measures. This included development of measures based on building participants' consensus on behavioural acts of KT and IOR in phase II of the AFA that were the highest rated for their positive and negative influence on innovation outcomes. The scales built consist of mapping the area of KT and IOR through four measures, positive and negative behavioural acts of KT and IOR to innovation outcome. These measures are: KT+, KT-, IOR+ and IOR-.

AFA methodology applied in this research as an exploratory methodology is heavily qualitative until its final quantitative stages (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Reif, 2012; Schimmack, 2010; Tucker and Turner, 2010; Cinite *et al.*, 2009). As such, each of the identified measures (KT+, KT-, IOR+, IOR-) is discussed qualitatively in this section and in reference to the existing literature, or lack thereof. The non-goal of this study was to test the scales using confirmatory methodologies relying strongly on quantitative methodologies. Validating scales developed using confirmatory methodologies is noted as a future research opportunity.

Findings indicate there exist no significant correlations between the positive (KT+) and negative (KT-) measures of knowledge transfer, and that these two measures are NOT mirrored one to another. Findings also indicate there exist no significant correlations between the positive (IOR+) and negative (IOR-) measures of interorganizational relationships, and that these two measures are NOT mirrored one to another. Taking into consideration that KT+ and KT- are not mirrored to each other, and that IOR+ and IOR- are also not mirrored to each other, each of these measures will be discussed individually in the next section. Explanation of why these measure pairs are not mirrored to each other could perhaps be explained with novel finding of this research on duality nature of KT and IOR measures. This is because findings indicate that positive measures KT+ and IOR+ have strong positive correlations, as well as negative measures KT- and IOR- also having strong negative correlations and are co-existing in parallel. Duality nature of KT and IOR is discussed following the general discussion of individual measures KT+, KT-, IOR+ and IOR-.

5.1.1.1 KT+ Measure discussion

Developed measure of KT+ (positive influence of knowledge transfer) through this research consists of two principal components of behaviours positively influencing innovation outcome:

1. **Knowledge management** principal component of KT+ measure was developed based on participants consensus from their experiences that the following knowledge management behaviours are SUPPORTIVE to innovation, as such participants DID:

- Actively combine multiple sources of knowledge to acquire new knowledge
- Use IT infrastructure for knowledge management activities.
- Use rich communication media (e.g., video, presentation, animations) that were not text-only
- Proactively apply the new knowledge acquired

2. **Customer market research** principal component of KT+ measure was developed based on participants consensus from their experiences that the following knowledge management behaviours are SUPPORTIVE to innovation, as such participants DID:

- Learn from customers in order to develop my innovation
- Seek to understand the way customers use my products and/or services
- Have flexibility in discovering new knowledge useful to my innovation.

For the purpose of theoretical discussion, behaviours making the measures (1^{st} order concepts), as analysed in AFA I qualitative phase of this research, are aggregated as per Gioa *et al.* (2013) in higher 2^{nd} order items and have been linked with components of the measures developed and tested in the final AFA III phase of this research, shown in Table 94. This approach helps construct data structure connecting the qualitative data into concepts, themes and dimensions that could be mapped to the existing literature to help identify new concepts (Gioa *et al.*, 2013).

Knowledge Transfer positive behavioural acts (KT+)			
Behavioural acts of KT+ measure (1st order concepts)	**2nd order themes (AFA I)**	**Aggregate dimensions (AFA II)**	**Measure components (AFA III)**
Actively combine multiple sources of knowledge to acquire new knowledge	Combining and recombining knowledge	Applying and using knowledge	**Knowledge management**
Use IT infrastructure for knowledge management activities	Document and manage knowledge		
Use rich communication media (i.e., video, presentation, animations) that were not text-only			
Proactively apply the new knowledge acquired	Disseminate knowledge		
Learn from customers in order to develop my innovation	Customer market research	Sourcing knowledge	**Customer market research**
Seek to understand the way customers use my products and/or services			
Have flexibility in discovering new knowledge useful to my innovation	Being flexible in acquiring knowledge	Knowledge transfer	

Table 94 – Measure of KT+ developed

Immediate observation of KT+ measure seems to indicate that both components "knowledge management" and "customer market research" of the KT+ measure are aligned with the two main drivers of process-view theory of innovation being: knowledge and resources as internal drivers, and market opportunity as external drivers of innovation (Dervitsiotis, 2010; Desouza *et al.*, 2009; Fallah and Lechler, 2008; Hansen and Birkinshaw, 2007). This provides a strong indication that identified individual behaviours measuring constructs of knowledge management and customer market research provide positive support to innovation outcomes.

For the purposes of theoretical discussion, KT+ measure distinct aggregate dimensions are the following three high level concepts positively influencing innovation outcomes:

- Sourcing knowledge
- Knowledge transfer
- Applying and using knowledge

It seems that KT+ measure captures the "full cycle" of effective interorganizational knowledge transfer process – from sourcing knowledge from as wide possible sources, to transferring that knowledge from provider into recipient organization, and finally using the knowledge in the recipient organization for purpose of developing innovation.

The purpose of organizations forming interorganizational relationships is to extend their sources of knowledge and access to resources (Lee *et al.*, 2019). Sourcing knowledge from external organizations, that is access to a broader knowledgebase through interorganizational knowledge transfer enables learning from experiences of other organizations and provides new knowledge that previously was not available (Wang and Lam, 2019; Kim *et al.*, 2016; Dolińska, 2015; Hohberger *et al.*, 2015; Chen *et al.*, 2014). Fundamental aspect of innovation is in "making novel linkages and associations" in knowledge creation and further extending such linkages to transcend boundaries of a single organization (Kim *et al.*, 2016). In enabling successful innovation, KT+ measure indicates that customer market research seems to be perhaps the most important source of knowledge. In particular, learning how customers are using product and services.

Customers learning from customers for development of innovative products are practicing market-based view of innovation (Albats *et al.*, 2019; Chang *et al.*, 2014; Ford and Paladino, 2013). Practicing market-based view of innovation also denotes exploratory nature of innovation activities. In addition, KT+ measure seems to indicate that organizations need to be flexible in discovering new knowledge, sometimes even from unexpected sources, as a true nature of exploration. Companies who practice exploratory discovery of knowledge are found to likely produce novel products (Madsen *et al.*, 2010). Academic knowledge provides indication of a strong correlation between organizational flexibility and innovation performance (Bishwas, 2015; Fallah and Lechler, 2008).

This view helps understand market (customer) demand for products and services. Software companies in particular, due to the help of technology and especially web technology and Internet are exploiting the ways to understand how customer are using products and services (Saldanha, 2017). Sometimes this could be electronics data sampling on how customers are using certain products, or perhaps could denote active customer participation in product co-development. Research indicates that through active role of customer co-development results in accelerated pace of innovation development (Maria-Stock and Zacharias, 2017; Saldanha, 2017). This certainly seems to be theme of internet, modern and agile software IT companies. On the other hand, research also suggest that growth with customer co-development of innovative products is not infinite and that it is effective only to a certain point (Maria-Stock and Zacharias, 2017; Knudsen, 2007).

Using IT infrastructure to help as a knowledge of transferring knowledge, but also for managing and suing knowledge seems also positively influence transfer of knowledge regardless of the tacitness of the knowledge (Ciabuschi *et al.*, 2011; Wu, 2010). This is perhaps because information technology can enable a large spectrum of communication channels of different richness (Windsperger and Gorovaia, 2010; Wu, 2010), and it positively supports knowledge transfer regardless if the knowledge is being transferred peer to peer, or through a knowledge broker (Ciabuschi *et al.*, 2011). Using rich communication media for knowledge transfer denotes more complex communication capabilities: transferring audio and video, ability to use multiple languages, providing two-way feedback, including capabilities for both personal and business communication. Rich communication media also provides feedback loop on information receipt resulting in improved knowledge dissemination capabilities. Richness of information and its redundancy (repetitiveness) transmitted through KT is responsible for establishing of trust in a team (Jarle Gressgård, 2011), being strongly supportive of interorganizational knowledge transfer. Using rich communication media also helps reduce ambiguity in knowledge transfer, therefore enhances the performance of knowledge transfer (Windsperger and Gorovaia, 2010) and it seems fundamental to fostering novel product development (Jarle Gressgård, 2011).

Proactively applying new knowledge acquired for the benefit of innovation is aligned with the view that organizations who are better in realized knowledge absorption capacity are better in innovation, as they are more successful exploiting acquired knowledge into product and services (Khosravi *et al.*, 2019; Camison and Villar-Lopez, 2014; Shaker and Gerard, 2002). Researchers distinguish between potential and realized knowledge absorption capacity. The main premise of this theory is that not all knowledge absorbed in the organization through the process of acquisition and assimilation will actually be useful and exploited for the benefit of the organization. Potential absorption capacity represents the ability to acquire and assimilate knowledge, whereas realized capacity represents transformation and exploitation of knowledge applied to innovation development (Kim *et al.*, 2016). In addition, for knowledge transfer to be considered successful, the recipient organization needs to utilize the knowledge received for its benefit, otherwise the knowledge transfer cannot be considered as successful (Van Wijk *et al.*, 2008). Information technology can also help with both content and collaborative knowledge management in organizations (Alavi *et al.*, 2005). Using IT infrastructure seems to support organization's knowledge absorption capacity and speed of absorption, in turn influencing innovation performance (Burkhart and Piller, 2010; Madsen *et al.*, 2010; Lichtenthaler *et al.*, 2010). The above suggests a strong theoretical support that KT+ measure on sourcing knowledge, knowledge transfer and applying new knowledge for development of innovation are all positively influencing innovation outcome, therefore providing theoretical support to validity of the measure.

Sourcing knowledge from multiple sources seems to influence more successful creation of new knowledge, and therefore positively influence innovation performance (Phelps, 2010; Bergman and Maier, 2009; Van Wijk *et al.*, 2008; Owen and Powell, 2003; Moore, 1993). Interorganizational knowledge transfer is found to contribute to innovation performance, whereas intra-organizational knowledge transfer was found to contribute to organizational performance (Van Wijk *et al.*, 2008). This suggests that measuring if companies are combining multiple sources of knowledge and in particular between organizations for innovation through KT+ seems to provide support this is a positive measure of knowledge transfer and innovation performance.

For the purpose of further discussion, the market research component of KT+ seems to suggest an orientation toward the marked based view of innovation (Albats *et al.*, 2019; Ford and Paladino, 2013; Paladino, 2007). Organizations in which innovation is driven by market opportunities are more likely to enhance existing products (i.e. practice incremental innovation) and as such focus on increasing the customer value (Ford and Paladino, 2013; Chang *et al.*, 2014; Nylund, 2008), although this is not exclusive as pursuing market opportunities could also result in radical innovation (Chang *et al.*, 2014). This research has found examples of globally novel innovation produced by software companies in SEE. In AFA I phase of the field research, qualitative findings indicate that 63% of participants adopted an existing innovation to their country, whereas 37% of participants have indicated they produced globally novel innovation originating in SEE (see AFA I demographics section of Chapter IV - Findings). Furthermore, variable of KT+ measuring "having flexibility in discovering new knowledge" denotes exploratory approach to innovation in discovering new knowledge (Lee *et al.*, 2019), and exploratory discovery of knowledge positively supports globally novel innovation developments versus adoption and imitation (Madsen *et al.*, 2010). This suggests alignment with Chang *et al.* (2014) arguing that market-based approach to innovation might be supportive of both incremental product improvements and novel product development innovation. This view is in line with researchers arguing that interorganizational relationships (Lavie *et al.*, 2010) and organizational innovation activities (Lee *et al.*, 2019) combining both co-exploration (e.g. joint innovation activities) and co-exploitation (e.g. licensing, alliances, buyer-supplier relationship et sim.) activities at the same time achieve better innovation performance. This indicates importance to observe both exploration and exploitation of interorganizational relationships and innovation activities as ambidextrous (Lee *et al.*, 2019; Ford and Paladino, 2013). Understanding these aspects requires further investigation and research.

5.1.1.2 KT- Measure Discussion

Developed measure of KT- (negative influence of knowledge transfer) through this research consists of a single principal component of behaviours negatively influencing innovation outcome:

1. Knowledge management principal component of KT+ measure was developed based on participants consensus from their experiences that the following knowledge management behaviours are NOT SUPPORTIVE to innovation, as such participants DID NOT:

- Source knowledge from multiple sources
- Strive to spend as little time as possible in meetings
- Attempt to understand the type of knowledge that I needed to acquire
- Create a plan for the type of knowledge I needed to acquire
- Take market conditions into consideration
- Document knowledge verbally sourced from external parties
- Strive to have a good quality of recorded knowledge (i.e. documentation)

For the purpose of theoretical discussion, behaviours making the measures (1^{st} order concepts), as analysed in AFA I qualitative phase of this research, are aggregated as per Gioa *et al.* (2013) in higher 2^{nd} order items and have been linked with components of the measures developed and tested in the final AFA III phase of this research, shown in Table 95. This approach helps construct data structure connecting the qualitative data into concepts, themes and dimensions that could be mapped to the existing literature to help identify new concepts (Gioa *et al.*, 2013).

<table>
<tr><th colspan="4">Knowledge Transfer negative behavioural acts (KT-)</th></tr>
<tr><th>Behavioural acts of KT- measure (1^{st} order concepts)</th><th>2^{nd} order themes (AFA I)</th><th>Aggregate dimensions (AFA II)</th><th>Measure components (AFA III)</th></tr>
<tr><td>(do not) Source knowledge from multiple sources</td><td>Inefficiencies in sourcing knowledge from multiple sources</td><td rowspan="2">Issues with knowledge transfer</td><td rowspan="7">Knowledge mismanagement</td></tr>
<tr><td>(do not) Strive to spend as little time as possible in meetings</td><td>Blockers to knowledge transfer</td></tr>
<tr><td>(do not) Attempt to understand the type of knowledge that I needed to acquire</td><td>Inefficiencies in knowledge absorption capacity</td><td>Issues with knowledge absorption capacity</td></tr>
<tr><td>(do not) Create a plan for the type of knowledge I needed to acquire</td><td>Inefficiencies in knowledge acquisition planning</td><td rowspan="2">Issues with sourcing knowledge</td></tr>
<tr><td>(do not) Take market conditions into consideration</td><td>Inefficiencies in market research</td></tr>
<tr><td>(do not) Document knowledge verbally sourced from external parties</td><td rowspan="2">Inefficiencies in documenting knowledge acquired</td><td rowspan="2">Issues with managing and using knowledge</td></tr>
<tr><td>(do not) Strive to have a good quality of recorded knowledge (i.e., documentation)</td></tr>
</table>

Table 95 – Measure of KT- developed

As all questions of this measure come together as a single principal component, this research suggests that companies scoring low on questions on the scale would have a negative impact on knowledge transfer to innovation outcomes.

For the purposes of theoretical discussion, KT- measure distinct aggregate dimensions are the following high-level concepts negatively influencing innovation outcomes:

- Issues with sourcing knowledge
- Issues with knowledge transfer
- Issues with knowledge absorption capacity
- Issues with managing and using knowledge

It seems that KT- measure also captures the "full cycle" of ineffective interorganizational knowledge transfer process – issues from sourcing knowledge, issues with knowledge transfer, issues with absorption capacity, and them managing and using knowledge.

The issue with sourcing knowledge and knowledge transfer might be related to research indicating that sourcing knowledge from multiple sources (Phelps, 2010; Bergman and Maier, 2009; Van Wijk *et al.*, 2008) and taking market conditions into consideration (Albats *et al.*, 2019; Ford and Paladino, 2013; Paladino, 2007) positively influences innovation outcomes. While it is plausible to believe that negative behaviours to factors found positively to influence innovation would also result in negative influence to innovation outcomes, it should also be noted that some variables could also cause have a neutral or no effect to innovation outcomes.

It needs to be noted that KT- measure, compared to KT+ measure, introduces also a specific notion of issues with knowledge absorption capacity. Regardless of the knowledge transfer being successful, if organization is unable to absorb that knowledge, the knowledge transfer is considered unsuccessful (Zou *et al.*, 2018; Kim *et al.*, 2016; Zonooz *et al.*, 2011; Volberda *et al.*, 2010). There are various underlying reasons why knowledge absorption can fail – some of the basic reasons are related starting with the knowledge transfer in which there exist differences in language and terms used which caused both parties to "speak different languages" (i.e. issues with encoding and decoding) making the recipient of knowledge not understand what was transmitted (Oppat, 2007). Similar to this, is lack of complementary knowledge, or just experience with similar subjects, in which recipients cannot make relationships to the received knowledge resulting in inability to absorb and apply transmitted knowledge (Zou *et al.*, 2018; Kim *et al.*, 2016; Zonooz *et al.*, 2011). Researchers (Kim *et al.*, 2016;

Shaker and Gerard, 2002) distinguish between potential and realized knowledge absorption capacity. Potential absorption capacity represents the ability to acquire and assimilate knowledge, whereas realized capacity represents transformation and exploitation of knowledge. This represents an issue in the next stage of knowledge transfer whereas the knowledge was absorbed successfully, however it cannot be applied in organization for development of innovation. Perhaps a starting point of investigation is research suggesting that organizations receiving knowledge utilize only what they need and adopt knowledge received to their own circumstances and the environment (Zonooz *et al.*, 2011). One could also argue that there certainly exists a difference between organizations who pursues exploratory innovation and who would be more open to apply a wider array of new knowledge absorbed, versus organizations pursuing exploitation of innovation and looking for a more narrowed scope of knowledge (Albats *et al.*, 2019), perhaps in such case discarding what otherwise might have been useful knowledge for exploratory purposes.

The literature provides support that sourcing knowledge from multiple sources (Phelps, 2010; Bergman and Maier, 2009; Van Wijk *et al.*, 2008) and taking market conditions into consideration (Albats *et al.*, 2019; Ford and Paladino, 2013; Paladino, 2007) in service companies positively influences innovation outcomes. While it is plausible to presume that opposite behaviours to which positive support was found would result in negative influence to innovation outcomes, it should also be noted that some variables could also cause neutral, or no effect to innovation outcomes. While academic knowledge provides insights on positive aspects influencing innovation outcomes, the literature on the other hand is underdeveloped on researching negative determinants to innovation outcomes.

Zooming in specifically to issues with managing and using knowledge, KT- measure indicates behaviour of not having a good quality of recorded knowledge and documentation negatively influences innovation outcome. In order for organizational knowledge to be created, it needs to be transferred from tacit to explicit knowledge, that is be converted to documented and systematized knowledge that could be reused for innovation development (Alipour *et al.*, 2011; Sherwat and Fallah, 2005). Organizational knowledge represents a systemized and documented knowledge attributable to innovation performance (Khosravi *et al.*, 2019; Saunila, 2017b; Alipour and Karimi, 2011; Crossan and Apaydin, 2010). This measure is interesting in the respect that it indicates a tacit knowledge transfer which perhaps indicates verbal or informal channels of knowledge exchange. This could perhaps indicate informal knowledge transfer through communities of practices (CoP) in which expertise is built within a group of individuals. While these individuals have the appropriate tacit knowledge, the inherit problem of CoPs is externalization of such knowledge (Roberts, 2006). On the other hand, issues with informal knowledge transfer could be related to lack of strong social networks who are a pre-cursor of successful knowledge transfer (Najafi-Tavani *et al.*, 2012; Berzina, 2011), as both individual and groups benefit from stronger social ties (Brennecke and Stoemmer, 2018; Almeida *et al.*, 2011).

Another interesting aspect of KT- measure is behaviour indicating that do not striving to spend as little as time as possible as aggregate dimension of issues with knowledge transfer has a negative impact to innovation outcome. Perhaps a starting point of understanding this could possibly be explained through corporate culture, as one of key determinants of innovation effectiveness. The widespread software development framework "SCRUM" popular for its innovation effectiveness in software companies suggests that software developers should spend as minimum time as possible in meetings while focusing their time on delivering working software frequently (Scrum.org, 2017). Research indicates that too frequent and too long meetings have produce negative attitudes in organizations practicing SCRUM (Stray *et al.*, 2016). This is in line with research arguing that flexible (adhocracy) type of corporate culture with traits of freedom, creativity and risk-taking is positively related to innovation performance (Naranjo-Valencia *et al.*, 2016). On the other hand, having frequent and long meetings could perhaps indicate a high degree of formalization typically found in hierarchy corporate structures. This type of corporate culture was found to have negative effect to innovation performance (Naranjo-Valencia *et al.*, 2016; Büschgens *et al.*, 2013).

While positive aspects of knowledge transfer, and positive aspects of interorganizational knowledge transfer have been discussed in the literature, understanding negative aspects of KT would require further investigation and research to understand.

5.1.1.3 IOR+ MEASURE DISCUSSION

Developed measure of IOR+ (positive influence of interorganizational relationships) through this research consists of two principal components of behaviours influencing innovation outcome:

1. **What partners do for us** principal component of IOR+ measure was developed based on participants consensus from their experiences that the following interorganizational relationship behaviours are SUPPORTIVE to innovation, as such participants DID:

- Need to believe that I was dealing with a trustworthy partner
- Need to believe that I was dealing with a reliable partner
- Have transparent communication
- Have clear expectations of my partner responsibilities
- Recognize my partner's work as valuable

2. **What do we do for partners** principal component of IOR+ measure was developed based on participants consensus from their experiences that the following interorganizational relationship behaviours are SUPPORTIVE to innovation, as such participants DID:

- Build a good reputation as a trustworthy partner to others
- Honour my partnership commitments
- Take responsibility for my own actions in my partnerships
- Make myself open to learn from my partner's cultural specificities

For the purpose of theoretical discussion, behaviours making the measures (1st order concepts), as analysed in AFA I qualitative phase of this research, are aggregated as per Gioa *et al.* (2013) in higher 2nd order items and have been linked with components of the measures developed and tested in the final AFA III phase of this research, shown in Table 96. This approach helps construct data structure connecting the qualitative data into concepts, themes and dimensions that could be mapped to the existing literature to help identify new concepts (Gioa *et al.*, 2013).

Interorganizational relationships positive behavioural acts (IOR+)			
Behavioural acts of IOR+ measure (1st order concepts)	**2nd order themes (AFA I)**	**Aggregate dimensions (AFA II)**	**Measure components (AFA III)**
Need to believe that I was dealing with a trustworthy partner	Trust and reliability	Quality of interorganizational relationships	**What partners do for us**
Need to believe that I was dealing with a reliable partner			
Have transparent communication	Transparent communication		
Have clear expectations of my partner responsibilities	Responsibilities in partnership	Relationship governance	
Recognize my partner's work as valuable	Relationship value	Leveraging the relationship	
Build a good reputation as a trustworthy partner to others	Trust and reliability	Quality of interorganizational relationships	**What do we do for partners**
Honour my partnership commitments			
Take responsibility for my own actions in my partnerships	Responsibilities in partnership	Relationship governance	
Make myself open to learn from my partner's cultural specificities	Learning from the relationship	Leveraging the relationship	

Table 96 – Measure of IOR+ developed

The first impression of IOR+ that caught the attention is the dyadic view indicating a two-way relationship with “What partners do for us”, and “What do we do for partners”. It is also interesting to note that both of these components have the trust component contained in them. Further, both principal components of the measure have exactly the same three aggregate dimensions:

- Quality of interorganizational relationships,

- Relationship governance, and
- Leveraging the relationship.

In observing the trust component of the quality of relationships, behaviours "Need to believe that I was dealing with a trustworthy partner" and "Need to believe that I was dealing with a reliable partner" are part of "What partners do for us" component, whereas "Build a good reputation as a trustworthy partner to others" and "Honour my partnership commitments" are trust components of "What do we do for partners". Trust was found to be instrumental to good interorganizational relationships (Rossato and Diniz-Pereir, 2017; Berzina, 2011). Interorganizational trust has been defined as expectation that one organization can rely on the other to fulfil its obligation, in a predictive manner, and that will be fair when possibly of opportunity is presented (McEvily *et al.*, 2017). Interorganizational trust seems to be recognized to be bidirectional in involving two parties, each being a trustor and trustee (Korsgaard *et al.*, 2015). Research also indicates that trust exists on both sides between partners in interorganizational relationships (McEvily *et al.*, 2017; Ekici, 2013), but more importantly research indicates that trust between partners is NOT reciprocal, therefore NOT the same (Ekici, 2013). Its strength often depends on power positions of partners in the relationships and is regulated with relatedness between partners. This could perhaps provide an explanation of the dyadic nature of IOR+ measure. Similarly, relationship quality and leveraging the relationship could perhaps be explained and argued with theories of why organizations form interorganizational relationships in the first place – and that is for mutually beneficial cooperation (Parmigiani and Rivera-Santos, 2011), hence indicating mutual and therefore bidirectional relationship.

In particular, measuring needing to believe that I was dealing with a trustworthy partner on one side, and honouring my partner commitments on the other side seems to be a function of trust in interorganizational relationships (McEvily *et al.*, 2017; Thorgren and Wincent, 2011). Research (Rossato and Diniz-Pereir, 2017) suggest that trustworthiness is one of the main criteria positively attributable to partner selection in interorganizational relationships. Trust is explained to relate to a belief that promise given by the partner shall be respected and obligations made honoured. Research indicates that trust strengthens social relationships, and strong social relationships can help organizations go an extra mile innovating with partners as they help build social capital, allowing one to draw a credit to achieve an action with partners otherwise unlikely (Berzina, 2011). Shared goals and bounded relationships enhance trust in interorganizational relationships (Chen *et al.*, 2014). Trust has a positive influence to knowledge transfer (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011; Windsperger and Gorovaia, 2010) and also has a positive influence to interorganizational knowledge transfer (Chen *et al.*, 2014). Successful knowledge transfer was found to have a positive impact to innovation performance (Zhang *et al.*, 2010).

Further understanding of IOR+ measure could perhaps be understood through interorganizational collaboration dynamics representing an ongoing relationship communicated between the two organizations. Dynamics of interorganizational collaboration describe changes in internal collaboration between parties and over time. Majchrzak *et al.* (2015) identifies six (6) types of characteristics that affect change in interorganizational relationships: mutual goal dynamics, contract frame dynamics, interaction style dynamics, decision-making dynamics, organizational structure dynamics and actor composition dynamics. These changes are influenced by three (3) categories triggering change of collaboration dynamics in interorganizational relationships, and these are: between-partner differences, external sources and withing interorganizational collaboration sources. Observing IORs through dynamics of interorganizational collaboration, shown in Table 97 is mapping of identified behaviours of IOR+ measure with one of six characteristics of interorganizational collaboration dynamics. This view provides a novel perspective into dynamics of interorganizational relationships.

Mapping IOR+ to characteristics of interorganizational collaboration dynamics		
Measure components	**Behavioural acts of IOR+ measure**	**Characteristics of interorganizational collaboration dynamics**
What partners do for us	Need to believe that I was dealing with a trustworthy partner	**Contract** frame dynamics (trust) – dyad "for us"
	Need to believe that I was dealing with a reliable partner	**Contract** frame dynamics (trust) – dyad "for us"
	Have transparent communication	**Interaction** style dynamics (transparency)
	Have clear expectations of my partner responsibilities	**Contract** frame dynamics (expectations)
	Recognize my partner's work as valuable	**Contract** frame dynamics (value from the relationship)
What do we do for partners	Build a good reputation as a trustworthy partner to others	**Contract** frame dynamics (trust) – dyad "for them"
	Honour my partnership commitments	**Contract** frame dynamics (commitments)
	Take responsibility for my own actions in my partnerships	**Decision**-making control dynamics
	Make myself open to learn from my partner's cultural specificities	**Between-partner differences** (increase compatibility)

Table 97 - Mapping IOR+ to characteristics of interorganizational collaboration dynamics

Interesting to note that in IOR+ measure dynamics of mutual goal setting, organizational structure or actor composition are not present. Goal setting represents the mutual goal between the parties, organizational structure is the structure of roles and processes governing the relationship, and actors are major individual or partners of the collaboration. While these aspects are important for positive interorganizational collaboration, it seems that other factors present in the IOR+ measure such are contract frame dynamics, decision-making and interaction style dynamics are the most important to positive innovation outcomes. In addition, it seems that between-partner differences is also present as a source of interorganizational collaboration change. This could perhaps be explained with patterns of POSITIVE change loop in IORs proposed by Majchrzak *et al.* (2015), shown in Figure 38.

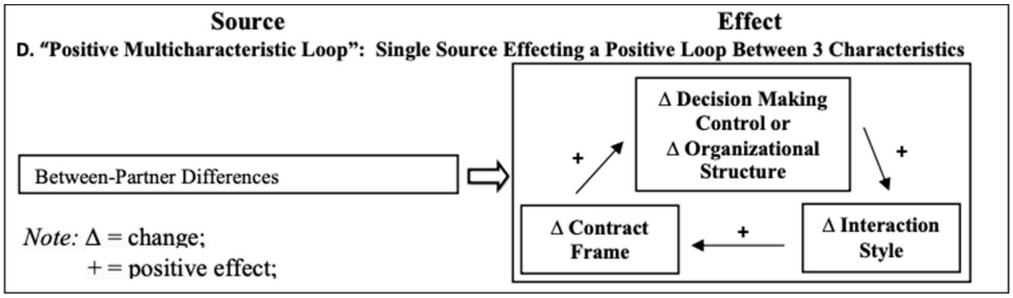

Figure 38 - Single source effecting a positive loop between 3 characteristics (Majchrzak *et al.*, 2015)

The model shows that in-between partner differences (typically the way partners work, decide, the type of corporate culture they embrace, et sim.) triggers an organizational change. In this case, between partner differences influence change in contract-frame which is responsible for governing the way two parties are collaborating. The contract frame dynamics represent all formal and information agreements governing the relationship, and in turn influencing knowledge transfer, IP property exchange, shared risks and benefits, et sim. In case of IOR+ measure, POSITIVE influence to trust on both sides of the partnership (McEvily *et al.*, 2017; Thorgren and Wincent, 2011), and trust is a part of relational governance (Cao and Lumineau, 2015), in case of IOR+ this is having clear expectations of responsibilities, and positive recognition of the value of the relationship for partners. These are in turn positively influencing interaction style between the parties. Interaction style represents collaborative (versus competitive) behaviour of individuals in the relationship. As interaction style is improved and moving more from transactional (in its simple form buyer-supplier relationships) to relational relationships (joint ventures or partner alliances). The positive change in interaction style is having a positive effect to the contract frame further enabling support for organization collaboration to develop. The shown model maps well with IOR+ measure and provides theoretical support and a plausible explanation that developed measure of IOR+ can be considered as positively influencing the "positive loop" of organizational collaboration dynamics shown by the model (Majchrzak *et al.*, 2015). This in turn improves interorganizational collaboration and knowledge transfer, and results in increased innovation performance.

Measuring having clear expectations of my partner responsibilities to innovation outcomes could perhaps be explained with research indicating that if partners are not in agreement on who is delivering a particular component of an innovation this might lead to conflicts in interorganizational relationships (Davis, 2016). Research indicates several reasons behind this. First, in case partners are having overlapping capabilities there could be conflicts arising in cases when both could deliver the same component of innovation but are not in agreement on expectations who should deliver it. Second, the research suggests that previous partner behaviours indicate anticipation of future behaviours in relationships making it harder to decompose tasks in case a partner needs to work on something else they historically have not been working on, which might lead to misunderstandings. Third, while most of the literature addresses IORs in a dyadic relationship of two partners working together, there could be more than two partners working together on innovation making it even hard to manage the relationship and having clear expectations of partner responsibilities (Davis, 2016). This suggests that measuring the aspect of having clear expectations in a relationship between partners responsibilities through IOR+ provides support this is a positive measure of interorganizational relationships to innovation outcomes.

Transparent communication with partners seems to indicate disclosing good and bad at the same time - being honest about the true state of things in partnerships. Collaborative interorganizational relationships are highly receptive and highly transparent. On the other hand, if this is not the case, the non-transparency between partners can turn into non-collaborative relationships (i.e. competitive, accommodative, avoidance, and compromising). Measuring the level of transparency in interorganizational relationships is indicator if the partnership is a true collaboration, and in turn collaborative relationships positively support innovation outcomes (Kang and Kang, 2010). This suggests that measuring the aspect of transparent communication in partnerships through IOR+ provides support this is a positive measure of interorganizational relationships to innovation outcomes.

Being opened to learn from partner's cultural specificities plays an important role in the knowledge transfer between as alignment between cultures helps improve KT (Yi and Begley, 2011). In order to maximize the success of international knowledge transfer, a fusion of two cultures is suggested to bring out the best from such cultural diversity to the knowledge transfer. Such fusion of international cultures and policies is likely to be more potent to the common organizational performance outperforming either of individual organizations working alone. In cases when knowledge being transferred is highly tacit, the role of sharing cultures between partners seems to be even more important to success of the knowledge transfer (Yi and Begley, 2011). New knowledge is created through transformation of tacit to explicit dimensions of knowledge (Sherwat and Fallah, 2005), and organizational learning and knowledge positively influence innovation outcomes (Khosravi *et al.*, 2019; Zou *et al.*, 2018; Alipour and Karimi, 2011; Crossan and Apaydin, 2010). This suggests that measuring the aspect of being open to partner's cultural specificity through IOR+ provides support this is a positive measure of interorganizational relationships to innovation outcomes.

5.1.1.4 IOR- Measure Discussion

Developed measure of IOR- (negative influence of interorganizational relationships) through this research consists of two principal components of behaviours negatively influencing innovation outcome:

1. Mismanaged trust and openness principal component of IOR- measure was developed based on participants consensus from their experiences that the following interorganizational relationship behaviours are NOT SUPPORTIVE to innovation, as such participants DID NOT:

- Avoid engaging with partners who had a history of being involved in damaging relationships
- Allow partners to make an independent decision on forming a relationship without me forcing them into it
- Openly share Intellectual Property in my partnerships
- Trust partners freely from the start of a relationship
- Avoid making judgements on my partner relationships based on what my partners said to me

2. **Mismanaged decision-making** principal component of IOR- measure was developed based on participants consensus from their experiences that the following interorganizational relationship behaviours are NOT SUPPORTIVE to innovation, as such participants DID NOT:

- Make decisions based on ‘gut’ feeling (intuition) without due diligence in my partnerships
- Allow partners to make decisions independently without my influence

For the purpose of theoretical discussion, behaviours making the measures (1st order concepts), as analysed in AFA I qualitative phase of this research, are aggregated as per Gioa *et al.* (2013) in higher 2nd order items and have been linked with components of the measures developed and tested in the final AFA III phase of this research, shown in Table 98. This approach helps construct data structure connecting the qualitative data into concepts, themes and dimensions that could be mapped to the existing literature to help identify new concepts (Gioa *et al.*, 2013).

Interorganizational relationships negative behavioural acts (IOR-)			
Behavioural acts of IOR- measure (1st order concepts)	**2nd order themes (AFA I)**	**Aggregate dimensions (AFA II)**	**Measure components (AFA III)**
(do not) Avoid engaging with partners who had a history of being involved in damaging relationships	Inefficiencies in compatibility alignments with partners	Issues with expanding the network of knowledge and resources	**Mismanaged trust and openness**
(do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it	Inefficiencies in decision making in partnership	Issues with relationship governance	
(do not) Openly share Intellectual Property (IP) in my partnerships	Inefficiencies in open innovation	Issues with leveraging partnership value	
(do not) Trust partners freely from the start of a relationship	Inefficiencies in trust and reliability	Issues with strengthening of interorganizational relationships	
(do not) Avoid making judgements on my partner relationships based on what my partners said to me			
(do not) Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships	Inefficiencies in decision making in partnership	Issues with relationship governance	**Mismanaged decision-making**
(do not) Allow partners to make decisions independently without my influence			

Table 98 – Measure of IOR- developed

For the purposes of theoretical discussion, IOR- measure distinct aggregate dimensions are the following high-level concepts negatively influencing innovation outcomes:

- Issues with expanding the network of knowledge and resources
- Issues with relationship governance
- Issues with leveraging partnership value
- Issues with quality of interorganizational relationships

Issues with expanding the network of knowledge and resources seems to be related with avoiding engaging with partners who had a history of being involved in damaging relationships. This denotes an aspect of reputation and yet again is a subject of trust relationship. As such, trust is a moderator of relational governance (Cao and Lumineaum 2015). Perhaps a starting point to understand this could be research suggesting that previous behaviours are likely to be indicator of future behaviours (Mehi, 2008). In addition, research suggests that companies favour working with partners they already had experience with as knowing their partners reduces the risk of uncertainty, capability and reliability.

Similarly, trusting partners freely from the start of a relationship seems to be a function of trust in interorganizational relationships. Trust as a variable is present in both positive and negative measures of IOR developed through this research. This is aligned with the view that trust can be both positive (functional) and negative (dysfunctional) in interorganizational relationships and co-existing at the same time as two parallel processes (McEvily *et al.*, 2017; Thorgren and Wincent, 2011). This suggest that both positive and negative effects of interorganizational trust can be moderated and managed separately. Trust is very important part of interorganizational relationships performance (McEvily *et al.*, 2017; Palmatier *et al.*, 2007) as it increases partners' willingness to cooperate (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011). This suggests that measuring the aspect of not trusting partners freely from the start through IOR- provides support this is a negative measure of interorganizational relationships to innovation outcomes.

Perhaps a starting point to understand negative impact of not openly sharing intellectual property (IP) in partnerships to innovation outcomes could be a view that open sharing of IP in partnerships seems to indicate a practice of open innovation (Almirall and Casadesus-Masanell, 2010). The concept of open innovation denotes that organizations freely contributes and enters into knowledge exchange, including proprietary IP exchange between partners as they believe that knowledge generated jointly in a group will have a much larger benefit to innovation outcomes to its members, compared to protecting and using the knowledge just for themselves (West and Bogers, 2017; Felin *et al.*, 2014; Chiaroni *et al.*, 2010; Almeida *et al.*, 2011; Almirall and Casadesus-Masanell, 2010). Research suggest that companies enlarging their external partner networks through IORs can benefit from pursuing the strategy of open innovation to innovation performance (Felin *et al.*, 2014; Almirall and Casadesus-Masanell, 2010). On the other hand, dark side of this could perhaps be indicated that companies need to have a capability to handle their external relationships in order to benefit from open innovation (Almirall and Casadesus-Masanell, 2010). Perhaps an organization also might be lacking knowledge desorption capacity required for successful dissemination of knowledge (Najafi-Tavani *et al.*, 2012; Lichtenthaler *et al.*, 2010; Oppat, 2007). While the literature provides views that practicing open innovation in interorganizational collaborations has a positive influence to innovation outcomes, the literature is underdeveloped on understanding negative aspects of not practicing open innovation.

Further understanding of IOR- measure could perhaps be understood through interorganizational collaboration dynamics representing an ongoing relationship communicated between the two organizations. Dynamics of interorganizational collaboration describe changes in internal collaboration between parties and over time. Majchrzak *et al.* (2015) identifies six (6) types of characteristics that affect change in interorganizational relationships: mutual goal dynamics, contract frame dynamics, interaction style dynamics, decision-making dynamics, organizational structure dynamics and actor composition dynamics. These changes are influenced by three (3) categories triggering change of collaboration dynamics in interorganizational relationships, and these are:

between-partner differences, external sources and withing interorganizational collaboration sources. Observing IORs through dynamics of interorganizational collaboration, shown in Table 99 is mapping of identified behaviours of IOR- measure with one of six characteristics of interorganizational collaboration dynamics. This view gives us a novel perspective into dynamics of interorganizational relationships.

Mapping IOR- to characteristics of interorganizational collaboration dynamics		
Measure components	**Behavioural acts of IOR- measure**	**Characteristics of interorganizational collaboration dynamics**
Mismanaged trust and openness	(do not) Avoid engaging with partners who had a history of being involved in damaging relationships	**Decision**-making control dynamics
	(do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it	**Decision**-making control dynamics
	(do not) Openly share Intellectual Property (IP) in my partnerships	**Contract** frame dynamics (knowledge sharing)
	(do not) Trust partners freely from the start of a relationship	**Contract** frame dynamics (trust)
	(do not) Avoid making judgements on my partner relationships based on what my partners said to me	**Decision**-making control dynamics (judgments)
Mismanaged decision-making	(do not) Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships	**Decision**-making control dynamics (intuition)
	(do not) Allow partners to make decisions independently without my influence	**Decision**-making control dynamics (independent)

Table 99 - Mapping IOR- to characteristics of interorganizational collaboration dynamics

Interesting to note that in IOR- measure dynamics of mutual goal setting, organizational structure or actor composition are not present (same as with IOR+ measure). Goal setting represents the mutual goal between the parties, organizational structure is the structure of roles and processes governing the relationship, and actors are major individual or partners of the collaboration. While these aspects are important for positive interorganizational collaboration, it seems that other negative factors present in the IOR- measure such are contract frame dynamics and especially decision-making are the most important to negative innovation outcomes. This could perhaps be explained with patterns of NEGATIVE change loop in IORs proposed by Majchrzak *et al.* (2015), shown in

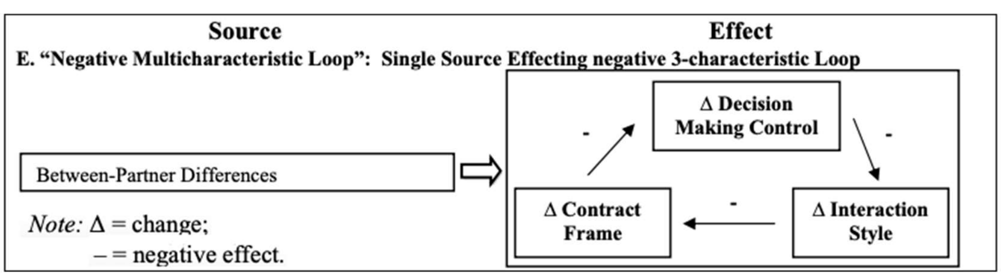

Figure 39.

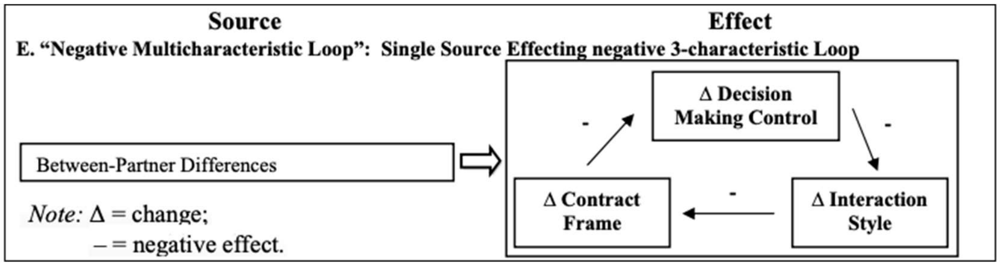

Figure 39 - Single source effecting negative 3-characteristic loop.

The model shows that in-between partner differences (typically the way partners work, decide, the type of corporate culture they embrace, et sim.) triggers an organizational change. Conflicts could occur due to incompatible values and beliefs, there could also exist issues with incentive misalignments between the parties, and dynamic business environments make a continuous pressure to changing and evolving relationship arrangements (Lumineau *et al.*, 2015). Researchers argue that key characteristics of interorganizational relationships is conflict (Lumineau *et al.*, 2015; Cao and Lumineau, 2015; Lumineau and Henderson, 2012; Tangpong *et al.*, 2010). This is because this relationship leads to behavioural contradictions between the parties in terms of cooperation versus competition, structural contradictions in rigidity versus flexibility, and temporal contradictions in short and long-term goals. In case organization is unable to avoid these contradictions, conflicts occur. By the nature of joining an interorganizational relationship, organizations introduce an additional (external) organization into their domain by voluntarily agreeing to relinquish certain freedoms, and to shape parts of their activities under the regime of the arrangement. As such, interorganizational relationships contain properties of interdependencies between parties.

Between partner differences influence contract-frame change which is responsible for governing the way two parties are collaborating. The contract frame dynamics represent all formal and information agreements governing the relationship, and in turn influencing knowledge transfer, IP property exchange, shared risks and benefits, et sim. Contract forms of governance also cause conflicts in interorganizational relationships, as they are typically informal and largely self-governed arrangements. Informal structures of interorganizational relationships make governance more difficult (Cao and Lumineau, 2015), as in case of a conflict, there isn't a formal singular hierarchy to resolve disputes (Lumineau and Henderson, 2012). Engaging a third party arbitrary is typically lengthy and too expensive.

In case of IOR- measure, NEGATIVE influence to decision making (McEvily *et al.*, 2017; Thorgren and Wincent, 2011) is related to NOT allowing partners to make decision independently, making decision based on gut feelings, avoiding making judgments based on what partner said to me, avoid engaging with partners who had a history of being in damaging relationships and allow partners to make independent decisions on forming relationships. These "negative" decisions then negatively influence interaction style perhaps moving from collaborative to more competitive in individual relationships. An additional obstacle in conflict resolution is related to individuals responsible to manage IORs. There could exist a mix and mismatch between individual interests and organizational interests creating another layer of conflict. In such cases, conflict resolution is complex and requires a management of both individual and organizational conflicts (Tangpong *et al.*, 2010).

As interactional style is worsened, it has a negative influence to the contract frame further tightening the formal and informal agreements governing the relationship, and influencing KT, IP exchange, and similar. The model shown maps well with IOR- measure and provides theoretical support and a plausible explanation that developed measure of IOR- can be considered as negatively influencing the "negative loop" of organizational collaboration dynamics shown by the model (Majchrzak *et al.*, 2015).

In understanding measuring negative influence of making decisions based on gut feeling (intuition) without due diligence to innovation outcomes, perhaps some insights as a starting point cold be drawn connecting with the research in psychology on rational versus feelings-based decision making. The research suggests that in rational decision-making individuals carefully evaluate decisions, whereas in feeling based decision-making individuals are unable to carefully make an evaluation as a result of limitations in processing (Xuhong, 2016). These typically are situations with a high degree of risk and uncertainty (Lucey and Dowling, 2005). Innovation activities, especially of exploratory nature, consist of a high degree of risk and uncertainty due to a number of unknowns and moving parts. Phycological research is underdeveloped on feelings-based decision making and there exist no determinates of feelings suggesting that decisions based on feelings are unpredictable (Lucey and Dowling, 2005). Understanding negative impact of making decisions based on gut feelings to innovation outcomes requires further research.

While academic knowledge provides insights on positive aspects influencing innovation outcomes, the literature on the contrary is underdeveloped on negative influences to innovation outcomes (Witell *et al.*, 2015; Anderson *et al.*, 2014), as such understanding further aspects negative aspects of IOR- to innovation outcomes is a future research opportunity.

5.1.2 Relationships Between KT and IOR to Innovation Outcomes

Academic literature is underdeveloped on connections between KT and IOR and their mutual influence to innovation outcomes. This research provides insights to these relationships as shown in Table 100 and discussed further in this section. For the purpose of further discussion, please note correlations and no correlations indicated with arrows between each of the four measures in the table.

KT+ measure

Component	Statements to evaluate on Likert scale
Knowledge management	• Actively combine multiple sources of knowledge to acquire new knowledge • Use IT infrastructure for knowledge management activities • Use rich communication media (e.g., video, presentation, animations) that were not text-only • Proactively apply the new knowledge acquired
Customer market research	• Learn from customers in order to develop my innovation • Seek to understand the way customers use my products and/or services • Have flexibility in discovering new knowledge useful to my innovation

Positive correlation KT+ IOR+

IOR+ measure

Component	Statements to evaluate on Likert scale
What partners do for us	• Need to believe that I was dealing with a trustworthy partner • Need to believe that I was dealing with a reliable partner • Have transparent communication • Have clear expectations of my partner responsibilities • Recognize my partner's work as valuable
What do we do for partners	• Build a good reputation as a trustworthy partner to others • Honour my partnership commitments • Take responsibility for my own actions in my partnerships • Make myself open to learn from my partner's cultural specificities

No correlation KT+ KT-

No correlation IOR+ IOR-

KT- measure

Component	Statements to evaluate on Likert scale
Knowledge mismanagement	• (do not) Source knowledge from multiple sources • (do not) Strive to spend as little time as possible in meetings • (do not) Attempt to understand the type of knowledge that I needed to acquire • (do not) Create a plan for the type of knowledge I needed to acquire • (do not) Take market conditions into consideration • (do not) Document knowledge verbally sourced from external parties • (do not) Strive to have a good quality of recorded knowledge (i.e. documentation)

Positive correlation KT- IOR-

IOR- measure

Component	Statements to evaluate on Likert scale
Mismanaged trust and openness	• (do not) Avoid engaging with partners who had a history of being involved in damaging relationships • (do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it • (do not) Openly share Intellectual Property in my partnerships • (do not) Trust partners freely from the start of a relationship • (do not) Avoid making judgements on my partner relationships based on what my partners said to me
Mismanaged decision- making	• (do not) Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships • (do not) Allow partners to make decisions independently without my influence

Table 100 – Measures of KT and IOR and their correlations

Findings on KT measure indicate the following relationships:

- There exist no significant correlations between the positive (KT+) and negative (KT-) measures of KT.
- Positive and negative measures of knowledge transfer (KT+, KT-) are **NOT mirrored** one to another

Findings on IOR measure indicate the following relationships:

- There exist no significant correlations between the positive (IOR+) and negative (IOR-) measures of IOR.
- Positive and negative measures of interorganizational relationships (IOR+, IOR-) are also **NOT mirrored** one to another.

Positive and negative measures of KT and IOR NOT mirroring one to another could be explained with the following finding, indicating duality nature of the measures:

- There EXIST significant positive correlations between positive measures KT+ and IOR+, and
- There EXIST significant positive correlations between negative measures KT- and IOR-.

5.1.2.1 Duality Nature of KT and IOR measures

Strong positive correlations exiting between **positive measures** of KT+ and IOR+, and strong positive correlations between **negative measures of** KT- and IOR- to innovation outcomes suggests the following:

- Organizational behaviour measured with positive measures KT+ and IOR+ **mutually** indicate positive influence to innovation outcomes, and
- Organizational behaviours measured with negative measures KT- and IOR- **mutually** indicate negative influence to innovation outcomes.
- Behaviours positively influencing innovation outcome (KT+, IOT+) can **co-exist and affect innovation outcome in parallel** with behaviours negatively influencing innovation outcome (KT-, IOR-). The existence of duality nature of the measure is the reason why it makes sense that KT+/KT- and IOR+/IOR- are NOT mirrored one to another.

The concept of co-existence of positive and negative measures simultaneously influencing innovation outcome will henceforth be referred to as **duality nature of KT and IOR measures**.

This finding was unexpected, and it also seems underdeveloped in the innovation literature, not only from the literature scarcely addressing duality nature of innovation, but also because literature seems to be undeveloped on the negative sides of innovation effectiveness (Witell *et al.*, 2015). However, this finding is valuable as it provides novel insights in the area of innovation research as there does not seem to exist research papers on duality nature of KT and IOR to innovation outcomes. The literature however does provide views on duality nature of innovation through various other aspects that could perhaps be related. Garud and Turunen (2017) recognize duality of innovation in the form of process and outcome, suggesting they should not be observed separately, but together in coexistence. Witell *et al.* (2015) recognize innovation as multidimensional on the level of involvement between individual, organization and society, and between duality of success or failure outcome of innovation. Li *et al.* (2018) recognize dual influence of both positive and negative influence of political and economic factors to innovation performance. Innovation theories also recognize ambidextrous (dual) view of exploration and exploration of innovation suggesting that companies can practice both market-view (exploration) and resource-based (exploitation) view of innovation at the same time (Lee *et al.*, 2019; Ford and Paladino, 2013; Lavie *et al.*, 2010).

As measures of KT and IOR were developed based on understanding of individual behaviours, perhaps observing through the lens of traits and individual behaviours might provide some further insights into the duality nature of KT and IOR measures. Trust as a human behaviour was present in both positive and negative behaviours of IOR+ and IOR- scales. In this respect, trust was found to have a dual property, as it can be both positive (functional) and negative (dysfunctional) in interorganizational relationships and co-existing at the same time as two separate parallel processes (McEvily *et al.*, 2017; Thorgren and Wincent, 2011). Similarly, researchers (Zacher and Rosing, 2015) argue that instead of a single leadership approach, leaders should utilize ambidextrous (dual) leadership style of combining both open and closed leadership behaviours at the same time to manage innovation performance. In this context, open leadership represent leadership behaviours supporting follower behaviours stimulating the change. On the other hand, closed leadership behaviours reduce follower behaviours by taking corrective actions and specific measures. The leadership ambidextrous theory seems to remind of the theorized duality nature of KT and IOR in this work, suggesting that behaviours influencing positive, and behaviours influencing negative innovation outcomes can be simultaneously managed as separate processes. This finding indicates that duality nature of KT and IOR can perhaps be each managed with different management techniques. For example, similar to the duality of leadership management (Zacher and Rosing, 2015), perhaps it could be theorised that practitioners could manage behaviours of KT+ and IOR+ found through this research to positively influence innovation outcomes in a supportive manner, whereas behaviours of KT- and IOR- found to negatively influence innovation outcomes could be managed with corrective actions.

Next, comparison and contrast of positive measures of KT+ and IOR+ first, followed by comparison and contrast of negative measures of KT- and IOR- in attempting to observe their duality nature and further theorize on this concept is continued in the following section.

5.1.2.2 DUALITY NATURE OF MEASURES: RELATIONSHIPS BETWEEN POSITIVE MEASURES OF KT+ AND IOR+

Positive measures of KT+ and IOR+ are found to mutually indicate positive influence to innovation outcome having strong positive correlations one to another. This pair of measures positively influencing innovation outcomes is shown in Table 101.

KT+ measure

Component	Behaviours (evaluated on Likert scale)
Knowledge management	• Actively combine multiple sources of knowledge to acquire new knowledge • Use IT infrastructure for knowledge management activities • Use rich communication media (e.g., video, presentation, animations) that were not text-only • Proactively apply the new knowledge acquired
Customer market research	• Learn from customers in order to develop my innovation • Seek to understand the way customers use my products and/or services • Have flexibility in discovering new knowledge useful to my innovation

Positive correlation KT+ IOR+ ↔

IOR+ measure

Component	Behaviours (evaluated on Likert scale)
What partners do for us	• Need to believe that I was dealing with a trustworthy partner • Need to believe that I was dealing with a reliable partner • Have transparent communication • Have clear expectations of my partner responsibilities • Recognize my partner's work as valuable
What do we do for partners	• Build a good reputation as a trustworthy partner to others • Honour my partnership commitments • Take responsibility for my own actions in my partnerships • Make myself open to learn from my partner's cultural specificities

Table 101 – Positive measures KT+ and IOR+

For the purpose of theoretical discussion, behaviours making the measures (1st order concepts), as analysed in AFA I qualitative phase of this research, and aggregated as per Gioa *et al.* (2013) in higher 2nd order items, have been linked with components of final measures developed and tested in AFA III phase of this research. This approach helps construct data structure connecting the qualitative data into concepts, themes and dimensions that could be mapped to the existing literature to help identify new concepts (Gioa *et al.*, 2013).

Positive measures of KT+ with 2nd order themes and aggregate dimensions are shown in Table 102, followed immediately with positive measures of IOR+ shown in Table 103.

Knowledge Transfer positive behavioural acts (KT+)			
Behavioural acts identified (1st order concepts)	**2nd order themes (AFA I)**	**Aggregate dimensions (AFA II)**	**Measure components (AFA III)**
Actively combine multiple sources of knowledge to acquire new knowledge	Combining and recombining knowledge	Applying and using knowledge	**Knowledge management**
Use IT infrastructure for knowledge management activities	Document and manage knowledge		
Use rich communication media (i.e., video, presentation, animations) that were not text-only			
Proactively apply the new knowledge acquired	Disseminate knowledge		
Learn from customers in order to develop my innovation	Customer market research	Sourcing knowledge	**Customer market research**
Seek to understand the way customers use my products and/or services			
Have flexibility in discovering new knowledge useful to my innovation	Being flexible in acquiring knowledge	Knowledge transfer	

Table 102 – KT+ measure linked with 2nd order themes and aggregate dimensions of qualitative AFA I phase

Interorganizational relationships positive behavioural acts (IOR+)			
Behavioural acts identified (1st order concepts)	**2nd order themes (AFA I)**	**Aggregate dimensions (AFA II)**	**Measure components (AFA III)**
Need to believe that I was dealing with a trustworthy partner	Trust and reliability	Quality of interorganizational relationships	**What partners do for us**
Need to believe that I was dealing with a reliable partner			
Have transparent communication	Transparent communication		
Have clear expectations of my partner responsibilities	Responsibilities in partnership	Relationship governance	
Recognize my partner's work as valuable	Relationship value	Leveraging the relationship	
Build a good reputation as a trustworthy partner to others	Trust and reliability	Quality of interorganizational relationships	**What do we do for partners**
Honour my partnership commitments			
Take responsibility for my own actions in my partnerships	Responsibilities in partnership	Relationship governance	
Make myself open to learn from my partner's cultural specificities	Learning from the relationship	Leveraging the relationship	

Table 103 – IOR+ measure linked with 2nd order themes and aggregate dimensions of qualitative AFA I phase

In theorizing and attempting to identify new concepts, it needs to be noted that KT+ measure distinct aggregate dimensions in measure's components of "Knowledge management", and "Customer market research" are:

- Applying and using knowledge
- Sourcing knowledge
- Knowledge transfer

IOR+ measure distinct aggregate dimensions in measure's components of "What partners do for us", and "What do we do for partners" are:

- Quality of interorganizational relationships
- Relationship governance
- Leveraging the relationship

Aggregate dimension of knowledge transfer (KT+) and leveraging the relationship (IOR+) seems to be connected, as this is in line with understanding that learning between companies through interorganizational knowledge transfer contributes to knowledge generation and supports innovation performance (Zhou *et al.*, 2019; Chen *et al.*, 2014; Lichtenthaler *et al.*, 2010; Van Wijk *et al.*, 2008). Aggregate dimension of sourcing knowledge (KT+) and quality of interorganizational relationships (IOR+) also seems to be connected as research also indicates that access to a broader knowledge base (hence a larger number of interorganizational relationships) positively influences innovation outcomes (Wang and Lam, 2019; Dolińska, 2015; Hohberger *et al.*, 2015; Felin *et al.*, 2014; Lichtenthaler *et al.*, 2010; Phelps, 2010; Bergman and Maier, 2009; Van Wijk *et al.*, 2008; Palmatier *et al.*, 2007). Sourcing the knowledge (KT+) can also be associated with leveraging the relationship (IOR+) as sourcing knowledge from multiple sources, in this case partners, positively influences creation of new knowledge, and therefore innovation performance (Phelps, 2010; Bergman and Maier, 2009).

Looking backwards into KT+ behavioural act (1st order item) of aggregate dimension of applying and using knowledge (KT+) being "Use rich communication media", and "Use IT infrastructure for knowledge management activities", another link could be made between applying and using knowledge (KT+) and quality of interorganizational relationships (IOR+). This is because using rich communication media and IT infrastructure for knowledge management activities reduce ambiguity in knowledge transfer, therefore enhances the performance of knowledge transfer (Windsperger and Gorovaia, 2010). This provides link with 1st order item of IOR+ "Transparent communication", belonging to quality of interorganizational relationships. Further, using information technology as a tool for social activities positively strengthens real-life social interactions (Ljepava *et al.*, 2013; Meyer, 2010). Social relationships are an important dimension of interorganizational relationships as stronger the social interactions are, stronger IORs are between companies (Najafi-Tavani *et al.*, 2012; Almeida *et al.*, 2011). Research also suggests that companies who use social software are more likely to innovate and have a positive influence to innovation outcomes compared to companies that do not use social software (Meyer, 2010).

Similarly, an additional link could be made between aggregate dimension of applying and using knowledge (KT+) and strength of organizational relationships (IOR+). This is because using rich communication media in knowledge transfer can contribute to establishing trust in a team (Jarle Gressgård, 2011). IOR+ aggregate dimension of quality of interorganizational relationships (IOR+) in terms of trust and reliability could be linked with aggregate dimension of knowledge transfer (KT+). This is because partner trustworthiness and reliability (IOR+) seems to be a function of trust in interorganizational relationships (McEvily *et al.*, 2017; Thorgren and Wincent, 2011), and trust was found to has a positive influence to knowledge transfer (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011; Windsperger and Gorovaia, 2010), and interorganizational knowledge transfer was suggested to positively support innovation outcomes (Hohberger *et al.*, 2015; Felin *et al.*, 2014; Van Wijk *et al.*, 2008).

There could also possibly be a link between aggregate dimension of sourcing knowledge (KT+) and aggregate dimension of leveraging the relationship (IOR+). Companies form interorganizational partnerships to extend their knowledge networks and have a larger access to resources (Felin *et al.*, 2014; Huggins and Johnston, 2009; Bergman and Maier, 2009). Market-based view of innovation practiced mostly by service companies suggests that innovation opportunities are externally driven by market opportunities – understanding customer needs and how they are using products and services (Albats *et al.*, 2019; Janssen *et al.*, 2011; Ford and Paladino, 2013). Observing the partnership between companies innovating together as a single extended organization (Andersen and Drejer, 2008), a link between market research as a function of KT and IOR could be drawn suggesting that companies innovating together might benefit from an extended network of knowledge used to source knowledge on market opportunities and to solicit customer feedback. Leveraging IORs to access into customer knowledge and feedback seems plausible in connecting these two aggregate dimensions.

5.1.2.3 Duality Nature of Measures: Relationships Between Negative Measures of KT- and IOR-

Negative measures of KT- and IOR- are found to mutually indicate negative influence to innovation outcome having strong positive correlations one to another. This pair of measures negatively influencing innovation outcomes is shown in Table 104.

KT- measure

Component	Statements to evaluate on Likert scale
Knowledge mismanagement	• (do not) Source knowledge from multiple sources • (do not) Strive to spend as little time as possible in meetings • (do not) Attempt to understand the type of knowledge that I needed to acquire • (do not) Create a plan for the type of knowledge I needed to acquire • (do not) Take market conditions into consideration • (do not) Document knowledge verbally sourced from external parties • (do not) Strive to have a good quality of recorded knowledge (i.e. documentation)

Positive correlation KT- IOR- ⟷

IOR- measure

Component	Statements to evaluate on Likert scale
Mismanaged trust and openness	• (do not) Avoid engaging with partners who had a history of being involved in damaging relationships • (do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it • (do not) Openly share Intellectual Property in my partnerships • (do not) Trust partners freely from the start of a relationship • (do not) Avoid making judgements on my partner relationships based on what my partners said to me
Mismanaged decision- making	• (do not) Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships • (do not) Allow partners to make decisions independently without my influence

Table 104 – Negative measures of KT- and IOR-

For the purpose of theoretical discussion, behaviours making the measures (1st order concepts), as analysed in AFA I qualitative phase of this research, and classified as per Gioa *et al.* (2013) in higher 2nd order items, have been linked the components of final measures developed and tested in AFA III phase of this research. This approach helps construct data structure connecting the qualitative data into concepts, themes and dimensions that could be mapped to the existing literature to help identify new concepts (Gioa *et al.*, 2013).

Negative measures of KT- with 2nd order themes and aggregate dimensions have been shown in Table 105, followed immediately with negative measures of IOR- shown in Table 106.

Knowledge Transfer negative behavioural acts (KT-)			
Behavioural acts identified (1st order concepts)	**2nd order themes (AFA I)**	**Aggregate dimensions (AFA II)**	**Measure components (AFA III)**
(do not) Source knowledge from multiple sources	Inefficiencies in sourcing knowledge from multiple sources	Issues with knowledge transfer	**Knowledge mismanagement**
(do not) Strive to spend as little time as possible in meetings	Blockers to knowledge transfer		
(do not) Attempt to understand the type of knowledge that I needed to acquire	Inefficiencies in knowledge absorption capacity	Issues with knowledge absorption capacity	
(do not) Create a plan for the type of knowledge I needed to acquire	Inefficiencies in knowledge acquisition planning	Issues with sourcing knowledge	
(do not) Take market conditions into consideration	Inefficiencies in market research		
(do not) Document knowledge verbally sourced from external parties	Inefficiencies in documenting knowledge acquired	Issues with managing and using knowledge	
(do not) Strive to have a good quality of recorded knowledge (i.e., documentation)			

Table 105 – KT- measure linked with 2nd order themes and aggregate dimensions of qualitative AFA I phase

Interorganizational relationships negative behavioural acts (IOR-)			
Behavioural acts identified (1st order concepts)	**2nd order themes (AFA I)**	**Aggregate dimensions (AFA II)**	**Measure components (AFA III)**
(do not) Avoid engaging with partners who had a history of being involved in damaging relationships	Inefficiencies in compatibility alignments with partners	Issues with expanding the network of knowledge and resources	**Mismanaged trust and openness**
(do not) Allow partners to make an independent decision on forming a relationship without me forcing them into it	Inefficiencies in decision making in partnership	Issues with relationship governance	
(do not) Openly share Intellectual Property (IP) in my partnerships	Inefficiencies in open innovation	Issues with leveraging partnership value	
(do not) Trust partners freely from the start of a relationship	Inefficiencies in trust and reliability	Issues with strengthening of interorganizational relationships	
(do not) Avoid making judgements on my partner relationships based on what my partners said to me			
(do not) Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships	Inefficiencies in decision making in partnership	Issues with relationship governance	**Mismanaged decision-making**
(do not) Allow partners to make decisions independently without my influence			

Table 106 – IOR- measure linked with 2nd order themes and aggregate dimensions of qualitative AFA I phase

In theorizing and attempting to identify new concepts, it needs to be noted that KT- measure distinct aggregate dimensions in measure's components of "Knowledge mismanagement" are:

- Issues with knowledge transfer
- Issues with knowledge absorption capacity
- Issues with sourcing knowledge
- Issues with managing and using knowledge

IOR- measure distinct aggregate dimensions in measure's components of "Mismanaged trust and openness" and "Mismanaged decision-making" are:

- Issues with expanding the network of knowledge and resources
- Issues with relationship governance
- Issues with leveraging partnership value
- Issues with strengthening of interorganizational relationships

Aggregate dimension "Issues with knowledge transfer" (KT-) seems to have influence to interorganizational relationships such are trust, openness and decision making denoting links with aggregate dimensions issues with leveraging partnership value (IOR-), issues with strengthening of interorganizational relationships (IOR-), and issues with relationship governance (IOR-). Trust is argued to enable successful knowledge transfer as it increases partners' willingness to cooperate and trust is an important part of interorganizational relationships performance (Najafi-Tavani *et al.*, 2012; Qile *et al.*, 2011). Lack of trust between partners can have negative effect to partner relationship (McEvily *et al.*, 2017; Thorgren and Wincent, 2011), therefore it affects aggregate dimension issues with strengthening of interorganizational relationships (IOR-).

Being open in sharing knowledge and IP through open innovation indicates strong IORs and increases innovation performance (West and Bogers, 2017; Felin *et al.*, 2014; Chiaroniet *et al.*, 2010; Almirall and Casadesus-Masanell, 2010; Lichtenthaler *et al.*, 2010; Palmatier *et al.*, 2007). However, not openly sharing knowledge and IP perhaps might have severe influence to links between aggregate dimension leveraging partnership value (IOR-) and aggregate dimension issues with knowledge transfer (KT-).

Mismanaged decision making, that is making decisions based on intuition seems to have negative effect to interorganizational relationships and knowledge transfer, in particular to aggregate dimensions issues with relationship governance (IOR-) and aggregate dimension issues with managing and using knowledge (KT-). This might be so because feeling based decision making is a result of limitations in processing (Xuhong, 2016), such are situations with a high degree of risk and uncertainty (Lucey and Dowling, 2005). Innovation activities, especially of exploratory nature, consist of a high degree of risk and uncertainty due to a number of unknowns and moving parts.

Research (Davis and Eisenhardt, 2007) indicates there seems to be a less successful innovation performance in cases when there is a single leader organization within a network of organizations, compared to when the leadership was rotated amongst organizations. This seems to point out to aggregate dimension of issues with relationship governance (IOR-), which might indicate issues with aggregate dimension issues with knowledge transfer (KT-), in particular sourcing knowledge from dispersed sources. Decentralized decision making is suggested to have a positive effect on interorganizational knowledge transfer (Cardinal, 2001).

Although theoretical findings on duality views of innovation are scarce, it is relevant to note that other researchers also recognize various aspects of duality nature of innovation (duality view of exploration/exploitation, ambidextrous leadership styles), and also recognize that individual behaviours (such is for example duality nature of trust) can encompass properties of dual nature. This provides support to finding of this research on duality nature of KT and IOR in further theorizing the concept as a suggested future research opportunity. Further, findings of this study provide insights into negative behaviours influencing innovation outcome, also underdeveloped in the academic literature and suggested as a future research opportunity.

5.1.3 Helping to Facilitate Models of Innovation Effectiveness

In helping to facilitate models of innovation effectiveness, the area of positive and negative influence of KT and IOR to innovation outcomes was mapped through this research. This research argues that successful innovation is facilitated (or not) by KT and IOR. Internal organizational dynamics of KT and IOR regulating interorganizational innovation are depicted in extending the existing theoretical innovation framework of Dervitsiotis (2010) in Figure 40 to help support better understanding of innovation effectiveness models.

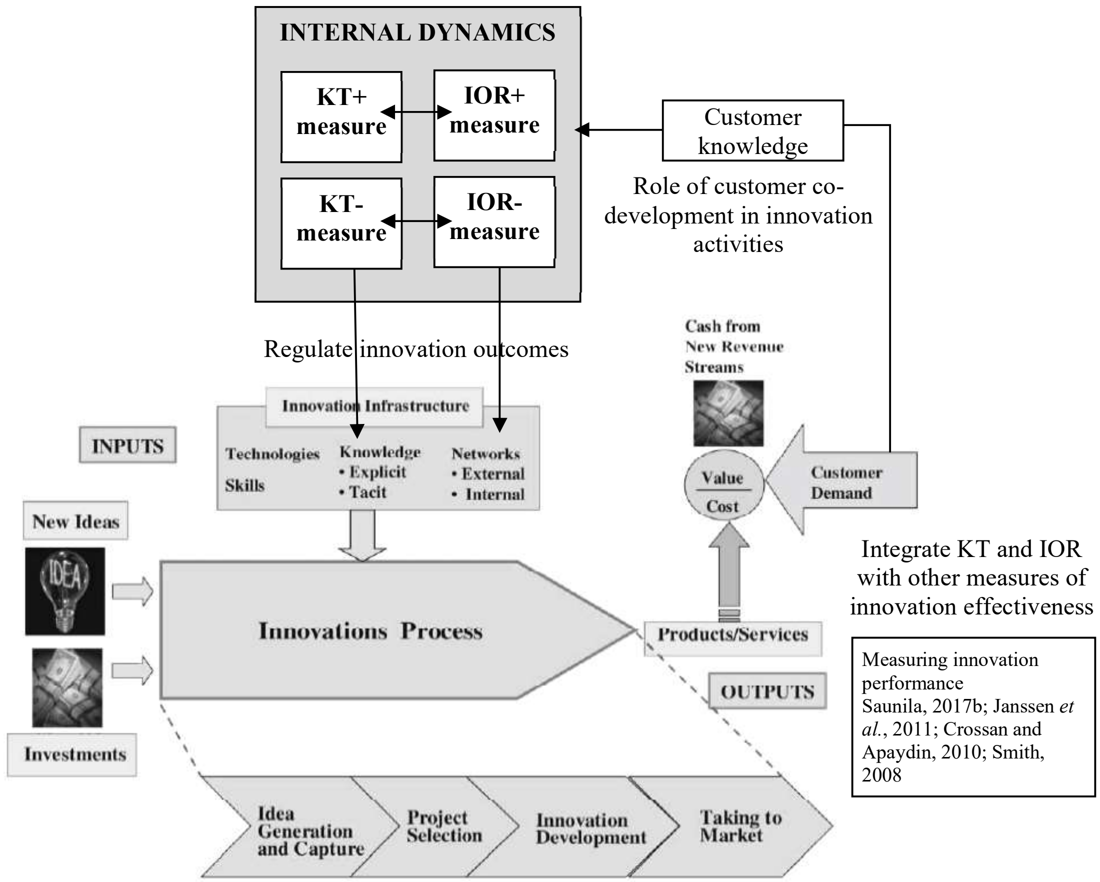

Figure 40 – Extended innovation model of Dervitsiotis (2010) with contribution of this research

Dervitsiotis (2010) in its *Innovation System* model introduces a concept of innovation infrastructure representing the regulators of the innovation process performance: resources needed (technologies and skills), knowledge (tacit and explicit), access to networks (internal and external) and open and closed locus of the innovation process. While Dervitsiotis (2010) recognizes that knowledge and networks (in this context external networks represent interorganizational relationships) are supporting infrastructure to innovation, it does not provide explanation on what exactly governs them. This innovation model is extended by this research with measures of KT and IOR governing internal organizational dynamics as suggested moderators of innovation outcomes. Specific measures consisting of the following components are provided through this research: knowledge management and customer market research (KT+), knowledge mismanagement (KT-), what partners do for us and what do we do for partners (IOR+), and mismanaged trust and openness and mismanaged decision-making (IOR-). This research extends the innovation model beyond a single organization extending it to innovation collaboration across external networks, that is innovation with partners. Group of organizations innovating in a network can be observed as an extended, or distributed organization to which the same principles of innovation, and the model, can be applied as to a single company (Andersen and Drejer, 2008). Providing an extended model of innovation through interorganizational relationships is important as organizations in an innovation network can have a better innovation performance compared to an individual company innovating by itself (Hohberger *et al.*, 2015; Felin *et al.*, 2014; Phelps, 2010; Andersen and Drejer, 2008).

Suggested and shown in Figure 40 is also research required to further extend this model is two ways: First, understanding the influence of customer market research and customer co-development of innovation could further understanding the models of innovation effectiveness. This research has suggested that companies in SEE are practicing market-based view of innovation (Albats *et al.*, 2019; Janssen *et al.*, 2011; Ford and Paladino, 2013) based on the market research component of the KT measure. This suggests that a specific type of market knowledge regarding the way customers use products and services, including market opportunities is required for innovation development. Academic knowledge supports a view that actively involving customers in co-development of innovation accelerates the pace of development (Maria-Stock and Zacharias, 2017; Saldanha, 2017). In addition, exploratory discovery of knowledge positively supports globally novel innovation developments versus adoption and imitation (Madsen *et al.*, 2010). Therefore, research opportunities exist in understanding the role of customer engagement in innovation development, and in producing a globally novel innovation in developing countries. Second, expanding the model through combining measures of KT and IOR with other measures throughout facets of the innovation system has a potential to help develop a consolidated measure of innovation performance. Academic literature on measuring innovation effectiveness is underdeveloped and segmented into measuring inputs, processes, outputs and outcomes (Janssen *et al.*, 2011), and it is lacking a consolidated view and a research direction (Saunila, 2017a).

Through expanding Dervitsiotis (2010) innovation model, this research has contributed to the gap in academic literature of lacking a consolidated theoretical framework of interorganizational relationships and innovation (Parmigiani and Rivera-Santos, 2011). In addition, research has through development of measures of KT and IOR to innovation outcomes helped bridge theoretical gap between the process and outcome view of innovation (Garud and Turunen, 2017).

5.2 Theoretical Implications

This study has several implications. First, the research maps the areas of KT+, KT-, IOR+ and IOR- through development of scales contributing to understanding internal organizational dynamics governing innovation outcomes as the first effort of this kind in the academic literature. Academic literature is lacking a consolidated theoretical framework on determinants of innovation connecting individual theoretical facets found in the literature (Khosravi *et al.*, 2019; Saunila, 2017b; Crossan and Apaydin, 2010; Xu *et al.*, 2007). In addition, academic literature is underdeveloped on influence of IOR and KT to innovation outcomes (Davis, 2009; Eisingerich *et al.* 2009). This work contributes to filling the knowledge gaps by providing measures of KT and IOR bridging the boundaries between these two areas as determinants of innovation outcomes.

Second, contribution of this research has implications to academic knowledge on innovation effectiveness by bridging the theoretical process view of innovation with the outcome view of innovation as a novel contribution. Academic literature on innovation effectiveness is underdeveloped and segmented into measuring inputs, processes, outputs and outcomes (Janssen *et al.*, 2011), and it is lacking a consolidated view and a research direction (Saunila, 2017a). This research connects internal procedural view of innovation through measuring internal organizational dynamics of KT and IOR with external outcomes of innovation. Understanding this connection is relevant as innovation process governing internal organizational dynamics and innovation outcomes are dependent upon each other – the process of how innovation is developed is related to the outcome of innovation (Khosravi *et al.*, 2019; Saunila, 2017b; Damanpour and Aravind, 2012; Crossan and Apaydin, 2010; Xu *et al.*, 2007). As such, measures developed through this research combine measuring internal process view with the external outcome view of innovation effectiveness bridging gaps across the boundaries of academic knowledge as a novel effort.

Third, this study provides a novel contribution to the duality nature of positive and negative behaviours influencing innovation outcome arguing that both can co-exist in parallel at the same time. Analysis of the scales developed indicate there exists significant correlations between the positive measures of the scale (KT+ and IOR+) and between the negative measures of the scale (KT- and IOR-). Non-existence of significant correlations between positive and negative measures KT+ and KT-, and between positive and negative measures IOR+ and IOR- supports the duality nature of measures influencing innovation outcome. This indicates that factors positively influencing innovation outcome can co-exist in parallel with factors negatively influencing innovation outcome. This finding provides novel insights in the area of innovation research. In addition, the study makes a novel contribution in understanding negative influences to innovation outcome as academic literature is scarce on observing innovation effectiveness through negative views, rather majority of literature focuses on positive outcomes of innovation effectiveness (Witell *et al.*, 2015).

Fourth, academic literature on innovation focuses on observing positive aspects of innovation outcomes; however, the literature is underdeveloped on its negative observations. While it is important for practitioners to understand what works for innovation, it is also important to understand what does not work for innovation. Implications of this research are in providing novel views of what does not work for innovation by measuring negative behaviours (KT-, IOR-) to innovation outcomes. Some new questions came up from this work related to the understanding of decision making in unpredictable environments and not practicing, or poorly practicing open innovation in a network of companies collaborating together requiring further research.

Fifth, this work extends the existing theoretical frameworks of single organization innovation, in particular Dervitsiotis (2010) *innovation system* by explaining the supporting innovation infrastructure of the model being knowledge and networks. In this context external networks are interorganizational relationships representing extended organization's network beyond a single organization (Andersen and Drejer, 2008). While Dervitsiotis (2010) recognizes that knowledge and external networks (interorganizational relationships) are supporting infrastructure to innovation, it does not provide explanation on what exactly governs them. This innovation model is extended in two ways: first, measures of KT and IOR governing internal organizational dynamics are suggested as moderators of innovation outcomes. This research provides specific measures consisting of the following components: knowledge management and customer market research (KT+), knowledge mismanagement (KT-), what partners do for us and what do we do for partners (IOR+), and mismanaged trust and openness and mismanaged decision-making (IOR-). Second, this research extends Dervitsiotis (2010) innovation model beyond a single organization extending it to innovation collaboration across external networks, that is innovation with partners. Group of organizations innovating in a network can be observed as an extended, or distributed organization to which the same principles of innovation, and the model, can be applied as to a single company (Andersen and Drejer, 2008). Providing an extended model of innovation through interorganizational relationships is important as organizations in an innovation network can have a better innovation performance compared to an individual company innovating only by itself (Wang and Lam, 2019; Dolińska, 2015; Lichtenthaler *et al.*, 2010; Phelps, 2010; Andersen and Drejer, 2008). In addition, as academic literature is lacking consolidated theoretical framework of interorganizational relationships and innovation (Parmigiani and Rivera-Santos, 2011), through expanding Dervitsiotis framework this research contributes to filling this knowledge gap.

Sixth, this research has also provided a novel methodological contribution in the field of innovation in the first application of the Act Frequency Approach (AFA) methodology typically used in behavioural research to the field of innovation research. This methodology is best suitable in cases where there exist no previous or comparable measures (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Cinite *et al.*, 2009; Szamosi and Duxbury, 2002; Russel, 2001). In applying a novel methodology in the field of innovation research, novel insights are generated into the subject as observing researched through a new perspective often results in novel insights of the researched topic (Wahyun, 2012; DeLuca *et al.*, 2008; Buelens *et al.*, 2008).

Seventh, findings of this research suggest that companies innovating in SEE are also able to produce globally novel innovation. Findings of AFA I phase show that 37% of participants, software companies, have stated their organizations produce globally novel innovation originating in SEE. The literature notes that there exist examples of global innovation being developed through remote R&D development centres of multinational corporations (Blit, 2018). This could perhaps be explained with the finding of this research suggesting that companies in SEE are practicing market-based view of innovation (Albats *et al.*, 2019; Janssen *et al.*, 2011; Ford and Paladino, 2013), as market research was found to be a component of the developed KT measure. Academic knowledge supports a view that actively involving customers in co-development of innovation accelerates the pace of innovation development (Maria-Stock and Zacharias, 2017; Saldanha, 2017) and that exploratory discovery of knowledge positively supports globally novel innovation developments versus adoption and imitation (Madsen *et al.*, 2010). On the other hand research also indicates that innovation in developing economies, such is SEE, is fuelled by imitation of globally novel innovation – adaption of global innovation at the level of a country or an industry (Aggarwal and Madhavi, 2018; Edison *et al.*, 2013; Madsen *et al.*, 2010). The occurrence of both imitation and global innovation in SEE could perhaps be explained with suggestion that interorganizational relationships between partners combine both co-exploration and co-exploitation properties (Lee *et al.*, 2019; Lavie *et al.*, 2010). This finding provides a support to ambidextrous view of innovation, suggesting practice of combining market-based (exploration) and resource-based (exploitation) approach to innovation (Lee *et al.*, 2019; Ford and Paladino, 2013). Findings of this research indicate that globally novel innovation can also occur in companies locally started and owned in SEE. The literature is however not clear on the particular circumstances for occurrence of globally novel innovation by local companies in developing countries warranting further research.

Eight, through further understanding relationships between KT and IOR in connection between knowledge management and strengthening social relationships, this research suggests that use of information technology for innovation activities and use of social media is important to strengthening social, and therefore interorganizational relationships required for innovation co-development. This extends support to academic knowledge providing support between strengthening social relationships with use of information technology (Ljepava *et al.* 2013; Meyer, 2010), however extending this view with also a positive support to innovation outcomes. This research provides additional insights on the influence of social relationships to innovation outcomes (Najafi-Tavani *et al.*, 2012; Almeida *et al.*, 2011).

5.3 Recommendations to Practitioners

Knowledge creation and interorganizational relationships are fundamental to innovation performance in organizations (Khosravi *et al.*, 2019; Aggarwal and Madhavi, 2018; Hohberger *et al.*, 2015; Felin *et al.*, 2014; Damanpour and Aravind, 2012; Alipour and Karimi, 2011; Crossan and Apaydin, 2010). This is why as an outcome of this research recommendation to practitioners is an open invitation to use developed scales of KT and IOR to innovation outcomes (available in Appendix I: Scales of KT and IOR to Innovation Outcomes) to regularly measure and assess their innovation activities in relationship to innovation outcomes. Recommendations to foster supporting positive factors of KT+ and IOR+ should be taken into consideration, while understanding, mitigating and minimizing effects of KT- and IOR- measures identified.

Regularly measuring indicators of innovation performance positively influences innovation performance as managers are able to react more quickly and adjust the course (Janssen *et al.*, 2011). The measures of KT and IOR should be combined with other measures of organizational performance, such are for example measuring financial impact of innovation generated, customers satisfaction and market share (Zizlavsky, 2016; Janssen *et al,* 2011; Dervitsiotis, 2010). Combining measures of innovation with measures of business performance perhaps might provide an overall measure of innovation effectiveness in organizations (Saunila, 2017b).

5.4 Generalizability of Findings

Generalization of theories in social research denotes transfer of research findings and conclusions performed on particular set of situations and population of the research to another set of situations and population that was not part of the original research. Generalization is about drawing conclusions from observed to unobserved for the purpose of reaching a higher level of abstraction in order to contribute to academic knowledge (Demuth, 2018; Flick 2014). Generalization of knowledge theories relies on identifying commonalities that allow such knowledge to be used outside of the original domain of research. Therefore, generalization of new knowledge relies on linking new knowledge with the previous generalized knowledge (Sherif, 2006), which is the case of this study.

Measures developed through this research are grounded in the existing theories of organizational KT and IOR which are argued to be highly generalizable across different organizations and industries (Pertusa-Ortega *et al.*, 2010; Guo and Sheffield, 2008; Sherif, 2006; Baskerville and Dulipovici, 2006). This indicates that links between previous generalized knowledge of KT and IOR and developed measures of KT and IOR have been made, meeting a condition of generalizing new knowledge (Sherif, 2006). As generalization of theories in social research denotes transferability of research findings and conclusions to other populations not part of the original research, it can be argued that measures of KT and IOR developed with this research are generalizable and applicable to other economies and industries outside of software and SEE - used as a research population for this study (Demuth, 2018; Flick 2014).

On the other hand, critics (Ferguson, 2004) argue that generalizability of research findings is not assumed, even if internal validity of the findings was well addressed. Strict controls of internal validity can impact generalizability of findings as there seems to exist inverse relationships between internal and external validity. By strictly planning to eliminate extraneous variables that could influence correlations found, they limit external validity and generalizability. However, this view might not be applicable to this study, as Ferguson (2004) work relates to a confirmatory research, while the nature of this research is exploratory. In addition, for the purpose of theory development not all variables were restricted as suggested by Ferguson (2004) for generalizability, rather cross-loaded variables in IOR+ measure in AFA III stage were retained. Authors argue that the best way to address generalizability of findings is through external validation and assessment. In line with this, limitations of this research and further recommendations for a confirmation study of the scales developed through this exploratory study are suggested.

5.5 Research Limitations

Although the overall objective of this research to develop scales to understand impact of KT and IOR to innovation outcomes was successfully completed, this study has identified some research limitations, as follows:

- The study was designed and has captured understanding of innovation practices in software companies in SEE. Scales developed were not tested in other developing economies or mature markets as this was not the aim of this research. In addition, focus of this research was on service companies carrying specific characteristics over the manufacturing sector (Madsen *et al.*, 2010). Testing the scales in other industries, economies, manufacturing sector and non-corporate sectors would provide further confirmation of generalizability of the measures developed as a form of external validation (Ferguson, 2004).

- Scales were tested in AFA III phase of the field research on the population of eleven countries in SEE and were not tested separately country by country. Testing of scales country by country would provide further confirmation to findings of this study.

- Non-existence of previous theories on the topic of KT and IOR to innovation outcome provides a challenge for linking to theoretical models of innovation effectiveness. The aim of this research was to fill this knowledge void and every attempt was made to choose a suitable research methodology. While utilizing the research methodology AFA (Act Frequency Approach) was believed to be the best suited for development of behavioural measures where no existing or comparable measures exist (Cinite and Duxbury, 2018; Gardner *et al.*, 2018; Chapman and Goldberg, 2017; Tucker and Turner, 2010; Cinite *et al.*, 2009; Ivcevic and Mayer, 2009; Szamosi and Duxbury, 2002; Buss and Craik, 1984), there exist a limitation of this methodology in the main assumption that previously identified behaviours will influence future behaviours (Mehi, 2008; Angleitner and Demotroder, 1998; Buss and Craik, 1984). While this has been argued as a non-issue in Chapter III - Methodology of this thesis, it should be noted that further confirmation of findings of this research could perhaps be addressed through a longitudinal study, which is in line with recommendation from Cinite *et al.* (2009).

- The objective of this study was exploratory to understand factors of KT and IOR influencing innovation outcome through AFA methodology, with non-objective being validation of scales using confirmatory[24] methodologies. It should be noted that further confirmation of findings of

[24] CFA, SEM or similar

this research could perhaps be conducted through a confirmatory study (Cinite and Duxbury, 2018).

- Scale of IOR+ had two cross-leadings which were been kept in the scale for theory development purposes, and in accordance with the methodology (Matsunaga, 2010). This has not constrained the scales for internal validity and it is allowing for external validity and generalizability of the scales (Ferguson, 2004). Further confirmation of findings of this research could perhaps be conducted through a confirmatory study as suggested by researchers (Cinite and Duxbury, 2018; Matsunaga, 2010; Cinite *et al.*, 2009).

5.6 Future Research Opportunities

New questions and research opportunities were uncovered as a result of this study requiring further understanding. As innovation is still a young research subject in the academic literature, it is expected that uncovering new territories comes with new challenges. The following research opportunities might be considered based on this study:

This research provides novel insights in innovation literature on duality nature of KT and IOR measures suggesting that both positive and negative measures of KT and IOR could co-exist and in parallel influence innovation outcomes. This indicates that as moderators of innovation effectiveness, positive and negative factors influencing innovation effectiveness could perhaps be managed in simultaneously, and perhaps with a differently style. Further research to uncover duality nature of factors influencing innovation outcome could provide new insights in the area of innovation research.

Scales developed through this research could be used to further models of innovation effectiveness. Combining the scales developed through this research with others measures of innovation across all of its facets (inputs, process, output and outcomes) along with measures of business performance might help contribute create an overall measure of innovation effectiveness in organizations (Saunila, 2017b).

Academics and practitioners are encouraged to further test the scales of KT and IOR developed through this study. Research opportunities exist to test the scales country by country, and also to test the scales in other developing countries and mature economies worldwide. Academics and practitioners are also encouraged to test the scales in other industries outside of IT and on larger samples. Using confirmatory methodologies, such is SEM or CFA would be recommended in further validation of scales (Cinite *et al.*, 2009).

Findings of this research indicate that globally novel innovation can be developed in SEE, suggesting that the type of knowledge transfer between developed and developing countries is not only imitation. Further understanding of bidirectional knowledge transfer and co-development between developed and developing countries might provide further insights on supportive and non-supportive determinants to developing globally novel innovation in developing countries. In addition, understanding the feedback loop if the knowledge created in developing countries fuels back innovation in developed countries represents yet another research opportunity. Adding to the mix is also understanding if the company ownership being multinational versus locally owned perhaps has different mechanisms of delivering a globally novel innovation.

This research has suggested that participants, software companies in SEE seem to practice market-based and exploratory knowledge acquisition that in some cases result in globally novel innovation. Interorganizational relationships between partners could combine both co-exploration and co-exploitation properties (Lavie *et al.*, 2010). Research opportunity exists in understanding if the market-based and exploratory approach to innovation might be supportive of both imitation and novel product development. This might be in line with ambidextrous view of innovation arguing that companies who practice both exploitative and explorative innovation are likely to achieve a better innovation performance (Lee *et al.*, 2019).

Understanding the role of customer engagement in innovation development in service software IT companies represents a research opportunity. In addition, understanding the role of customer engagement in developing globally novel innovation in developing countries represents a research opportunity. Measure of KT+ developed through this research consists of a principal component measuring customer market research behaviours in organizations. This suggests that a specific type of knowledge regarding the way customers use products and services, including market opportunities are positively influencing innovation outcomes. Academic knowledge supports a view that actively involving customers in co-development of innovation accelerates the pace of development (Maria-Stock and Zacharias, 2017; Saldanha, 2017). Exploratory discovery of knowledge positively supports globally novel innovation developments versus adoption and imitation (Madsen *et al.*, 2010). Research opportunities exists in understanding the role of customer engagement in innovation development, and in producing a globally novel innovation in developing countries.

Observing intensity of innovation collaboration with use of information technology between international partners represents a research opportunity. Findings from this research have indicated differences between participants who develop innovation with partners whose core of innovation was developed more in SEE than abroad tend to have a higher intensity of using technology to communicate, versus when development of innovations' core was predominantly abroad. As information technology is important to innovation performance and interorganizational relationships (Najafi-Tavani *et al.*, 2012), furthering this area of knowledge could provide contribution to the field of innovation research.

Academic literature is underdeveloped on researching negative innovation performance, negative knowledge transfer and negative interorganizational relationships. While it is important for practitioners to understand what works for innovation, it is also important to understand what does not work for innovation to avoid the pitfalls. This area is very open to research with perhaps negative measure developed through this research being a starting point to further the knowledge on determinants of negative innovation outcomes.

Further, understanding negative influence of not practicing, or poorly practicing open innovation in a network of companies collaborating together represents another research opportunity. This research has suggested a negative influence of not openly sharing intellectual property (IP) in partnerships to innovation outcomes. The concept of open innovation denotes that organizations freely contribute and enter into knowledge exchange, including exchange of proprietary IP between partners. While the literature provides views that practicing open innovation in interorganizational collaborations has a positive influence to innovation outcomes, the literature is underdeveloped on understanding its negative aspects.

5.7 Concluding Remarks and Unique Contributions

Understanding innovation performance in organizations matters as it provides sustainable competitive advantage, it impacts corporate performance and contributes to the economic growth (Forés and Camisón, 2016; Iturrioz *et al.*, 2015; Camison and Villar-Lopez, 2014; Damanpour and Aravind, 2012; Rubera and Kirca, 2012). The overall aim of this research was to develop scales to understand impact of knowledge transfer (KT) and interorganizational relationships (IOR) to innovation outcomes.

The unique contribution of this study is that it has provided a globally novel view of innovation effectiveness in organizations by connecting and mapping the area of influence of KT and IOR to innovation outcomes in software companies in SEE. This study has made a novel contribution to knowledge through the development of scales measuring the influence of positive and negative behaviours of KT and IOR to innovation outcomes as a first measure of its kind in the literature. This research has bridged the theoretical internal process view of innovation with the external outcome view of innovation addressing the gap in knowledge. The study has uncovered existence of duality nature of behaviours influencing innovation outcome, suggesting that both positive and negative behaviours of KT and IOR could co-exist and in parallel independently influence innovation outcome. This study has contributed in providing novel views of what does not work for innovation by uncovering negative behaviours (KT-, IOR-) to innovation outcomes. Some new questions came up from this work related to the understanding of decision making in unpredictable environments and not practicing, or poorly practicing open innovation in a network of companies collaborating together requiring further research. Findings of this research suggest that companies innovating in SEE are also able to produce globally novel innovation practicing the market-based view of innovation. This suggest that exploratory discovery of knowledge positively supports globally novel innovation developments versus adoption and imitation. This research has also provided unique contribution in the first application of AFA methodology typically used in behavioural research to the field of innovation research providing novel insights.

Used by researchers, measures developed through this study and understanding of KT and IORs positive and negative influence to innovation outcomes may help further contribute in facilitating models of innovation effectiveness in academic research. Used by practitioners, scales developed through this research can be used to regularly measure and understand positive and negative behaviours of KT and IOR in organizations indicating areas to strengthen and improve, avoid and change to support improvements to innovation effectiveness in organizations. Regular assessment of innovation measurements in organizations is important as it influences managers to initiate quicker course corrections and organisational improvements, in turn positively influencing their innovation capability (Saunila, 2017b).

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APPENDIX I: Scales of KT and IOR to Innovation Outcomes

Academics and practitioners are encouraged to test the scales of KT and IOR to innovation outcomes developed through this study. Research opportunities exist to test the scales country by country, and also to test the scales in other developing countries and mature economies worldwide. Academics and practitioners are also encouraged to test the scales in other industries outside of IT and on larger samples. Such studies would indicate generalizability of measures to other countries, regions, economies and industries.

To measure, use the below scales to ask participants on their agreement or disagreement (from strongly disagree to strongly agree) with each statement on the 7-Point Likert scale:

KT+ measure

Use this scale to **measure positive influence of KT to innovation outcomes.**

Answer the following: Thinking back about my innovation activities on knowledge transfer with others that were SUPPORTIVE of my innovation: I DID ….

8. Seek to understand the way customers use my products and/or services	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
9. Have flexibility in discovering new knowledge useful to my innovation	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
10. Learn from customers in order to develop my innovation	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
11. Use rich communication media (e.g., video, presentation, animations) that were not text-only	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
12. Actively combine multiple sources of knowledge to acquire new knowledge	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
13. Proactively apply the new knowledge acquired	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
14. Use IT infrastructure for knowledge management activities	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree

KT- measure

Use this scale to **measure negative influence of KT to innovation outcomes.**

Answer the following: Thinking back about my innovation activities on knowledge transfer with others that were NOT SUPPORTIVE of my innovation: I DID NOT …

8. Document knowledge verbally sourced from external parties	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
9. Strive to have a good quality of recorded knowledge (i.e., documentation)	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
10. Strive to spend as little time as possible in meetings	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
11. Take market conditions into consideration	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
12. Source knowledge from multiple sources	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
13. Create a plan for the type of knowledge I needed to acquire	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
14. Attempt to understand the type of knowledge that I needed to acquire	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree

IOR+ measure

Use this scale to **measure positive influence of IORs to innovation outcomes.**

Answer the following: Thinking back about my innovation activities in cooperating with others that were SUPPORTIVE of my innovation: I DID ….

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
10. Take responsibility for my own actions in my partnerships	○	○	○	○	○	○	○
11. Make myself open to learn from my partner’s cultural specificities	○	○	○	○	○	○	○
12. Build a good reputation as a trustworthy partner to others	○	○	○	○	○	○	○
13. Honour my partnership commitments	○	○	○	○	○	○	○
14. Need to believe that I was dealing with a trustworthy partner	○	○	○	○	○	○	○
15. Recognize my partner's work as valuable	○	○	○	○	○	○	○
16. Need to believe that I was dealing with a reliable partner	○	○	○	○	○	○	○
17. Have transparent communication	○	○	○	○	○	○	○
18. Have clear expectations of my partner responsibilities	○	○	○	○	○	○	○

IOR- measure

Use this scale to **measure negative influence of IORs to innovation outcomes.**

Answer the following: Thinking back about my innovation activities in cooperating with others that were NOT SUPPORTIVE of my innovation: I DID NOT ….

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
8. Take responsibility for my own actions in my partnerships	○	○	○	○	○	○	○
9. Make myself open to learn from my partner’s cultural specificities	○	○	○	○	○	○	○
10. Build a good reputation as a trustworthy partner to others	○	○	○	○	○	○	○
11. Honour my partnership commitments	○	○	○	○	○	○	○
12. Need to believe that I was dealing with a trustworthy partner	○	○	○	○	○	○	○
13. Recognize my partner's work as valuable	○	○	○	○	○	○	○
14. Need to believe that I was dealing with a reliable partner	○	○	○	○	○	○	○

APPENDIX II: Ethics Approvals

Included in this section for the reference are ethics approval letters from the University of Sheffield for all three phases AFA I, AFA II and AFA III of the field research. Obtaining ethics approval consisted of following a strict university procedure and guidelines on ensuring protection of participant's personally identifiable information, treating and storing research data, ensuring data is anonymously used to present findings of the research, including ensuring a personal wellbeing of the participants and the researcher throughout the field research process.

Ethics approval letter for AFA I phase of the field research, approved on 2016-04-07.

The University Of Sheffield.

Downloaded: 25/11/2018
Approved: 07/04/2016

Danimir Ljepava
Registration number: 90252255
Management School
Programme: Management

Dear Danimir

PROJECT TITLE: Evaluating Determinants of Innovation Outcome in Information Technology Companies in SEE: Influence of Interorganizational Relationships and Knowledge Transfer
APPLICATION: Reference Number 002602

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 07/04/2016 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 002602 (dated 06/04/2016).
- Participant information sheet 1014656 version 3 (06/04/2016).
- Participant consent form 1014657 version 2 (06/04/2016).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Yours sincerely

Rebecca Roberts
Ethics Administrator
Management School

Ethics approval letter for AFA II phase of the field research, approved on 2017-09-26.

The University Of Sheffield.

Downloaded: 25/11/2018
Approved: 26/09/2017

Danimir Ljepava
Registration number: 90252255
Management School
Programme: Management

Dear Danimir

PROJECT TITLE: Evaluating Determinants of Innovation Outcome in Information Technology Companies in SEE: Influence of Interorganizational Relationships and Knowledge Transfer - Phase 2
APPLICATION: Reference Number 010724

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 26/09/2017 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 010724 (dated 30/07/2017).
- Participant information sheet 1034760 version 1 (30/07/2017).
- Participant consent form 1034761 version 1 (30/07/2017).

The following optional amendments were suggested:

Overall, it is a well written application. You would still need to take care of the comments from the three reviewers in the different sections. In particular, you need to be careful about the amount of data you are intending to collect and analyse. It is okay to have both information sheet and consent in the same document for the survey questionnaire but you would need to take care of forced tick options for the consent for the online survey. All the best!

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Yours sincerely

Lucy Bartrick
Ethics Administrator
Management School

Ethics approval letter for AFA III phase of the field research, approved on 2018-03-21.

The University Of Sheffield.

Approved: 21/03/2018

Danimir Ljepava
Registration number: 90252255
Management School
Programme: Management

Dear Danimir

PROJECT TITLE: Evaluating Determinants of Innovation Outcome in Information Technology Companies in SEE: Influence of Interorganizational Relationships and Knowledge Transfer - Phase 3
APPLICATION: Reference Number 018559

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 21/03/2018 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 018559 (dated 14/03/2018).
- Participant information sheet 1041647 version 1 (14/03/2018).
- Participant consent form 1041648 version 1 (14/03/2018).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Yours sincerely

Lucy Bartrick
Ethics Administrator
Management School

APPENDIX III – Demographics Summary for AFA I, II and III Phases

Summarized common participant demographics for AFA I, II and III phases of the field research are provided in the table below.
Note: The highest values are highlighted.

Participant Demographics	**Sample size** / **Data collection method**	**AFA I phase** **N = 30 participants** Interviews (qualitative)	**AFA II phase** **N = 60 participants** Surveys (quantitative)	**AFA III phase** **N = 145 participants** Surveys (quantitative)
Gender	Male	97%	83.33%	82.76%
	Female	3%	16.67%	17.24%
Age	20-29 years of age	10%	8.33%	20.00%
	30-39 years of age	50%	53.33%	44.14%
	40-49 years of age	37%	30.00%	28.28%
	> 50 years of age	3%	8.33%	7.59%
Education	High school	10%	11.67%	8.28%
	Undergraduate (B.Sc.)	63%	28.33%	33.79%
	Master's degree	27%	48.33%	53.79%
	PhD	-	11.67%	4.14%
Position	Software developers and tech. roles	27%	48.30%	44.83%
	Middle management	53%	26.67%	16.55%
	Senior managers	20%	25.00%	38.62%
Professional experience	< 1 year of experience	-	-	1.38%
	1-5 years of experience	7%	16.67%	15.17%
	6-10 years of experience	43%	23.33%	27.59%
	11-15 years of experience	17%	26.67%	22.07%
	16-20 years of experience	27%	18.33%	17.24%
	> 20 years of experience	7%	15.00%	16.55%
Country of residence	How many countries covered in SEE by the research	**8 countries of SEE** (Serbia, Bulgaria, Romania, Croatia, Greece, Slovenia, Montenegro, Bosnia & Herz.)*	**9 countries of SEE** (Serbia, Slovenia, Bulgaria, Romania, Bosnia & Herz., Albania, Croatia, North Macedonia, Montenegro)*	**11 countries of SEE** (Serbia, Romania, Slovenia, Bulgaria, Croatia, FRYOM, Greece, Albania, Bosnia & Herz., Kosovo, Montenegro)*

* Please note that additional demographics details are available in demographics overview for each phase in Appendix III – Demographics Summary for AFA I, II and III , Appendix VI – Demographics for AFA II Phase and Appendix VIII – Demographics for AFA III Phase.

Summarized common company demographics for AFA I, II and III phases of the field research are provided in the table below.
Note: The highest values are highlighted.

Company Demographics		AFA I phase	AFA II phase	AFA III phase
	Sample size	N = 30 participants	N = 60 participants	N = 145 participants
	Data collection method	Interviews (qualitative)	Surveys (quantitative)	Surveys (quantitative)
Company size	< 50 employees (small companies)	63%	40.00%	44.83%
	51-250 employees (medium companies)	33%	11.67%	20.69%
	>250 employees (large companies)	3%	48.33%	34.48%
Company age	< 5 years of age	-	18.33%	24.83%
	6-10 years of age	-	16.67%	17.24%
	>10 years of age	-	65.00%	57.93%
Primary activity	Software, cloud, R&D	80%	48.33%	51.03%
	Professional services (i.e. IT outsourcing)	13%	31.67%	33.79%
	Hardware development (embedded software)	7%	11.67%	9.66%
	Other (please specify)	-	8.33%	5.52%
Ownership structure	Wholly locally owned	-	36.67%	39.31%
	More local, some foreign owned	-	8.33%	6.90%
	50/50 local and foreign owned	-	10.00%	3.45%
	More foreign, some local owned	-	13.33%	13.10%
	Wholly foreign owned	-	31.67%	37.24%
Where is the core of innovation being developed	Developed entirely locally	-	-	43.45%
	More locally, some abroad	-	-	20.69%
	50/50 locally and abroad	-	-	14.48%
	More abroad, some locally	-	-	17.24%
	Entirely developed abroad	-	-	4.14%

* Please note that additional demographics details are available in demographics overview for each phase in Appendix III – Demographics Summary for AFA I, II and III , Appendix VI – Demographics for AFA II Phase and Appendix VIII – Demographics for AFA III Phase.

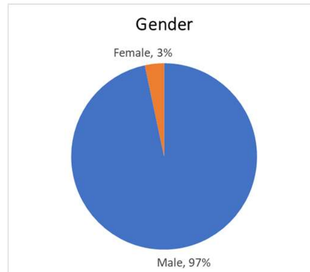
APPENDIX IV – Demographics for AFA I Phase

Details of the AFA I phase demographics are provided in this section.

Participant Demographics (AFA I phase)

Gender	Count	%
Male	29	97%
Female	1	3%

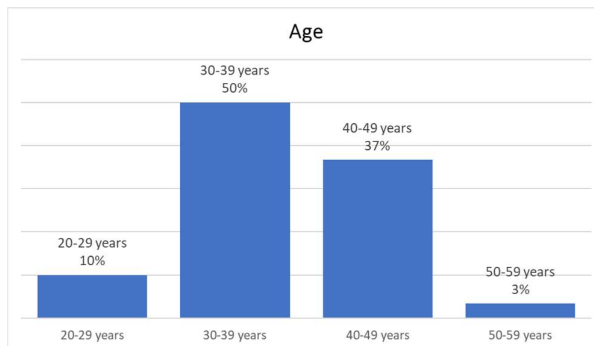
N=30



Participant gender – AFA I phase

Age	Count	%
20-29 years	3	10%
30-39 years	15	50%
40-49 years	11	37%
50-59 years	1	3%

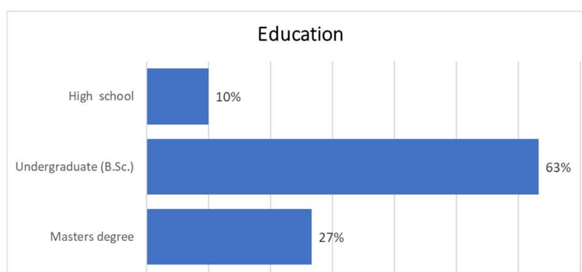
N=30



Participant age – AFA I phase

Education level	Count	%
Undergraduate (B.Sc.)	19	63%
Master's degree	8	27%
High school	3	10%

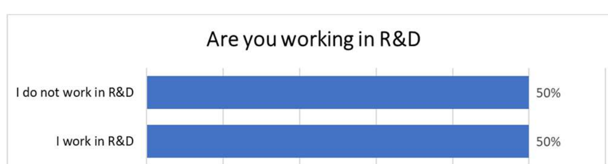
N=30



Participant education – AFA I phase

Do you work in R&D	Count	%
I work in R&D	15	50%
I do not work in R&D	15	50%

N=30



Are you working in R&D – AFA I phase

Position	Count	%
Software developers and technical roles	8	27%
Middle management	16	53%
Senior managers	6	20%

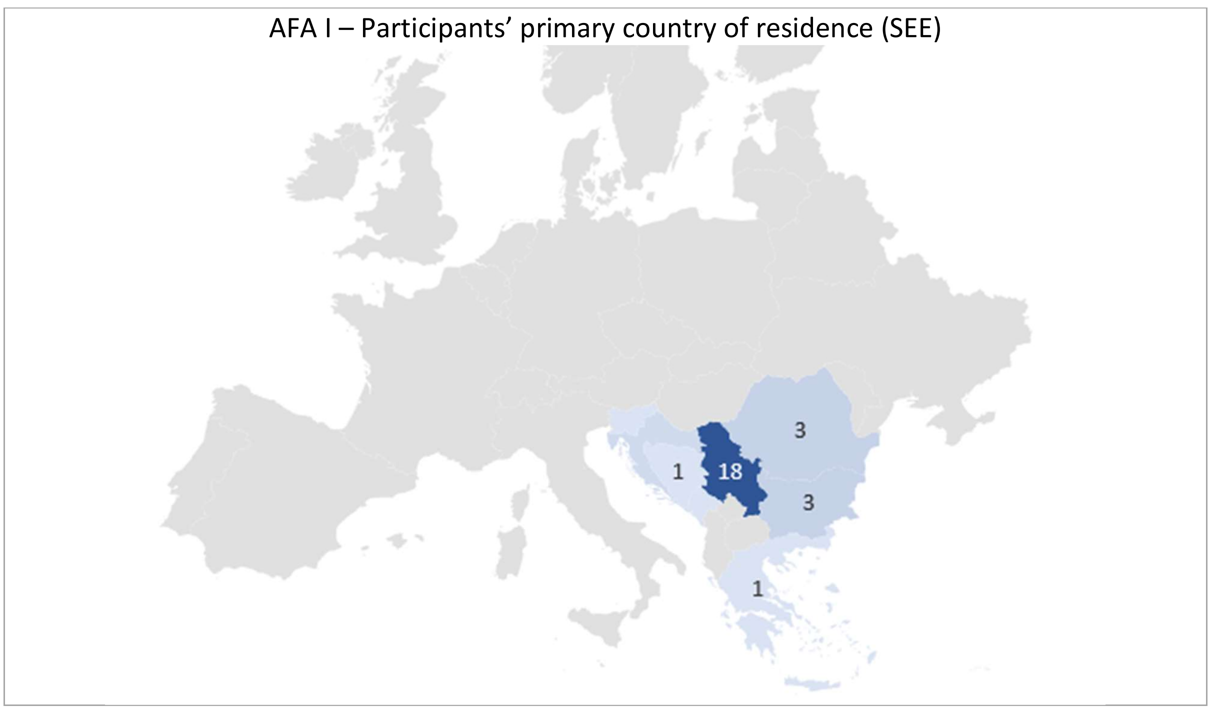
N=30

Participant job position – AFA I phase

Professional experience	Count	%
1-5 yrs. of experience	2	7%
6-10 yrs. of experience	13	43%
11-15 yrs. of experience	5	17%
16-20 yrs. of experience	8	27%
> 20 yrs. of experience	2	7%

N=30

Participant professional experience – AFA I phase



Participant country of residence in SEE – AFA I phase

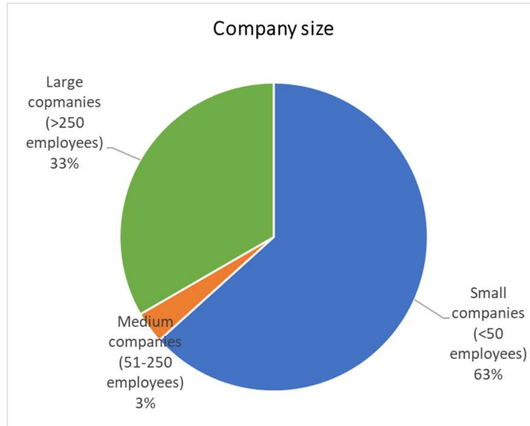
Country	Serbia	Bulgaria	Romania	Croatia	Greece	Slovenia	Montenegro	Bosnia & Herz.
Percentage	60%	10%	10%	7%	3%	3%	3%	3%
Count	18	3	3	2	1	1	1	1

Participant country of residence – AFA I phase

Company Demographics (AFA I phase)

(C2) Company size	Count	%
< 50 employees (Small companies)	19	63%
51-250 employees (Medium companies)	1	3%
> 250 employees (Large companies)	10	33%

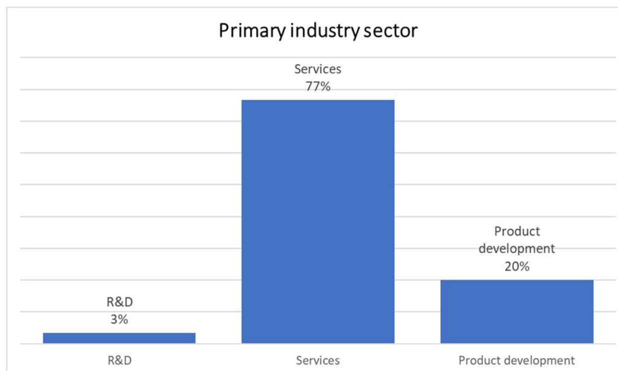
N=30



Company size – AFA I phase

(C2) Primary industry sector	Count	%
Services	23	77%
Product development	6	20%
R&D	1	3%

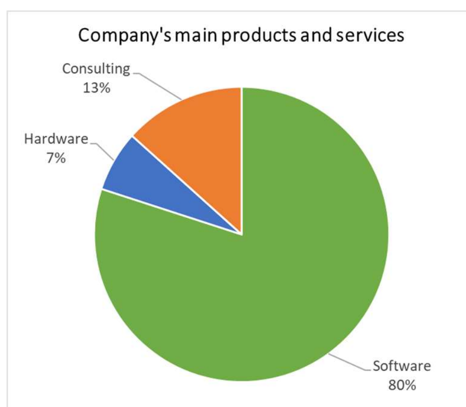
N=30



Primary industry sector – AFA I phase

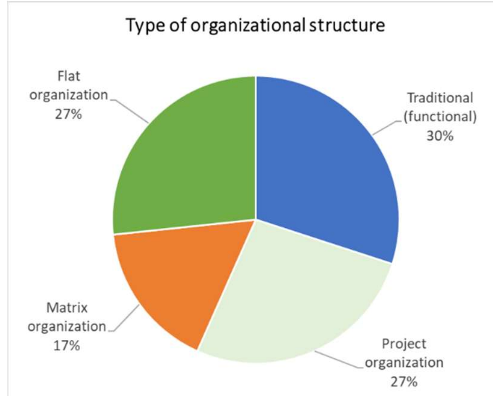
Company's main product and services	Count	%
Software	24	80%
Consulting	4	13%
Hardware	2	7%

N=30



Predominant activity type – AFA I phase

Type of organizational structure	Count	%
Traditional (functional)	9	30%
Project organization	8	27%
Flat organization	8	27%
Matrix organization	5	17%

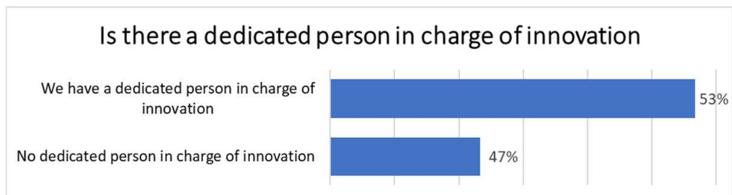


N=30

Type of organizational structure – AFA I phase

Innovation Activities (AFA I phase)

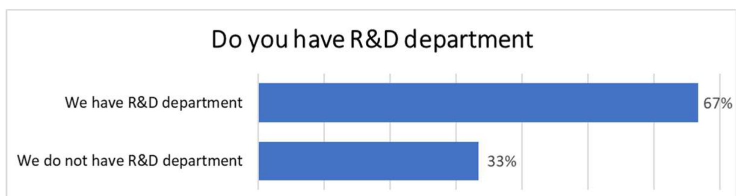
Dedicated person in charge of innovation	Count	%
We have a dedicated person in charge of innovation	16	53%
No dedicated person in charge of innovation	14	47%



N=30

Is there a dedicated person in charge of innovation – AFA I phase

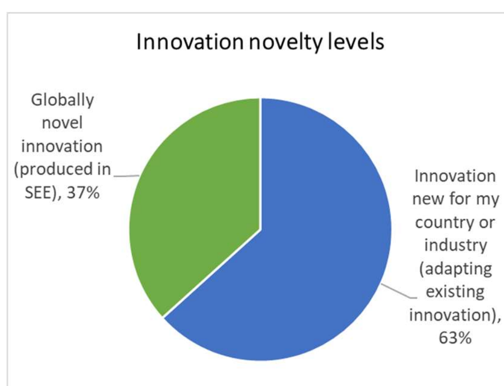
Do you have R&D department	Count	%
We have R&D department	20	67%
We do not have R&D department	10	33%



N=30

Do you have R&D department – AFA I phase

(I08) Innovation novelty level	Count	%
Innovation new for my country or industry (adapting existing innovation)	19	63%
Globally novel innovation (produced in SEE)	11	37%

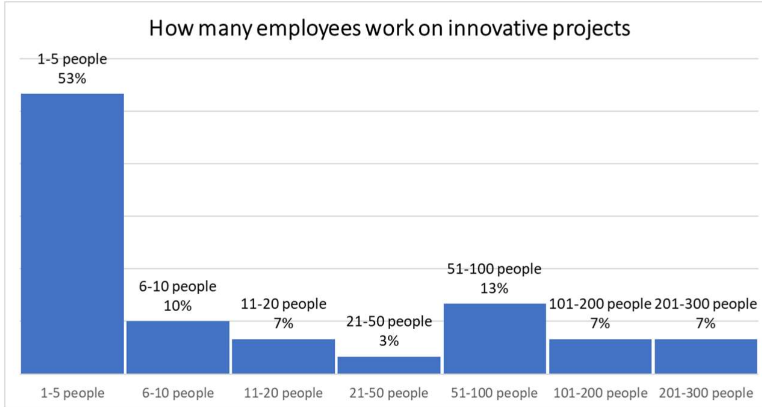


N=30

Innovation novelty levels – AFA I phase

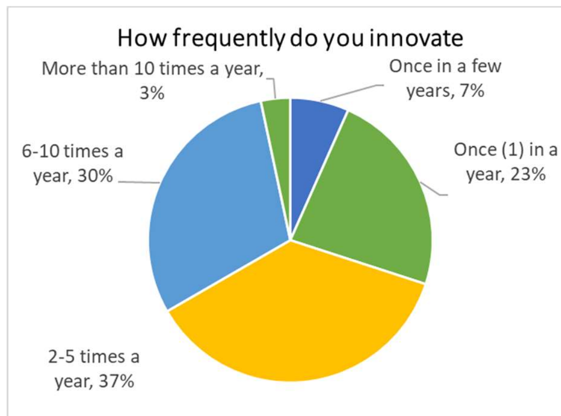
Employees	Count	%
1-5 people	16	53%
6-10 people	3	10%
11-20 people	2	7%
21-50 people	1	3%
51-100 people	4	13%
101-200 people	2	7%
201-300 people	2	7%

N=30



Number of employees working on innovative projects – AFA I phase

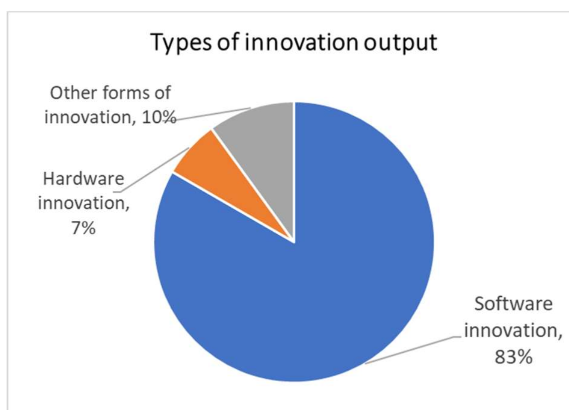
How frequently does your company innovate	Count	%
2-5 times a year	11	37%
6-10 times a year	9	30%
Once (1) in a year	7	23%
Once in a few years	2	7%
More than 10 times a year	1	3%



N=30

How frequently does your company innovate - AFA I phase

Types of innovation output	Count	%
Software innovation	25	83%
Hardware innovation	2	7%
Other forms of innovation	3	10%



N=30

Types of innovation output - AFA I phase

It should be noted that due to small sample numbers in certain categories it was necessary to collapse some categories into larger categories with logical break off points for data analysis in AFA II phase.

Participant Age (AFA II)

*original categories

Participant age	Count	%
20-24 years of age	1	1.67%
25-29 years of age	4	6.67%
30-34 years of age	15	25.00%
35-39 years of age	17	28.33%
40-44 years of age	13	21.67%
45-49 years of age	5	8.33%
Over 50 years of age	5	8.33%

N=60

→

*collapsed categories

Participant age	Count	%
20-29 years of age	5	8.33%
30-39 years of age	32	53.33%
40-49 years of age	18	30.00%
> 50 years of age	5	8.33%

N=60

Participants age collapsed categories – AFA II phase

Company Size (AFA II)

*original categories

Organization size	Count	%
Self-employed	2	3.33%
1-9 employees	11	18.33%
10-50 employees	11	18.33%
51-250 employees	7	11.67%
> 250 employees	29	48.33%

N=60

→

*collapsed categories

Organization size	Count	%
< 50 employees (small companies)	24	40.00%
51-250 employees (medium companies)	7	11.67%
> 250 employees (large companies)	29	48.33%

N=60

Organization size collapsed categories – AFA II phase

Company Age (AFA II)

*original categories

Company age	Count	%
1-2 years	3	5.00%
3-5 years	8	13.33%
6-10 years	10	16.67%
>10 years	39	65.00%

N=60

→

*collapsed categories

Company age	Count	%
< 5 years	11	24.83%
6-10 years	10	30.34%
>10 years	39	44.83%

N=60

Company age collapsed categories – AFA II phase

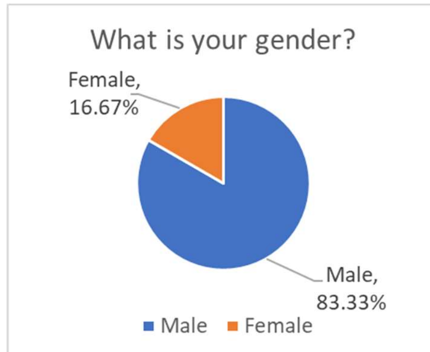
APPENDIX VI – Demographics for AFA II Phase

Details of the AFA II phase demographics are provided in this section.

Participant Demographics (AFA II phase)

What is your gender?	Count	%
Male	50	83.33%
Female	10	16.67%

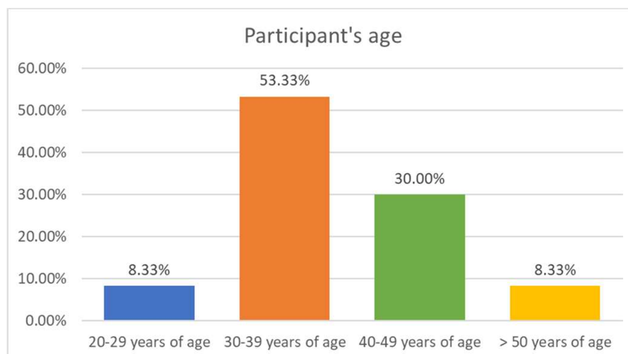
N=60



Participant gender – AFA II phase

Age	Count	%
20-29 years of age	5	8.33%
30-39 years of age	32	53.33%
40-49 years of age	18	30.00%
> 50 years of age	5	8.33%

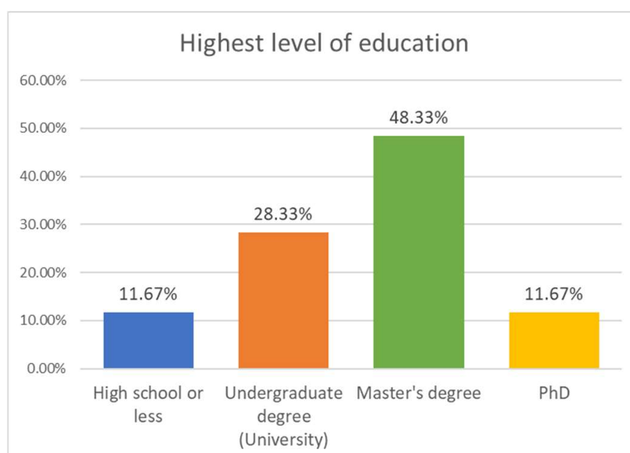
N=60



Participant age – AFA II phase

Your highest level of education	Count	%
Master's degree	29	48.33%
Undergraduate degree (University)	17	28.33%
High school or less	7	11.67%
PhD	7	11.67%

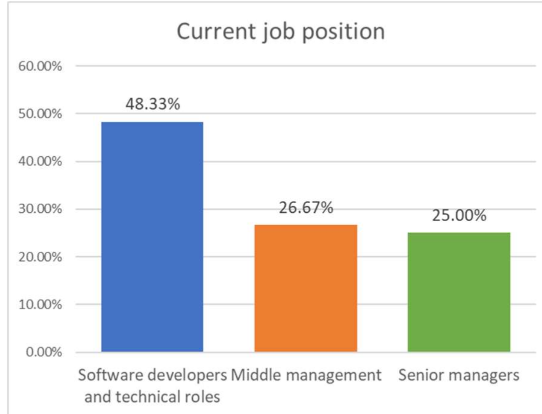
N=60



Participant education level – AFA II phase

Position	Count	%
Software developers and technical roles	29	48.3%
Middle management	16	26.67%
Senior managers	15	25.00%

N=60

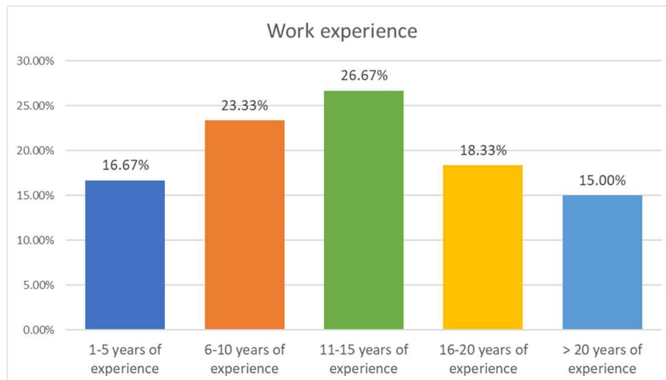


Participant job position – AFA II phase

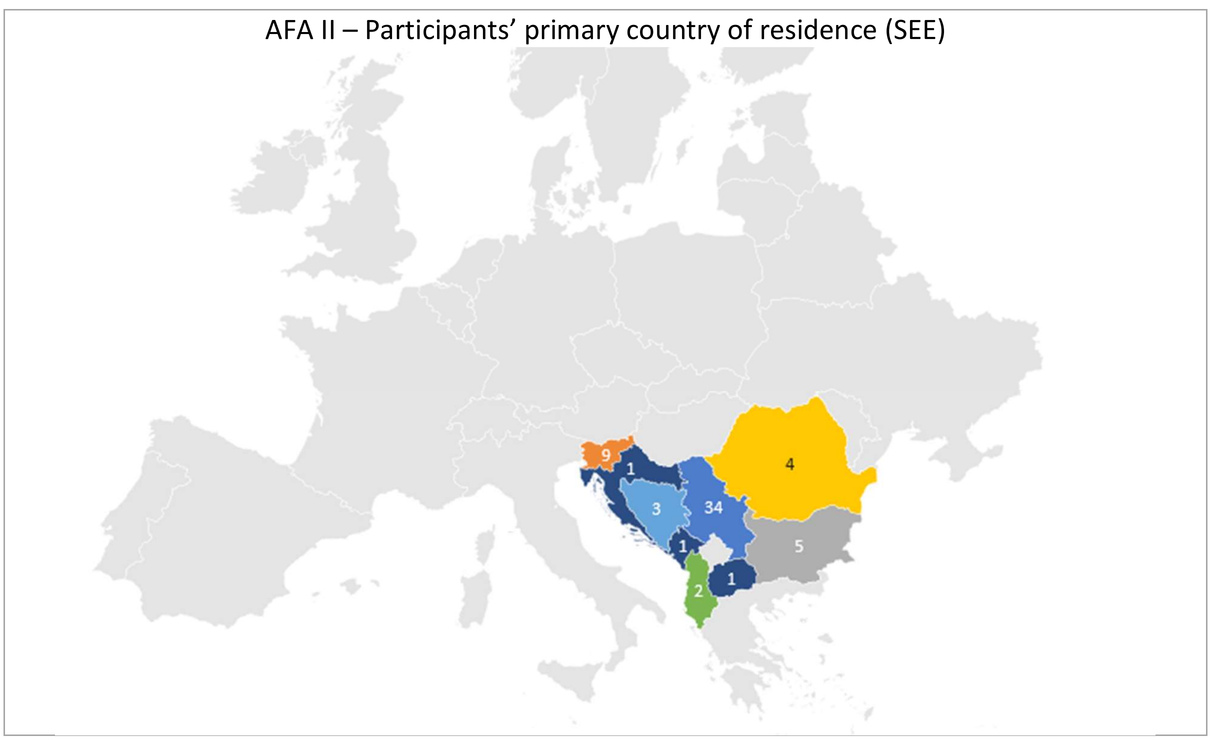
*years of professional experience

Professional experience	Count	%
1-5 yrs. of experience	10	16.67%
6-10 yrs. of experience	14	23.33%
11-15 yrs. of experience	16	26.67%
16-20 yrs. of experience	11	18.33%
> 20 yrs. of experience	9	15.00%

N=60



Participant professional experience – AFA II phase



Participant country of residence in SEE – AFA II phase

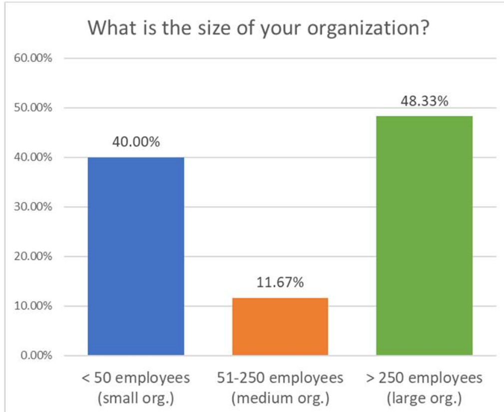
Country	Serbia	Slovenia	Bulgaria	Romania	Bosnia & Herz.	Albania	Croatia	North Macedonia	Montenegro
Percentage	56.67%	15.00%	8.33%	6.67%	5.00%	3.33%	1.67%	1.67%	1.67%
Count	34	9	5	4	3	2	1	1	1

Participant country of residence – AFA II phase

Company Demographics (AFA II phase)

Organization size	Count	%
< 50 employees (small company)	24	40.00%
51-250 employees (medium company)	7	11.67%
> 250 employees (large company)	29	48.33%

N=60



Company size – AFA II phase

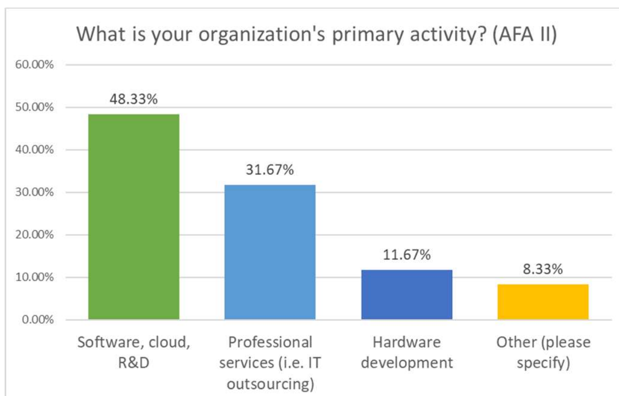
Age (years)	Count	%
< 5 years	11	18.33%
6-10 years	10	16.67%
>10 years	39	65.00%

N=60

Company age – AFA II phase

Your company's primary activity	Count	%
Software, cloud, R&D	29	48.33%
Professional services (i.e. IT outsourcing)	19	31.67%
Hardware development	7	11.67%
Other (please specify)	5	8.33%

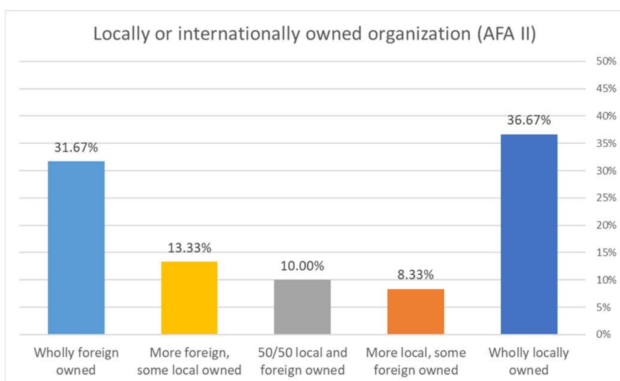
N=60



Company primary activity– AFA II phase

Are you a locally or internationally owned organization?	Count	%
Wholly locally owned	22	36.67%
Wholly foreign owned	19	31.67%
More foreign, some local owned	8	13.33%
50/50 local and foreign owned	6	10.00%
More local, some foreign owned	5	8.33%

N=60



Company ownership – AFA II phase

APPENDIX VII – Data Preparation for AFA III Phase

It should be noted that due to small sample numbers in certain categories it was necessary to collapse some categories into larger categories with logical break off points for data analysis in AFA III phase.

Participant Age (AFA III)

*original categories

Age	Count	%
20-24 years of age	3	2.07%
25-29 years of age	26	17.93%
30-34 years of age	28	19.31%
35-39 years of age	36	24.83%
40-44 years of age	27	18.62%
45-49 years of age	14	9.66%
50-59 years of age	9	6.21%
60-65 years of age	2	1.38%

N=145

→

*collapsed categories

Age	Count	%
20-29 years of age	29	20.00%
30-39 years of age	64	44.14%
40-49 years of age	41	28.28%
50-65 years of age	11	7.59%

N=145

Participant age collapsed categories – AFA III phase

Participant Education (AFA III)

*original categories

Education	Count	%
Master's degree	77	53.10%
Undergraduate degree	49	33.79%
High school	11	7.59%
PhD	6	4.14%
Other	2	1.38%

N=145

→

*collapsed categories

Education	Count	%
Master's degree	78	53.79%
Undergraduate degree	49	33.79%
High school	12	8.28%
PhD	6	4.14%

N=145

Participant education level – AFA III phase

Participant Country of Residence (AFA III)

*original categories

	Largest - lave as-is				Collapse into others						
Country	Serbia	Romania	Slovenia	Bulgaria	Croatia	FRYOM	Greece	Albania	Bosnia an	Kosovo	Monteneg
Percentage	44.83%	14.48%	11.72%	8.28%	4.83%	4.14%	3.45%	2.76%	2.07%	2.07%	1.38%
Count	65	21	17	12	7	6	5	4	3	3	2
											N=145

Participant country of residence original categories - AFA III phase

*collapsed categories

Country	Serbia	Romania	Slovenia	Bulgaria	Others
Percentage	44.83%	14.48%	11.72%	8.28%	20.69%
Count	65	21	17	12	30

N=145

Participant country of residence collapsed categories - AFA III phase

Company Size (AFA III)

*original (organization size)

Company size	Count	%
Self-employed	1	0.69%
1-10 employees	30	20.69%
11-50 employees	34	23.45%
51-250 employees	30	20.69%
251-500 employees	3	2.07%
501-1000 employees	8	5.52%
> 1000 employees	39	26.90%

N=145

→

*collapsed (organization size)

Company size	Count	%
< 50 employees (small company)	65	44.83%
51-250 employees (medium company)	30	20.69%
> 250 employees (large company)	50	34.48%

N=145

Company size collapsed categories – AFA III phase

Company Age (AFA III)

*original categories

Company age	Count	%
< 1 years	1	0.69%
1-2 years	3	2.07%
3-5 years	32	22.07%
6-10 years	25	17.24%
11-15 years	19	13.10%
16-20 years	19	13.10%
> 20 years	46	31.72%

N=145

→

*collapsed categories

Company age	Count	%
< 5 years	36	24.83%
6-10 years	25	17.24%
> 10 years	84	57.93%

N=145

Company age collapsed categories – AFA III phase

Company Country of Residence (AFA III)

*original categories

	Largest - leave as-is				Collapse into others ->						
Country	**USA**	**Serbia**	**Slovenia**	**Romania**	**Croatia**	**FRYOM**	**Germany**	**Bulgaria**	**UK**	**Sweden**	**witzerland**
Percentag	18.62%	15.17%	10.34%	9.66%	4.83%	4.14%	3.45%	2.76%	2.76%	2.76%	2.76%
Count	27	22	15	14	7	6	5	4	4	4	4
Country	**BiH**	**Albania**	**Greece**	**Netherland**	**Australia**	**Kosovo**	**Monteneg**	**Canada**	**France**	**New Zeal**	**Austria**
Percentag	2.07%	2.07%	2.07%	2.07%	2.07%	1.38%	1.38%	1.38%	1.38%	1.38%	0.69%
Count	3	3	3	3	3	2	2	2	2	2	1
Country	**China**	**Finland**	**Ireland**	**Norway**	**Poland**	**Portugal**	**Russian Federation**				
Percentag	0.69%	0.69%	0.69%	0.69%	0.69%	0.69%	0.69%				
Count	1	1	1	1	1	1	1				

Company country of residence original categories – AFA III phase

*collapsed categories

Country	USA	Serbia	Slovenia	Romania	Others
Percentage	18.62%	15.17%	10.34%	9.66%	46.21%
Count	27	22	15	14	67

N=145

Company country of residence collapsed categories – AFA III phase

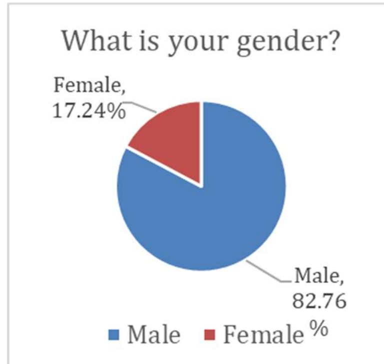
APPENDIX VIII – Demographics for AFA III Phase

Details of the AFA III phase demographics are provided in this section.

Participant Demographics (AFA III phase)

Gender	Count	%
Male	120	82.76%
Female	25	17.24%

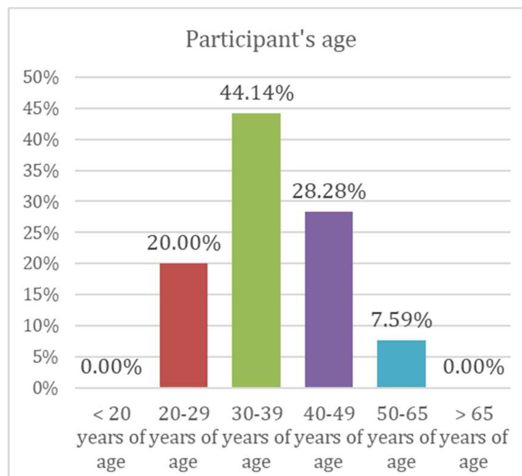
N=145



Participant gender – AFA III phase

Age	Count	%
< 20 years of age	0	0.00%
20-29 years of age	29	20.00%
30-39 years of age	64	44.14%
40-49 years of age	41	28.28%
50-65 years of age	11	7.59%
> 65 years of age	0	0.00%

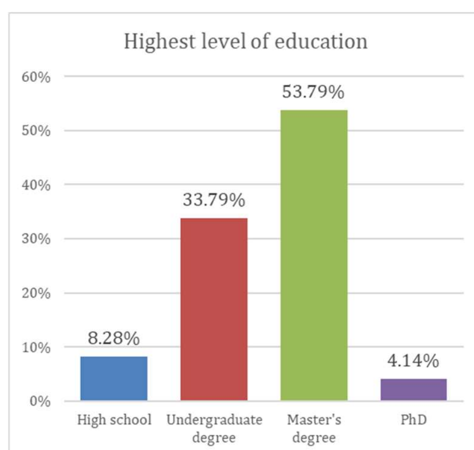
N=145



Participant age – AFA III phase

Education	Count	%
Master's degree	78	53.79%
Undergraduate degree	49	33.79%
High school	12	8.28%
PhD	6	4.14%

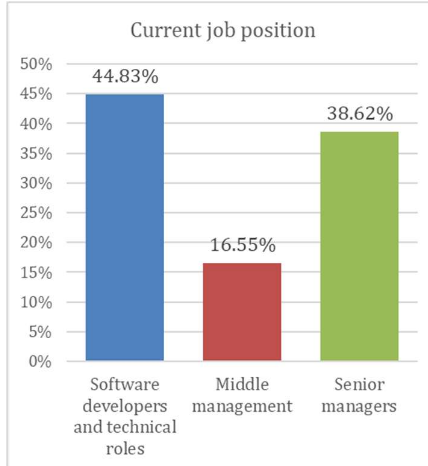
N=145



Participant education level – AFA III phase

Position	Count	%
Software developers and technical roles	65	44.83%
Senior managers	56	38.62%
Middle management	24	16.55%

N=145



Participant job position – AFA III phase

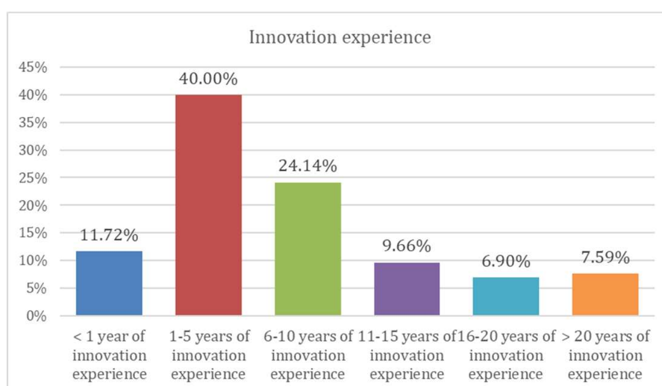
Professional experience	Count	%
< 1 yr. of prof. experience	2	1.38%
1-5 yrs. of prof. experience	22	15.17%
6-10 yrs. of prof. experience	40	27.59%
11-15 yrs. of prof. experience	32	22.07%
16-20 yrs. of prof. experience	25	17.24%
> 20 yrs. of prof. experience	24	16.55%

N=145

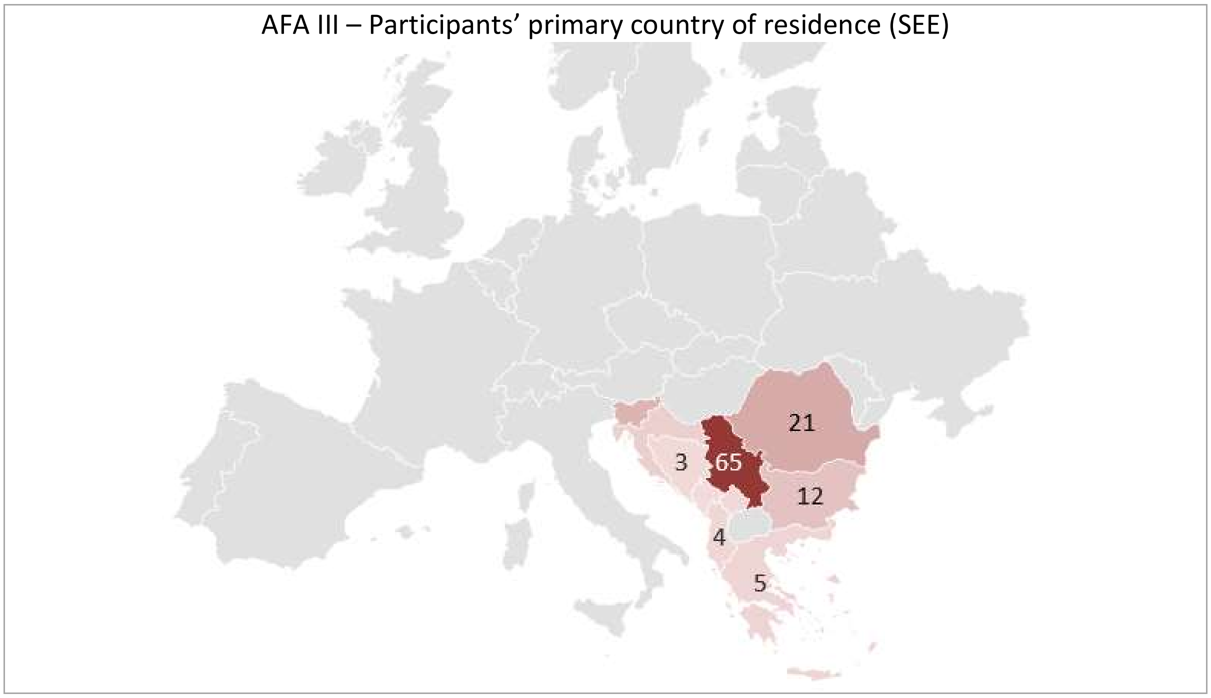
Participant professional experience – AFA III phase

Innovation experience	Count	%
< 1 yr. of innovat. exp.	17	11.72%
1-5 yrs. of innovat. exp.	58	40.00%
6-10 yrs. of innovat. exp.	35	24.14%
11-15 yrs. of innovat. exp.	14	9.66%
16-20 yrs. of innovat. exp.	10	6.90%
>20 yrs. of innovation exp.	11	7.59%

N=145



Participant innovation experience – AFA III phase



Participant country of residence - AFA III phase

Country	Serbia	Romania	Slovenia	Bulgaria	Croatia	FRYOM	Greece	Albania	Bosnia an	Kosovo	Montenegro
Percentage	44.83%	14.48%	11.72%	8.28%	4.83%	4.14%	3.45%	2.76%	2.07%	2.07%	1.38%
Count	65	21	17	12	7	6	5	4	3	3	2

Participant country of residence - AFA III phase.

Company Demographics (AFA III phase)

Organization size	Count	%
< 50 employees (small company)	65	44.83%
51-250 employees (medium company)	30	20.69%
> 250 employees (large company)	50	34.48%

N=145

Company size – AFA III phase

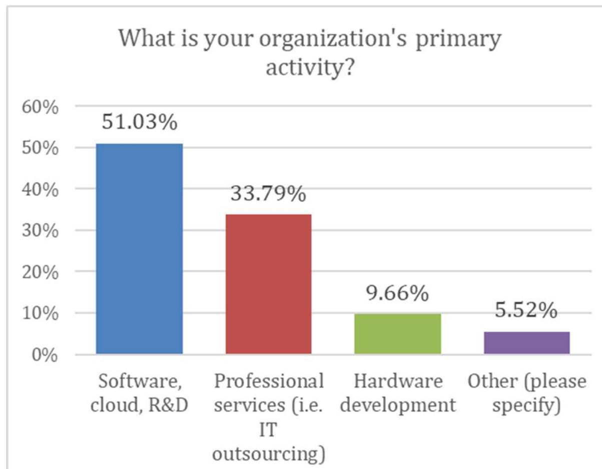
Age (years)	Count	%
< 5 years	36	24.83%
6-10 years	25	17.24%
>10 years	84	57.93%

N=145

Company age – AFA III phase

Activity	Count	%
Software, cloud, R&D	74	51.03%
Professional services (i.e. IT outsourcing)	49	33.79%
Hardware development	14	9.66%
Other (please specify)	8	5.52%

N=145



Company primary activity – AFA III phase

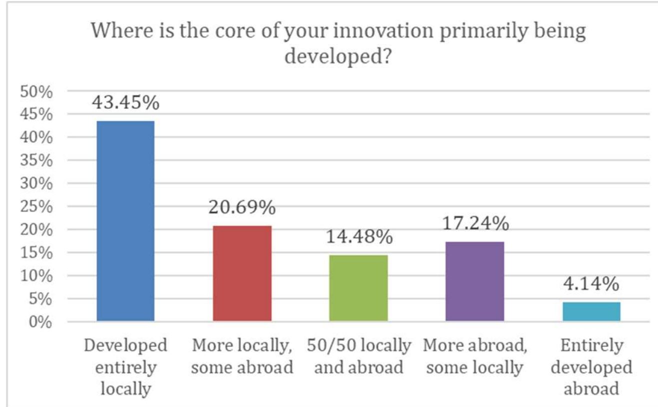
Ownership structure	Count	%
Wholly locally owned	57	39.31%
Wholly foreign owned	54	37.24%
More foreign, some local owned	19	13.10%
More local, some foreign owned	10	6.90%
50/50 local and foreign owned	5	3.45%

N=145

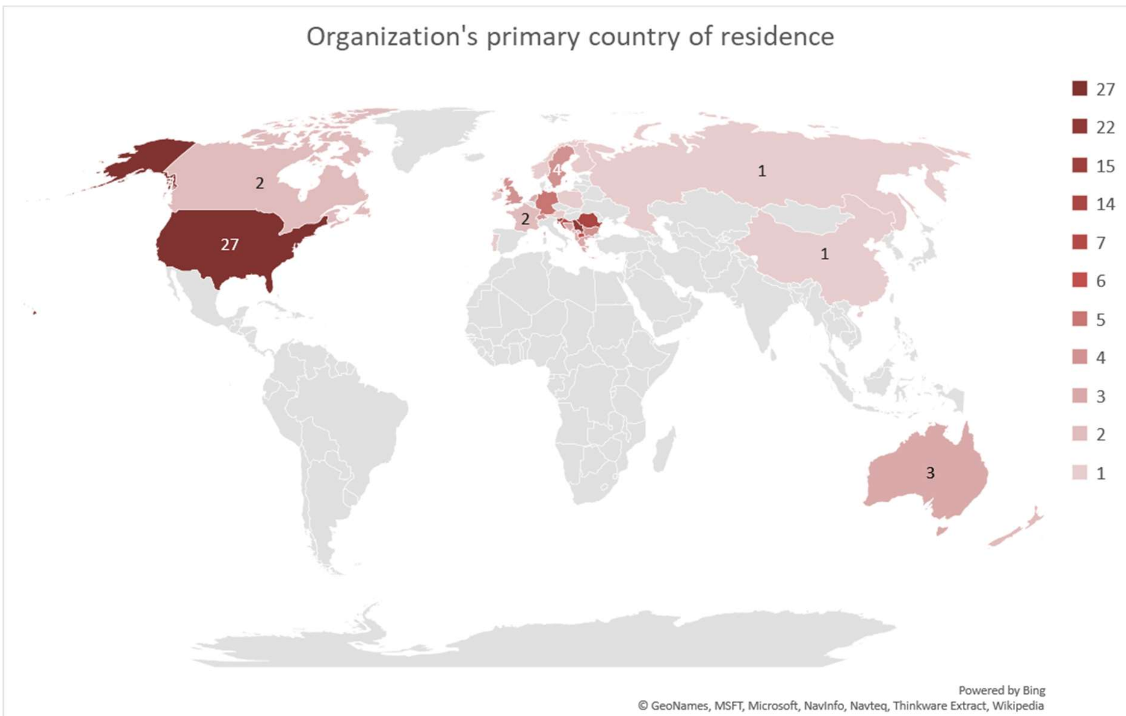
Company ownership – AFA III phase

Where is the core of innovation being developed	Count	%
Developed entirely locally	63	43.45%
More locally, some abroad	30	20.69%
More abroad, some locally	25	17.24%
50/50 locally and abroad	21	14.48%
Entirely developed abroad	6	4.14%

N=145



Location of the core innovation development – AFA III phase



Company country of residence – AFA III phase

Country	USA	Serbia	Slovenia	Romania	Croatia	FRYOM	Germany	Bulgaria	UK	Sweden	Switzerland
Percentage	18.62%	15.17%	10.34%	9.66%	4.83%	4.14%	3.45%	2.76%	2.76%	2.76%	2.76%
Count	27	22	15	14	7	6	5	4	4	4	4
Country	BiH	Albania	Greece	Netherlar	Australia	Kosovo	Montene	Canada	France	New Zeal	Austria
Percentage	2.07%	2.07%	2.07%	2.07%	2.07%	1.38%	1.38%	1.38%	1.38%	1.38%	0.69%
Count	3	3	3	3	3	2	2	2	2	2	1
Country	China	Finland	Ireland	Norway	Poland	Portugal	Russian Federation				
Percentage	0.69%	0.69%	0.69%	0.69%	0.69%	0.69%	0.69%				
Count	1	1	1	1	1	1	1				

Company country of residence – AFA III phase

APPENDIX IX – PCA and Cronbach α for the First 12 Variables of KT+ and KT-

The following table summarizes PCA and Cronbach α analysis for the first 12 variables of KT+ measure used in AFA II phase to support decision of 7 variables making the measure.

KT+ PCA (Principal Component Analysis, 11 tests) | **Cronbach Alpha (11 tests)**

Number of the top-rated behavioural acts to use for the scale?	Cumulative Total Variance Explained (%)	Components in the initial Principal Component Analysis.	Do negative correlations above 0.5 exist in the initial component matrix (Y/N)?	Components in rotated components matrix (Varimax with Kaiser Normalization)	Do negative correlations above 0.5 exist in the rotated component matrix (Y/N)?	Are there single values (i.e. distinct measure) for each component above 0.5 in the rotated component matrix (Y/N)?	Cronbach's Alpha (α) based on standardized items
2 variables*	100.000%	2	Y	2	N	Y	0.402
3 variables	89.882%	2	N	2	N	Y	0.665
4 variables	93.822%	3	N	3	N	Y	0.740
5 variables	95.187%	4	Y	4	N	Y	0.693
6 variables	87.836%	4	Y	4	N	Y	0.670
7 variables	**91.154%**	**5**	**Y**	**5**	**N**	**Y**	0.700
8 variables	92.387%	6	N	6	N	Y	0.685
9 variables	93.480%	7	Y	7	N	Y	0.712
10 variables	94.450%	8	Y	8	N	Y	0.721
11 variables	91.484%	8	Y	8	N	Y	0.757
12 variables	88.249%	8	Y	8	N	N	0.760

Note:

- The number of variables represents the number of the highest rated behavioural acts tested for the measure.
- Tests start with 2 variables as it is not possible to perform them with only 1 variable
- The first column shows the variance percentage explained based on the number of the behavioural acts (variables) tested.
- The number of components making up the measured constructs is shown in the following column.
- If there exist negatively corelated components, they are indicated in the following column.
- In case there exist negative correlations, or if there is no distinct measure for each of the principal components identified after the Varimax rotation and Kaiser normalization, this is indicated in the following two columns.
- The last column shows Cronbach alpha (α) value indicating reliability of the measure.

The following table summarizes PCA and Cronbach α analysis for the first 12 variables of KT- measure used in AFA II to support decision of 7 variables making the measure.

KT- PCA (Principal Component Analysis, 11 tests) / **Cronbach Alpha (11 tests)**

Number of the top-rated behavioural acts to use for the scale?	Cumulative Total Variance Explained (%)	Components in the initial Principal Component Analysis.	Do negative correlations above 0.5 exist in the initial component matrix (Y/N)?	Components in rotated components matrix (Varimax with Kaiser Normalization)	Do negative correlations above 0.5 exist in the rotated component matrix (Y/N)?	Are there single values (i.e. distinct measure) for each component above 0.5 in the rotated component matrix (Y/N)?	Cronbach's Alpha (α) based on standardized items
2 variables	86.398%	1	n/a	0	n/a	n/a	0.848
3 variables	91.598%	2	N	2	N	Y	0.770
4 variables	82.192%	2	Y	2	N	Y	0.794
5 variables	91.962%	3	N	3	N	Y	0.846
6 variables	88.945%	3	N	3	N	Y	0.875
7 variables	**88.837%**	**3**	**N**	**3**	**N**	**Y**	**0.904**
8 variables	90.675%	4	N	4	N	Y	0.900
9 variables	88.260%	4	N	4	N	N	0.911
10 variables	85.593%	4	N	4	N	N	0.918
11 variables	87.283%	5	Y	5	N	Y	0.891
12 variables	86.989%	5	Y	5	N	Y	0.906

Note:

- The first column of the table indicates for how many variables (behavioural acts) were taken into consideration for testing.
- Test start from 2 variables as it is not possible to run tests with only 1 variable
- The first column shows the variance percentage explained based on the number of the behavioural acts (variables) tested.
- The number of components making up the measured constructs is shown in the following column.
- If there exist negatively corelated components, they are indicated in the following column.
- In case there exist negative correlations, or if there is no distinct measure for each of the principal components identified after the Varimax rotation and Kaiser normalization, this is indicated in the following two columns.
- The last column shows Cronbach alpha (α) value indicating reliability of the measure.

APPENDIX X – PCA and Cronbach α for the First 12 Variables of IOR+ and IOR-

The following table summarizes PCA and Cronbach α analysis for the first 12 variables of IOR+ measure used in AFA II phase to support decision of 9 variables making the measure.

IOR+ PCA (Principal Component Analysis, 11 tests) | **Cronbach Alpha (11 tests)**

Number of the top-rated behavioural acts to use for the scale?	Cumulative Total Variance Explained (%)	Components in the initial Principal Component Analysis.	Do negative correlations above 0.5 exist in the initial component matrix (Y/N)?	Components in rotated components matrix (Varimax with Kaiser Normalization)	Do negative correlations above 0.5 exist in the rotated component matrix (Y/N)?	Are there single values (i.e. distinct measure) for each component above 0.5 in the rotated component matrix (Y/N)?	Cronbach's Alpha (α) based on standardized items
2 variables	100.000%	2	Y	2	N	Y	0.622
3 variables	86.086%	2	N	2	N	Y	0.748
4 variables	79.669%	2	N	2	N	Y	0.812
5 variables	75.261%	2	N	2	N	Y	0.855
6 variables	81.648%	3	N	3	N	Y	0.874
7 variables	81.995%	3	Y	3	N	Y	0.892
8 variables	79.887%	3	N	3	N	Y	0.901
9 variables	**83.695%**	**4**	**Y**	**4**	**N**	**Y**	**0.906**
10 variables	86.148%	5	Y	5	N	N	0.904
11 variables	84.198%	5	Y	5	N	Y	0.901
12 variables	81.904%	5	N	5	N	N	0.902

Note:

- The first column of the table indicates for how many variables (behavioural acts) were taken into consideration for testing.
- Test start from 2 variables as it is not possible to run tests with only 1 variable
- The first column shows the variance percentage explained based on the number of the behavioural acts (variables) tested.
- The number of components making up the measured constructs is shown in the following column.
- If there exist negatively corelated components, they are indicated in the following column.
- In case there exist negative correlations, or if there is no distinct measure for each of the principal components identified after the Varimax rotation and Kaiser normalization, this is indicated in the following two columns.
- The last column shows Cronbach alpha (α) value indicating reliability of the measure.

The following table summarizes PCA and Cronbach α analysis for the first 12 variables of IOR- measure used in AFA II phase to support decision of 7 variables making the measure.

IOR- PCA (Principal Component Analysis, 11 tests) | **Cronbach Alpha (11 tests)**

Number of the top-rated behavioural acts to use for the scale?	Cumulative Total Variance Explained (%)	Components in the initial Principal Component Analysis.	Do negative correlations above 0.5 exist in the initial component matrix (Y/N)?	Components in rotated components matrix (Varimax with Kaiser Normalization)	Do negative correlations above 0.5 exist in the rotated component matrix (Y/N)?	Are there single values (i.e. distinct measure) for each component above 0.5 in the rotated component matrix (Y/N)?	Cronbach's Alpha (α) based on standardized items
2 variables	100.000%	2	Y	2	N	Y	0.656
3 variables	85.046%	2	N	2	N	Y	0.557
4 variables	89.978%	3	N	3	N	Y	0.609
5 variables	84.947%	3	Y	3	N	N	0.731
6 variables	80.653%	3	N	3	N	N	0.788
7 variables	**84.266%**	**4**	**Y**	**4**	**N**	**N**	**0.795**
8 variables	87.829%	5	Y	5	N	N	0.814
9 variables	86.721%	5	Y	5	N	N	0.846
10 variables	86.306%	5	N	5	N	N	0.870
11 variables	84.887%	5	N	5	N	N	0.886
12 variables	87.862%	6	N	6	N	N	0.897

Note:

- The first column of the table indicates for how many variables (behavioural acts) were taken into consideration for testing.
- Test start from 2 variables as it is not possible to run tests with only 1 variable
- The first column shows the variance percentage explained based on the number of the behavioural acts (variables) tested.
- The number of components making up the measured constructs is shown in the following column.
- If there exist negatively corelated components, they are indicated in the following column.
- In case there exist negative correlations, or if there is no distinct measure for each of the principal components identified after the Varimax rotation and Kaiser normalization, this is indicated in the following two columns.
- The last column shows Cronbach alpha (α) value indicating reliability of the measure.

APPENDIX XI – Means for KT+ and KT- Measures

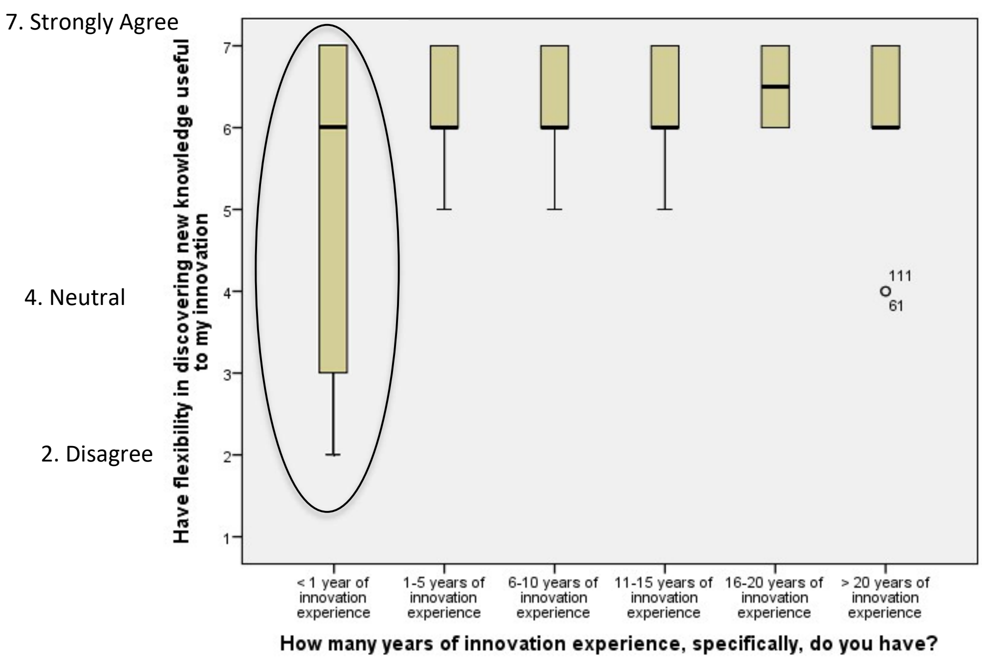
In support of understanding difference between demographic groups and various questions of KT+ and KT- measures, the following supporting analysis of means is provided.

Innovation Experience and KT+ (AFA III phase)

Means analysis for the question "*Having flexibility in discovering new knowledge useful to my innovation*" of KT+ measure and demographics variable innovation experience and its boxplot. Numbers 1-7 on the vertical (Y) axis on the graph indicate rating on 7-point Likert scale.

Have flexibility in discovering new knowledge useful to my innovation

How many years of innovation experience, specifically, do you have?	Mean	N	Std. Deviation
< 1 year of innovation experience	5.1765	17	1.77607
1-5 years of innovation experience	6.1034	58	.69306
6-10 years of innovation experience	6.2286	35	.68966
11-15 years of innovation experience	6.2143	14	.80178
16-20 years of innovation experience	6.5000	10	.52705
> 20 years of innovation experience	6.0000	11	1.09545
Total	6.0552	145	.96306

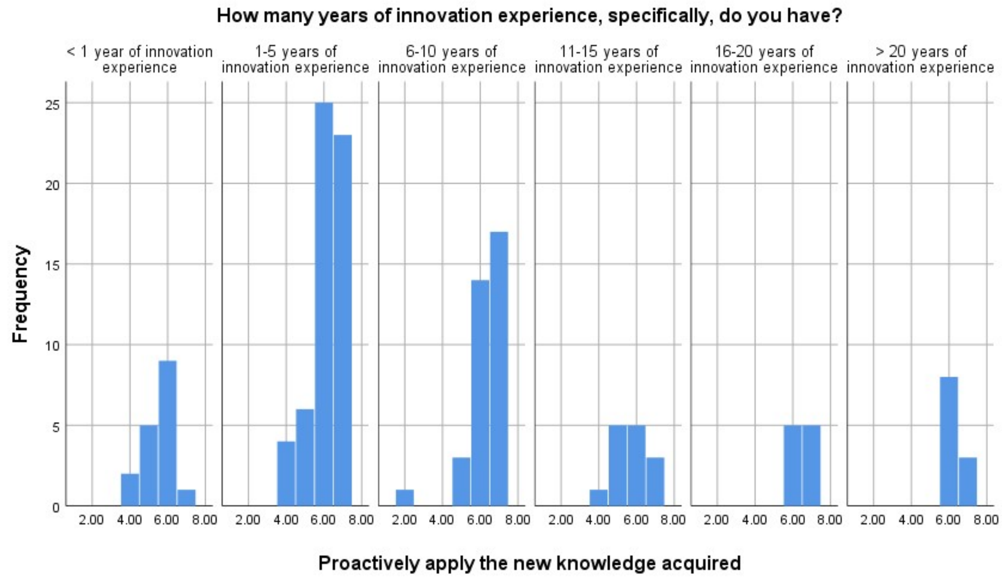


Means analysis for the question "*Proactively applying new knowledge acquired*" of KT+ measure.

Proactively apply the new knowledge acquired

How many years of innovation experience, specifically, do you have?	Mean	N	Std. Deviation
< 1 year of innovation experience	5.5294	17	.79982
1-5 years of innovation experience	6.1552	58	.87463
6-10 years of innovation experience	6.2857	35	.98731
11-15 years of innovation experience	5.7143	14	.91387
16-20 years of innovation experience	6.5000	10	.52705
> 20 years of innovation experience	6.2727	11	.46710
Total	6.1034	145	.88760

Histogram for the question "*Proactively applying new knowledge acquired*" of KT+ measure. Numbers 1-7 indicated on the horizontal axis (X) indicate ratings on 7-point Likert scale Numbers on the vertical axis (Y) indicate frequency (number of responses).

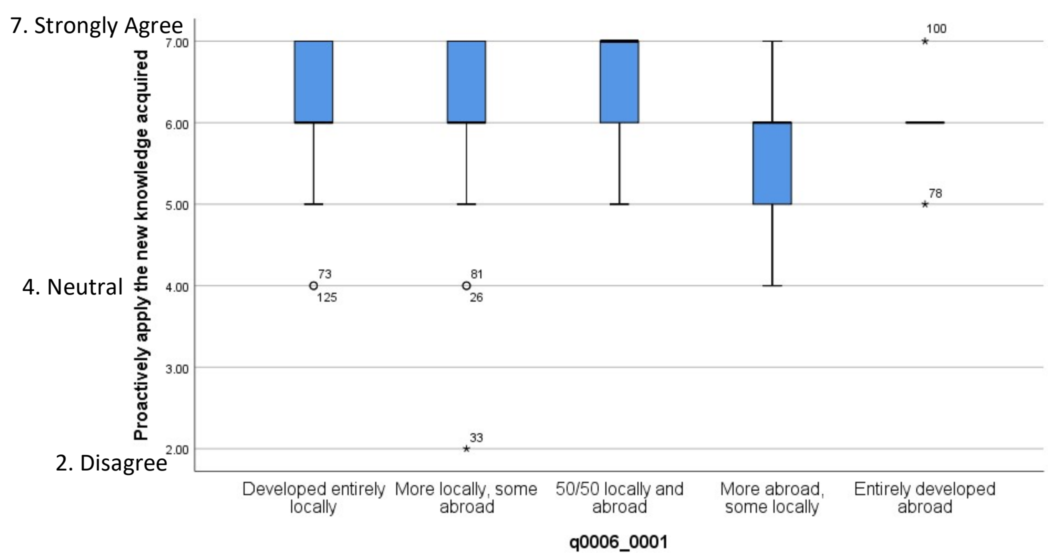


Location of Innovation Development and KT+ (AFA III phase)

Means analysis for the question "*Proactively apply the new knowledge acquired and where the core of innovation is being developed*" of KT+ measure and demographics variable location where the core of innovation is being developed and its boxplot.

Means for proactively apply the new knowledge acquired and where the core of innovation is being developed.

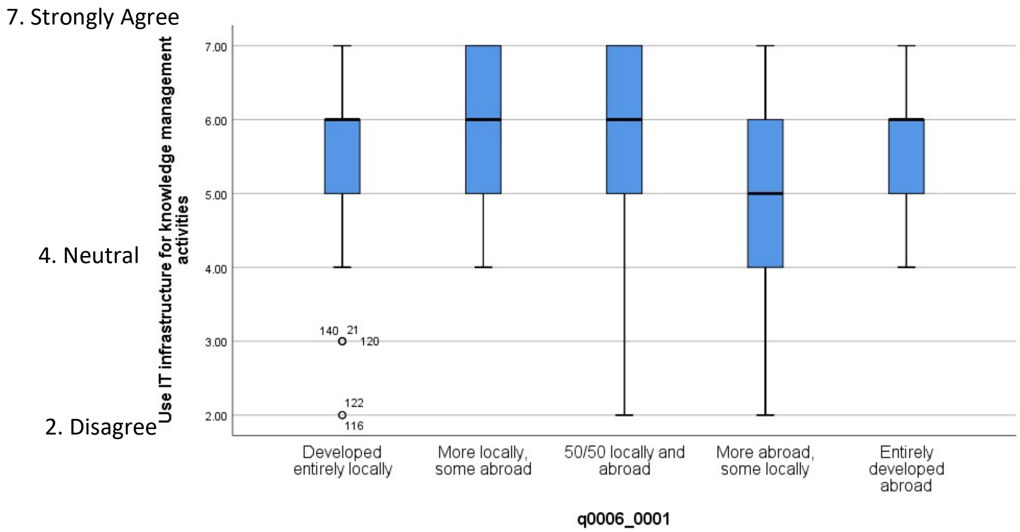
q0006_0001	Mean	N	Std. Deviation
Developed entirely locally	6.1746	63	.77334
More locally, some abroad	6.0667	30	1.11211
50/50 locally and abroad	6.4762	21	.60159
More abroad, some locally	5.6800	25	.98826
Entirely developed abroad	6.0000	6	.63246
Total	6.1034	145	.88760



Means for the question "*Proactively apply the new knowledge acquired*" of KT+ measure and demographics variable location where the core of innovation is being developed and its boxplot.

Means for use IT infrastructure for knowledge management activities and where the core of innovation is being developed.

q0006_0001	Mean	N	Std. Deviation
Developed entirely locally	5.4762	63	1.14803
More locally, some abroad	5.9667	30	.96431
50/50 locally and abroad	5.4286	21	1.53530
More abroad, some locally	4.8800	25	1.50886
Entirely developed abroad	5.6667	6	1.03280
Total	5.4759	145	1.26975

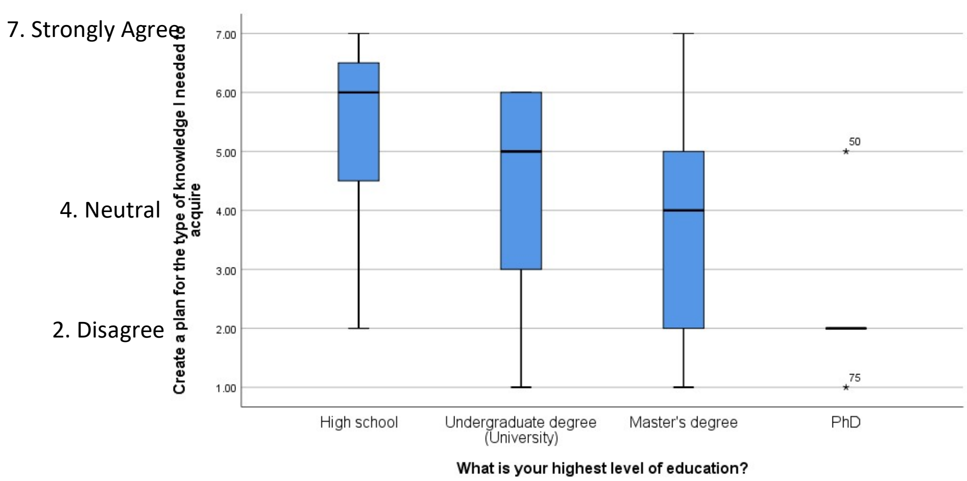


Participants' Education and KT- (AFA III phase)

Means for the question (I did not) "*Create a plan for the type of knowledge I need to acquire and participants' education levels*" of KT- measure and demographics variable participants' education level and its boxplot.

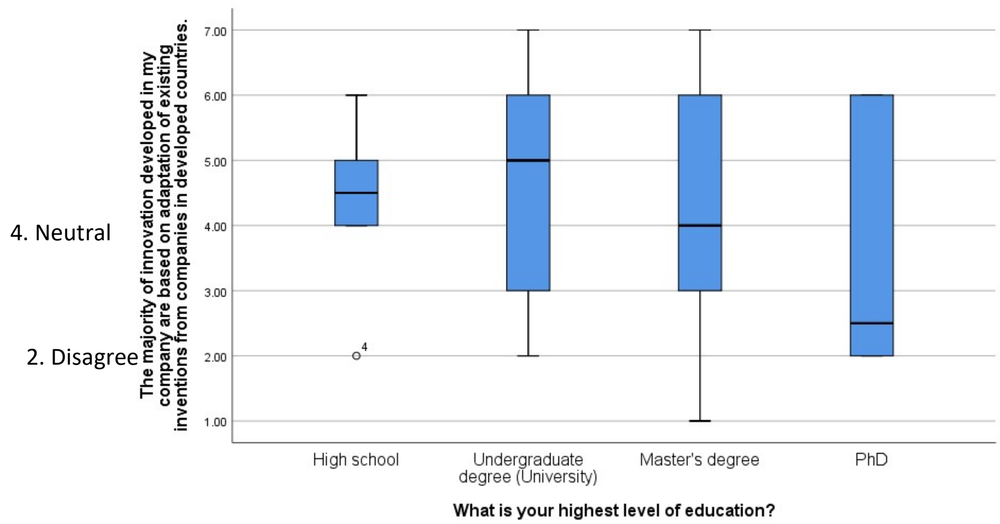
Means analysis for Create a plan for the type of knowledge I need to acquire and participants' education levels

What is your highest level of education?	Mean	N	Std. Deviation
High school	5.5000	12	1.50756
Undergraduate degree (University)	4.2449	49	1.63975
Master's degree	3.9615	78	1.67830
PhD	2.3333	6	1.36626
Total	4.1172	145	1.71797



Boxplot for extra question "M*ajority of my innovation is adaptation of existing innovations from developed countries*" in the survey and demographics variable participants' education level. Numbers 1-7 indicate rating on 7-point Likert scale.

7. Strongly Agree



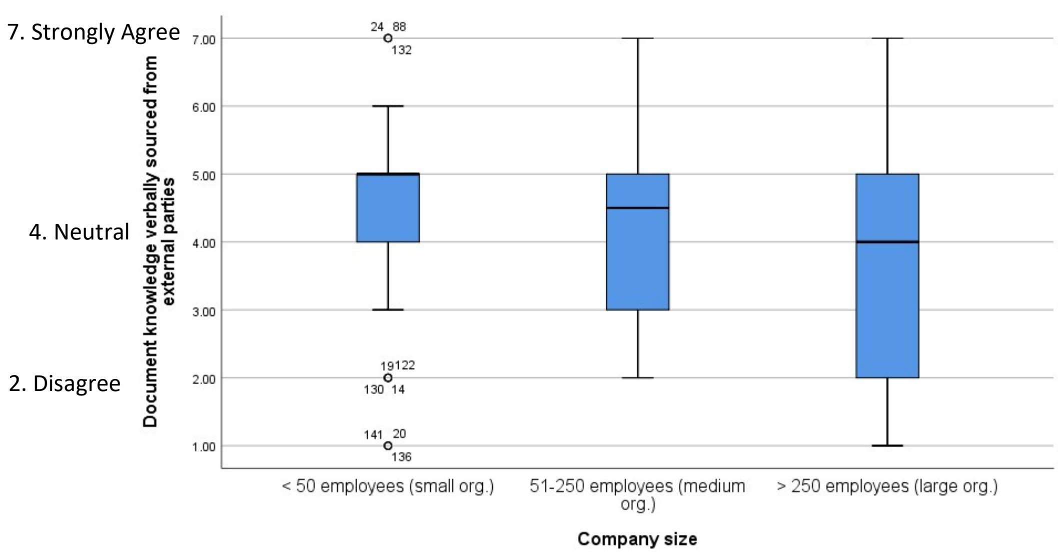
Company Size and KT- (AFA III phase)

Means for the question (I did not) "*Document knowledge verbally sourced from external parties*" of KT- measure and demographics variable company size.

Means for (I did not) Document knowledge verbally sourced from external parties

Company size	Mean	N	Std. Deviation
< 50 employees (small org.)	4.4154	65	1.46727
51-250 employees (medium org.)	4.3667	30	1.44993
> 250 employees (large org.)	3.5800	50	1.53981
Total	4.1172	145	1.52981

Boxplot for the question (I did not) "*Document knowledge verbally sourced from external parties*" of KT- measure and demographics variable company size. Numbers 1-7 on the vertical (Y) axis indicate rating on 7-point Likert scale.



APPENDIX XII – Means for IOR+ and IOR- Measures

In support of understanding difference between demographic groups and various questions of IOR+ and IOR- measures, the following supporting analysis of means is provided.

Gender and IOR+ (AFA III phase)

Means for the question "*Honour my partnership commitments*" of IOR+- measure and demographics variable participants' gender.

Honour my partnership commitments (q0019_005)

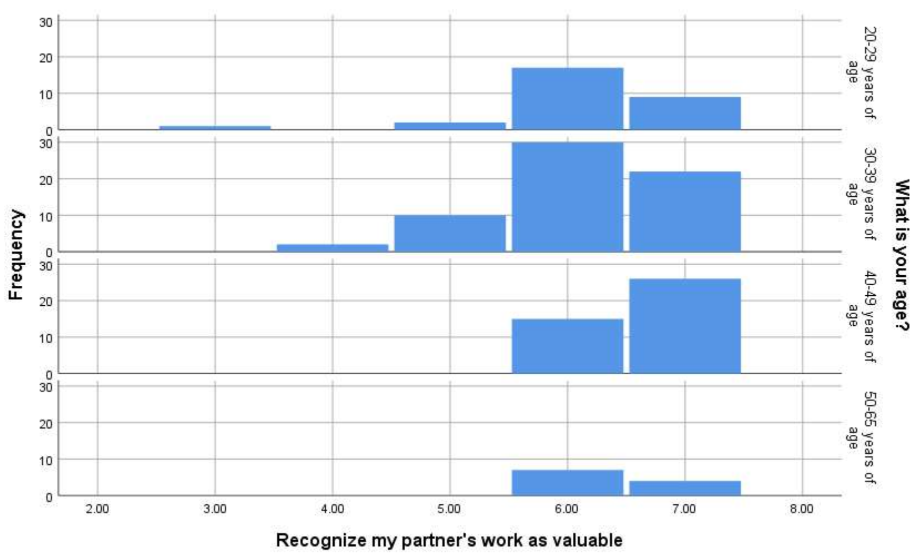
What is your gender?	Mean	N	Std. Deviation
Male	6.2583	120	.75030
Female	6.6000	25	.50000
Total	6.3172	145	.72364

Participant Age and IOR+ (AFA III phase)

Means for the question "*Recognize my partner's work as valuable*" of IOR+- measure and demographics variable participants' age and its graphical representation with a histogram.

Recognize my partner's work as valuable (q0019_004)

What is your age?	Mean	N	Std. Deviation
20-29 years of age	6.1379	29	.83342
30-39 years of age	6.1250	64	.78680
40-49 years of age	6.6341	41	.48765
50-65 years of age	6.3636	11	.50452
Total	6.2897	145	.73520



Education Level and IOR+ (AFA III phase)

Means for the question "*Honour my partnership commitments*" of IOR+- measure and demographics variable participants' education level.

Honour my partnership commitments (q0019_005)

What is your highest level of education?	Mean	N	Std. Deviation
High school	6.4167	12	.66856
Undergraduate degree (University)	6.0612	49	.80125
Master's degree	6.4487	78	.65757
PhD	6.5000	6	.54772
Total	6.3172	145	.72364

Means for the question "*Need to believe that I was dealing with a trustworthy partner*" of IOR+- measure and demographics variable participants' education level.

Need to believe that I was dealing with a trustworthy partner (q0019_006)

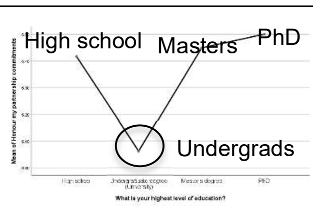
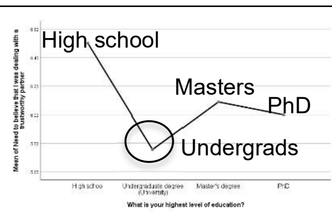
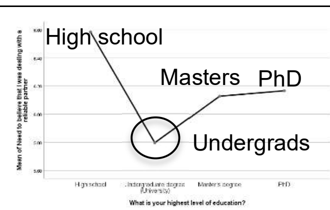
What is your highest level of education?	Mean	N	Std. Deviation
High school	6.5000	12	.52223
Undergraduate degree (University)	5.7551	49	.92490
Master's degree	6.0897	78	.82471
PhD	6.0000	6	.63246
Total	6.0069	145	.85388

Means for the question "*Need to believe that I was dealing with a reliable partner*" of IOR+- measure and demographics variable participants' education level.

Need to believe that I was dealing with a reliable partner (q0019_007)

What is your highest level of education?	Mean	N	Std. Deviation
High school	6.5833	12	.51493
Undergraduate degree (University)	5.7959	49	.93496
Master's degree	6.1282	78	.77893
PhD	6.1667	6	.40825
Total	6.0552	145	.83149

Summary of group difference means for participant education level and questions of IOR+ measure

	"***Honour my partnership commitments***" (q0019_005)	"***Need to believe that I was dealing with a trustworthy partner"*** (q0019_006)	"***Need to believe that I was dealing with a reliable partner***" (q0019_007)
Lowest mean	M=6.06 ("Agree") Undergraduate degree	M=5.75 ("Agree") Undergraduate degree	M=5.79 ("Agree") Undergraduate degree
Highest mean	M=6.44 ("Agree") Master's degree	M=6.50 ("Strongly agree") High school	M=6.58 ("Strongly agree") High school
Mini graphs of mean averages *lowest scoring are undergrads			

Job Position and IOR+ (AFA III phase)

Means for the question "*Take responsibility for my own actions in my partnerships*" of IOR+-measure and demographics variable participants' job - position.

Take responsibility for my own actions in my partnerships (q0019_001)

Job position	Mean	N	Std. Deviation
Software developers and technical roles	6.0154	65	.96002
Middle management	6.4583	24	.65801
Senior managers	6.4821	56	.71328
Total	6.2690	145	.85192

Means for the question "*Make myself open to learn from my partner's cultural specificities*" of IOR+-measure and demographics variable participants' job - position.

Make myself open to learn from my partner's cultural specificities (q0019_002)

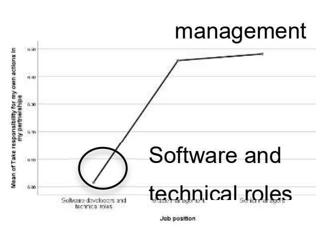
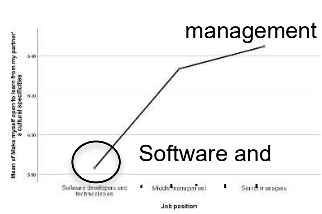
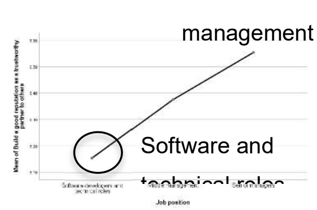
Job position	Mean	N	Std. Deviation
Software developers and technical roles	5.8308	65	1.13975
Middle management	6.3333	24	.63702
Senior managers	6.4464	56	.60059
Total	6.1517	145	.93043

Means for the question "*Build a good reputation as a trustworthy partner to others*" of IOR+-measure and demographics variable participants' job - position.

Build a good reputation as a trustworthy partner to others (q0019_003)

Job position	Mean	N	Std. Deviation
Software developers and technical roles	6.1538	65	.88795
Middle management	6.3750	24	.57578
Senior managers	6.5536	56	.56952
Total	6.3448	145	.74888

Summary of group differences means for participant job position demographics group and questions of and IOR+

	Take responsibility for my own actions in my partnerships (q0019_001)	**Make myself open to learn from my partner's cultural specificities** (q0019_002)	**Build a good reputation as a trustworthy partner to others** (q0019_003)
Lowest mean	M=6.01 ("Agree") Software developers and technical roles	M=5.83 ("Agree") Software developers and technical roles	M=6.15 ("Agree") Software developers and technical roles
Highest mean	M=6.48 ("Agree") Senior managers	M=6.44 ("Agree") Senior managers	M=6.55 ("Strongly agree") High school
Mini graphs of mean averages *lowest scoring are software and tech. roles.			

Professional Experience and IOR+ (AFA III phase)

Means for the question "*Take responsibility for my own actions in my partnerships*" of IOR+-measure and demographics variable professional experience.

Take responsibility for my own actions in my partnerships (q0019_001)

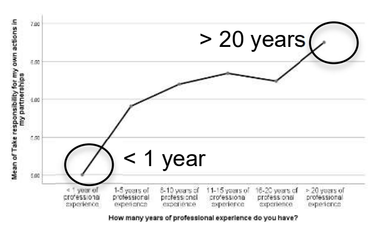
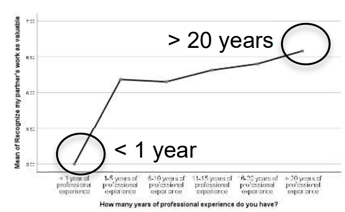
How many years of professional experience do you have?	Mean	N	Std. Deviation
< 1 year of professional experience	5.0000	2	1.41421
1-5 years of professional experience	5.9091	22	.92113
6-10 years of professional experience	6.2000	40	1.01779
11-15 years of professional experience	6.3437	32	.60158
16-20 years of professional experience	6.2400	25	.77889
> 20 years of professional experience	6.7500	24	.53161
Total	6.2690	145	.85192

Means for the question "*Recognize my partner's work as valuable*" of IOR+- measure and demographics variable professional experience.

Recognize my partner's work as valuable (q0019_003)

How many years of professional experience do you have?	Mean	N	Std. Deviation
< 1 year of professional experience	5.0000	2	2.82843
1-5 years of professional experience	6.1818	22	.66450
6-10 years of professional experience	6.1500	40	.76962
11-15 years of professional experience	6.3125	32	.69270
16-20 years of professional experience	6.4000	25	.64550
> 20 years of professional experience	6.5833	24	.50361
Total	6.2897	145	.73520

Summary of group difference means for participant professional experience demographic group and IOR+

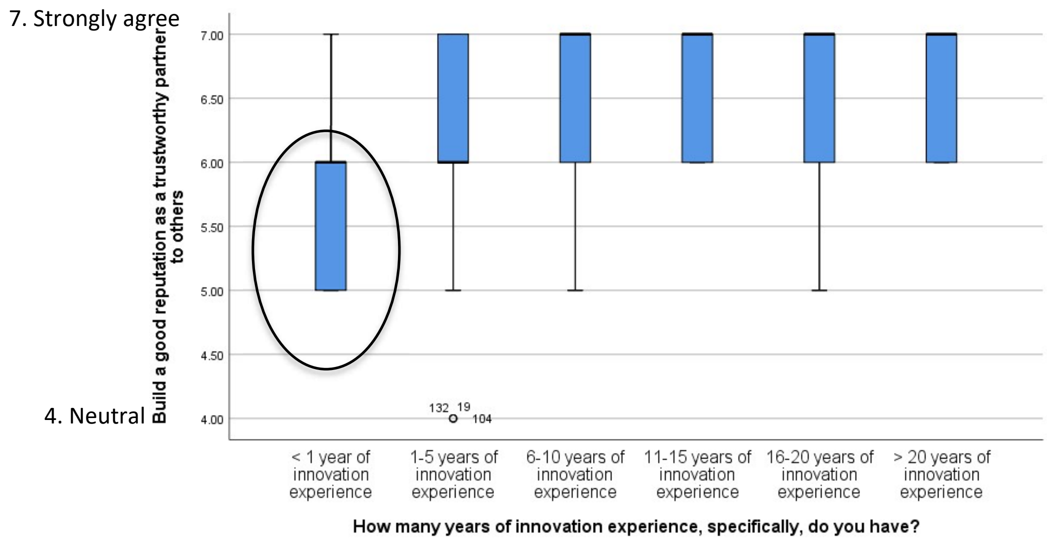
	Take responsibility for my own actions in my partnerships (q0019_001)	**Recognize my partner's work as valuable** (q0019_003)
Lowest mean	M=5.00 ("Somewhat agree") < 1 year of professional experience	M=5.00 ("Somewhat agree") < 1 year of professional experience
Highest mean	M=6.75 ("Strongly agree") > 20 years of professional experience	M=6.58 ("Strongly agree") > 20 years of professional experience
Mini graphs of mean averages *lowest scoring are < 1 year of prof. experience.		

Innovation Experience and IOR+ (AFA III phase)

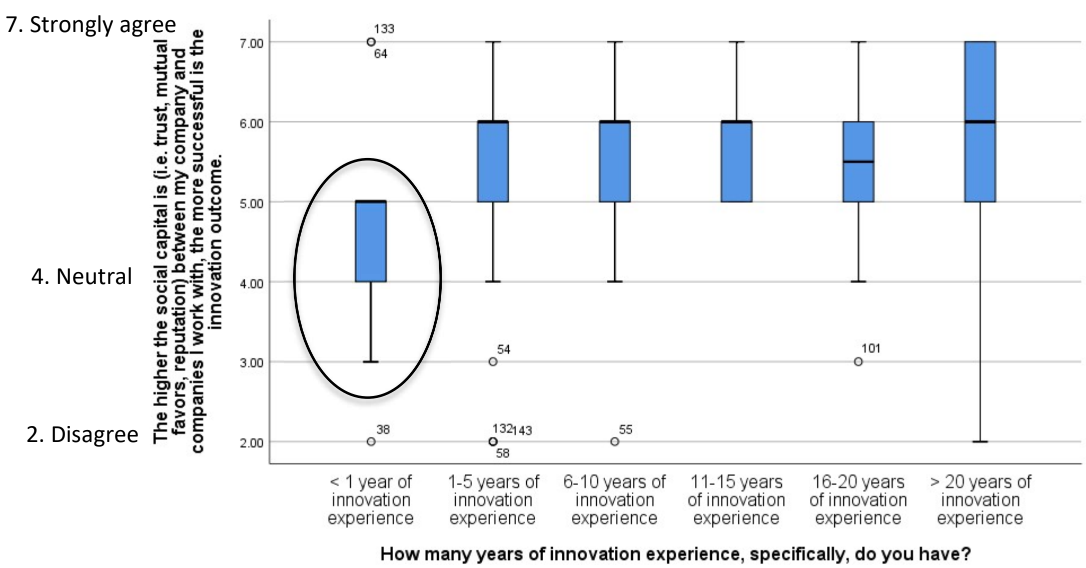
Means analysis for the question "*Build a good reputation as a trustworthy partner to others*" of IOR+ measure and demographics variable innovation experience and its boxplot.

Build a good reputation as a trustworthy partner to others (q0019_003)

How many years of innovation experience, specifically, do you have?	Mean	N	Std. Deviation
< 1 year of innovation experience	5.9412	17	.74755
1-5 years of innovation experience	6.2241	58	.83861
6-10 years of innovation experience	6.4286	35	.65465
11-15 years of innovation experience	6.7143	14	.46881
16-20 years of innovation experience	6.6000	10	.69921
> 20 years of innovation experience	6.6364	11	.50452
Total	6.3448	145	.74888



Boxplot for extra question "*The higher the social capital is (i.e. trust, mutual favours, reputation) between my company and companies I work with, the more successful is the innovation outcomes.*" in the survey and demographics variable innovation experience.

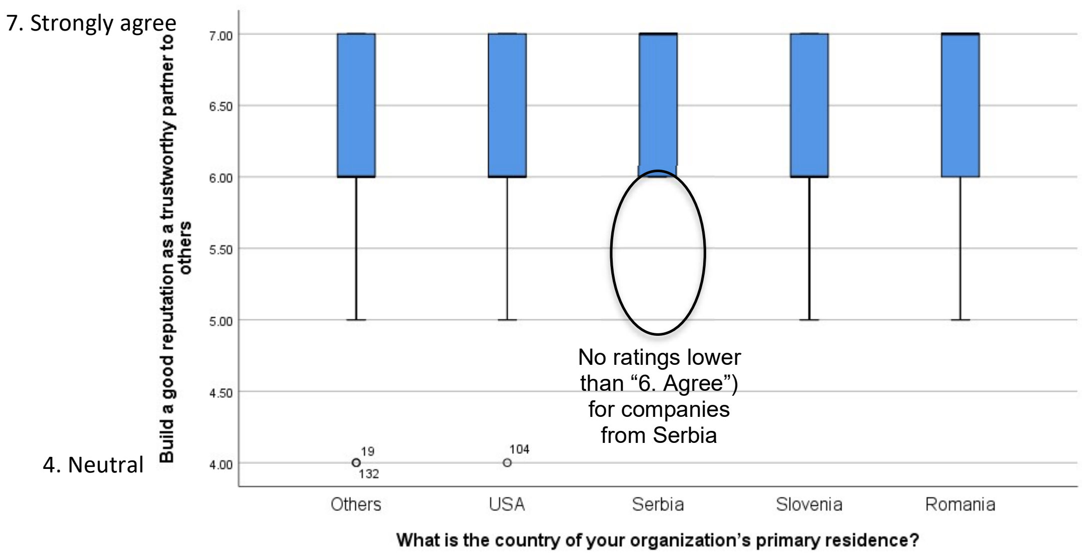


Organization's Country and IOR+ (AFA III phase)

Means analysis for the question "*Build a good reputation as a trustworthy partner to others*" of IOR+ measure and demographics variable organization's country and its boxplot.

Build a good reputation as a trustworthy partner to others (q0019_003)

What is the country of your organization's primary residence?	Mean	N	Std. Deviation
Others	6.2836	67	.79403
USA	6.1111	27	.80064
Serbia	6.7273	22	.45584
Slovenia	6.3333	15	.72375
Romania	6.5000	14	.65044
Total	6.3448	145	.74888



Location of Innovation Development and IOR+ (AFA III phase)

Means analysis for the question "*Make myself open to learn from my partner's cultural specificities*" of IOR+ measure and demographics variable location where the core of innovation was developed.

Make myself open to learn from my partner's cultural specificities (q0019_002)

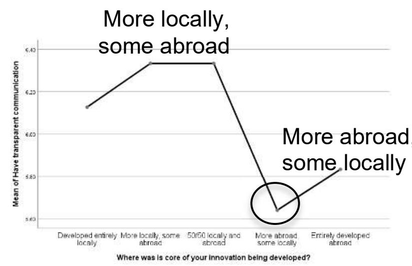
Where was is core of your innovation being developed?	Mean	N	Std. Deviation
Developed entirely locally	6.1270	63	.92444
More locally, some abroad	6.5000	30	.68229
50/50 locally and abroad	6.2857	21	.84515
More abroad, some locally	5.7600	25	1.12842
Entirely developed abroad	5.8333	6	.98319
Total	6.1517	145	.93043

Means analysis for the question "*Have transparent communication*" of IOR+ measure and demographics variable location where the core of innovation was developed.

Have transparent communication (q0019_008)

Where was is core of your innovation being developed?	Mean	N	Std. Deviation
Developed entirely locally	6.1270	63	.83264
More locally, some abroad	6.3333	30	.84418
50/50 locally and abroad	6.3333	21	.79582
More abroad, some locally	5.6400	25	1.03602
Entirely developed abroad	5.8333	6	.40825
Total	6.1034	145	.87974

Summary of group means differences for location of innovation development demographic group and IOR+

	Make myself open to learn from my partner's cultural specificities (q0019_002)	**Have transparent communication** (q0019_008)
Lowest mean	M=5.76 ("Agree") **More abroad, some locally**	M=5.64 ("Agree") **More abroad, some locally**
Highest mean	M=6.50 ("Strongly agree") **More locally, some abroad**	M=6.33 ("Strongly agree") **More locally, some abroad**
Range spread	*r* = 0.74	*r* = 0.69
Mini graphs of mean averages *lowest scoring are < 1 year of prof. experience.		

Gender and IOR- (AFA III phase)

Means analysis for the question "*Openly share Intellectual Property in my partnerships*" of IOR- measure and demographics variable participants' gender.

Openly share Intellectual Property in my partnerships (q0020_003)

What is your gender?	Mean	N	Std. Deviation
Male	4.4250	120	1.80412
Female	3.4400	25	1.55671
Total	4.2552	145	1.79807

Means analysis for the question "*Avoid engaging with partners who had a history of being involved in damaging relationships*" of IOR- measure and demographics variable participants' gender.

Avoid engaging with partners who had a history of being involved in damaging relationships (q0020_004)

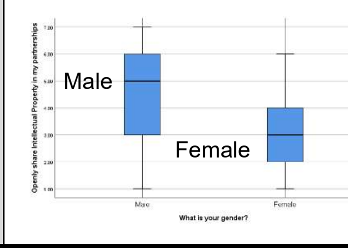
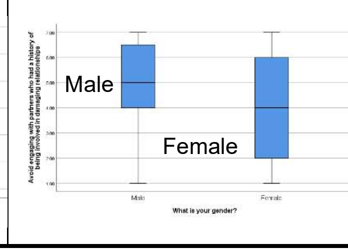
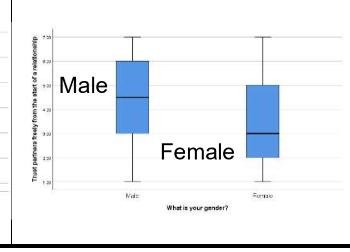
What is your gender?	Mean	N	Std. Deviation
Male	4.8583	120	1.79306
Female	3.9600	25	1.83666
Total	4.7034	145	1.82621

Means analysis for the question "*Trust partners freely from the start of a relationship*" of IOR- measure and demographics variable participants' gender.

Trust partners freely from the start of a relationship (q0020_005)

What is your gender?	Mean	N	Std. Deviation
Male	4.2917	120	1.66221
Female	3.5600	25	1.55671
Total	4.1655	145	1.66255

Summary of group differences means for participants gender demographic group (q0010) and IOR-

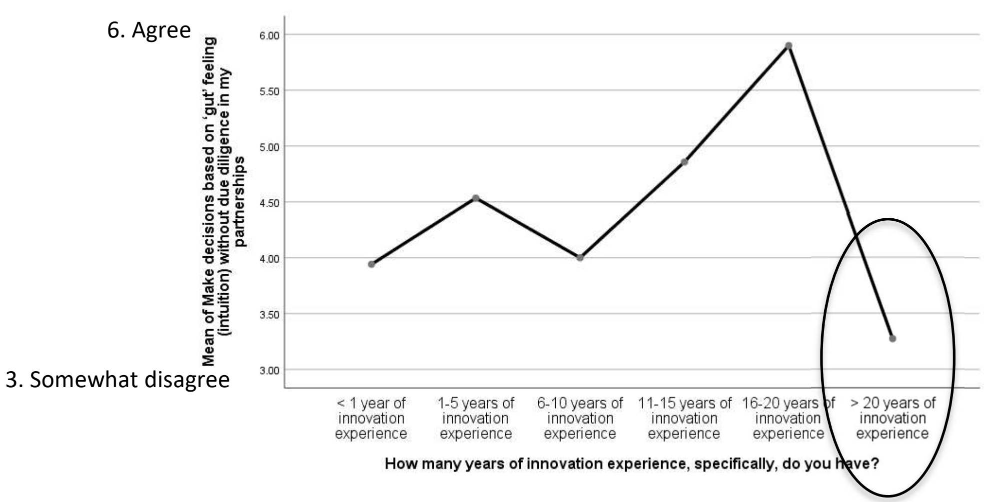
	Openly share Intellectual Property in my partnerships (q0020_003)	**Avoid engaging with partners who had a history of being involved in damaging relationships** (q0020_004)	**Trust partners freely from the start of a relationship** (q0020_005)
Lowest mean	M=3.44 (“Somewhat disagree”) **Female**	M=3.96 (“Neutral”) **Female**	M=3.56 (“Neutral”) **Female**
Highest mean	M=4.42 (“Neutral”) **Male**	M=4.85 (“Agree”) **Male**	M=4.29 (“Neutral”) **Male**
Mini boxplots of mean averages *lowest scoring are female participants			

Innovation Experience and IOR- (AFA III phase)

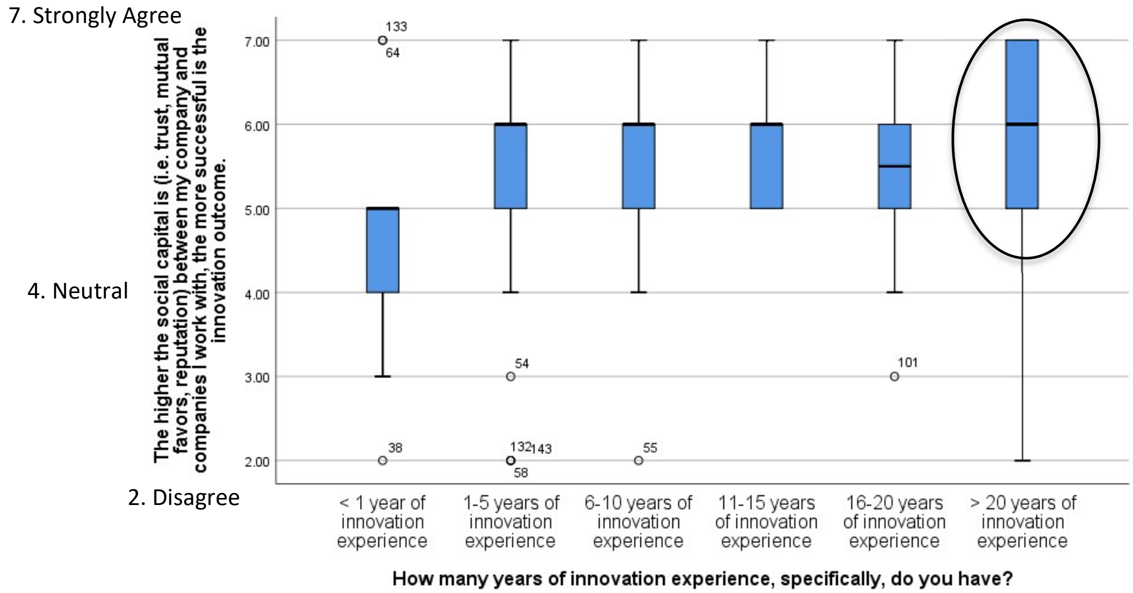
Means analysis for the question “*Make decisions based on ‘gut’ feeling (intuition) without due diligence in my partnerships*” of IOR- measure and demographics variable innovation experience and its graphical representation with a line diagram.

Make decisions based on ‘gut’ feeling (intuition) without due diligence in my partnerships (q0020_001)

How many years of innovation experience, specifically, do you have?	Mean	N	Std. Deviation
< 1 year of innovation experience	3.9412	17	1.63824
1-5 years of innovation experience	4.5345	58	1.37924
6-10 years of innovation experience	4.0000	35	1.49509
11-15 years of innovation experience	4.8571	14	1.56191
16-20 years of innovation experience	5.9000	10	.99443
> 20 years of innovation experience	3.2727	11	1.73729
Total	4.3655	145	1.55373



Boxplot for extra question “*The higher the social capital is (i.e. trust, mutual favours, reputation) between my company and companies I work with, the more successful is the innovation outcome.*” in

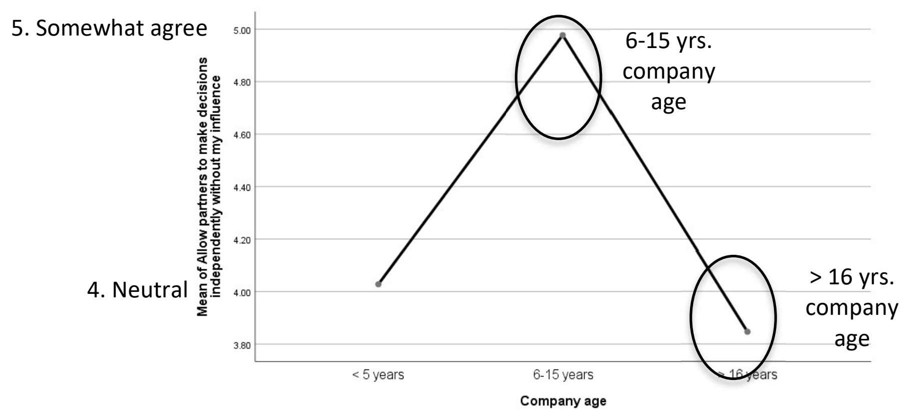


Company Age and IOR- (AFA III phase)

Means analysis for the question “*Allow partners to make decisions independently without my influence*” of IOR- measure and demographics variable company age and graphical representation with a line chart.

Allow partners to make decisions independently without my influence (q0020_002)

Company age	Mean	N	Std. Deviation
< 5 years	4.0278	36	1.61221
6-15 years	4.9773	44	1.40578
> 16 years	3.8462	65	1.51277
Total	4.2345	145	1.57680



In this section please find included a copy of the interview guide for the 1st phase of the field research (AFA I).

Note:
- This interview guide was filled by the researchers, and was not given to participants
- To ensure anonymity of participation, the first page of the interview guide is detachable to separate personally identifiable information from responses.

AFA Phase I – "Act nominations" interview guide

<< ------------------------------- **DETACHABLE FORM** ------------------------------->

This page is a detachable form to separate personally identifiable information.

Questionnaire ID: …………………………………

(used to link detachable and non-detachable parts)

About you

(P1) Participant name (First, Last):

(*Please write)

………………………………………………………

About your organization

(P2) Company\Organization name:

(*Please write)

………………………………………………………

<< ------------------------------- **DETACH HERE** ------------------------------- >>

AFA Phase I - “Act Nominations” Interview Guide

Questionnaire ID: …………………………………
(used to link detachable and non-detachable part)

Participation and Consent

The primary researcher will ensure the following takes place prior to interviews:
(*Please tick ✓ when completed)

- ❑ Provide Participant Information Sheet to the participant
- ❑ Provide and ask the participant to sign the Consent Form
- ❑ Ask for permission to record the conversation (or take notes)

Introduction

The primary research will ensure the following takes place at the beginning of interviews:

- Introduce yourself to the participant, make contact.
- Explain the purpose of the research in simple terms.
- Reiterate that data collected will be used as aggregate only.
- Reiterate that participant can withdraw at any time or refuse to answer any question.

Timestamp

(T1) Date interviewed (YYYY-MM-DD):
(T2) Interview duration (minutes):

Demographics

About you

(D1) Gender (male/female):
(*Please tick only one)
❑ Male ❑ Female

(D2) Age:
(*Please tick only one, and write description - if appropriate)

- ❑ Prefer not to answer
- ❑ < 20 years of age
- ❑ 20-29 years of age
- ❑ 30-39 years of age
- ❑ 40-49 years of age
- ❑ 50-59 years of age
- ❑ 60-70 years of age
- ❑ Retired

…………………………………………………………………………………………

(D3) Highest level of education:
(*Please tick only one, and write description - if appropriate)

- ❑ High school

❑ University degree
❑ Master’s degree
❑ PhD
❑ Other (please describe)

……………………………………………………………………………………

(D4) Position in the organization:
(*Please tick only one, and write description - title)

❑ Owner of the company
❑ Senior management (CEO, Director)
❑ Middle management
❑ Supervisor - Project manager
❑ Employee
❑ Other (please specify)

……………………………………………………………………………………

(D5) Professional experience:
(*Please tick only one, and write description)

❑ <1 year of experience
❑ 1-5 years of experience
❑ 6-10 years of experience
❑ 11-15 years of experience
❑ 16-20 years of experience
❑ More than 20 years of experience

……………………………………………………………………………………

About your organization

(C1) Type of the organization:
(*Please tick only one, and write description)

❑ Commercial
❑ Educational
❑ Institution
❑ Government
❑ Other (please describe)

……………………………………………………………………………………

(C2) Please specify your company’s primary industry sector:
(*Please tick only one, and write description)

❑ R&D
❑ Services
❑ Products
❑ Trading
❑ Other (please describe)

……………………………………………………………………………………

(C3) Size of the organization:
(*Please tick only one, and write description)

- ❑ Start-up
- ❑ Micro (<10 employees)
- ❑ Small (<50 employees)
- ❑ Medium (<250 employees)
- ❑ Large (> 250 employees)

……………………………………………………………………………………

(C4) Type of organizational structure:
(*Please tick only one, and write description)

- ❑ Traditional (functional)
- ❑ Project organization
- ❑ Matrix organization
- ❑ Flat organization
- ❑ Other (please specify)

……………………………………………………………………………………

(C5) Company's main products and services:
(*Please write description)

……………………………………………………………………………………

Involvement with Innovation

(I1) In your career did you have experience with innovation? Please explain.
(*Please tick only one, and write description - if appropriate)

- ❑ No experience with innovation
- ❑ Yes, please describe

……………………………………………………………………………………

(I2) Does your company innovate?
(*Please tick only one, and write description - if appropriate)

- ❑ No, my company does not innovate
- ❑ Yes, please describe

……………………………………………………………………………………

(I3) Is there a person in charge of innovation at your organization?
(*Please tick only one, and write description - if appropriate)

- ❑ No, there is no one in charge of innovation
- ❑ Yes, please describe

……………………………………………………………………………………

(I4) Do you have R&D in the organization?
(*Please tick only one, and write description - if appropriate)

- ❑ No, we have no R&D
- ❑ Yes, please describe

……………………………………………………………………………………

(I5) Do you work in R&D?
(*Please tick only one)

- ❑ Yes, I work in R&D
- ❑ No, I do not work in R&D

(I6) How many employees (or teams) work on innovative products and services in your organization (please be specific, quantify)?
(*Please write description)

……………………………………………………………………………………

(I7) How frequently does your company come up with innovative products or services?
(*Please tick only one, and write description - if appropriate)

- ❑ Does not innovate
- ❑ Once in a few years
- ❑ Once a year
- ❑ 2-5 times a year
- ❑ 6-10 times a year
- ❑ More than 10 times a year

……………………………………………………………………………………

(I8) Please indicate if the innovation in your organization is typically new for your organization (existing otherwise, just being implemented in your company), new for your industry, or new for the world?
(*Please tick all that applies)

- ❑ Innovation new only for my company
- ❑ Innovation new for my country or industry
- ❑ Globally novel innovation

(I9) Please indicate if innovation in your organization is a continual activity, or sporadic (ad-hoc) activity?
(*Please tick only one)

- ❑ Continuous – we are continuously working on innovations
- ❑ Sporadic – we are working on innovations from time to time

(I10) Please indicate forms of innovations that can be found in your company?
(*Please tick all that applies)

- ❑ New innovative service development
- ❑ New innovative product development
- ❑ Process improvement and innovation
- ❑ Business management innovation (new business and management models)

❑ Organizational innovation (organization structure innovation; labour; customer relations; value chain management, etc.)
❑ Technological innovation
❑ Business strategy innovation
❑ Innovation in Marketing
❑ Other - please specify ……………………………………………………………

(I11) Please indicate if innovation in your organization is predominantly incremental -- improvement of the existing, or radical - invention of a something completely new?
(*Please tick only one)

❑ Incremental innovation -- our innovation activities produce incremental improvements of the existing
❑ Radical innovation -- our innovation activities are producing radically new solutions of products or services

(I12) Please describe your organization's innovation outputs - products\services?
(*Please write description)

………………………………………………………………………………………

………………………………………………………………………………………

Interview Questions (Act Nominations)

KT (Knowledge Transfer)

(Q1) Please let me know me all that your organization has done with knowledge transfer that **HAS** been supportive to innovation outcome?
(*Please write description)

………………………………………………………………………………………

………………………………………………………………………………………

………………………………………………………………………………………

………………………………………………………………………………………

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………………………………………………………………………………………

(Q2) Please tell me all that your organization has done with knowledge transfer that **HAS NOT** been supportive to innovation outcome?
(*Please write description)

………………………………………………………………………………………

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IOR (Interorganizational Relationships)

(Q3) Please let me know all that your organization has done in relationship with other organizations (partners, suppliers, distributors, institutions and similar) that **HAS** been supportive to innovation outcome?
(*Please write description)

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

(Q4) Please let me know all that your organization has done in relationship with other organizations (partners, suppliers, distributors, institutions and similar) that **HAS NOT** been supportive to innovation outcome?
(*Please write description)

…………………………………………………………………………………

…………………………………………………………………………………

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…………………………………………………………………………………

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Closing the Interview

Snowballing

At the end of each interview, principal researcher will ask responded whom do they believe to be primarily responsible or knowledgeable about innovation at their own organization, or at a partner organization. Intent of this question is to ensure that those individuals perceived responsible are interviewed in the phase II of this research.

(S1) Primary responsible or knowledgeable about innovation at your organization (name and contact details):
(*Please write description)

………………………………………………………………………………………

………………………………………………………………………………………

(S2) Please recommend a contact you know at another IT organization involved with innovation whom you believe would be the most suitable for this research (name and contact details):
(*Please write description)

………………………………………………………………………………………

………………………………………………………………………………………

Thank you

Thank the participant on his\her time and reiterate that your contact details are available in the Participant Information Sheet.

Researcher's impressions

(*Filled out by the researcher following the interview.)

(R1) Evaluation of the participant:
(*Please tick all that applies)

- ❑ Good cooperation
- ❑ Participant was honest
- ❑ Participant was detailed ¥ informative
- ❑ Good interaction
- ❑ Good interview experience

(R2) Researcher's impressions and observations of the interview:
(write down all observation relevant to qualitative analysis)

………………………………………………………………………………………

………………………………………………………………………………………

APPENDIX XIV: Research Instrument - Questionnaire for AFA II Phase

In this section please find included a copy of the survey used for the 2nd phase of the field research (AFA II).

Note:

- The questionnaire was built online, and data collection was conducted fully online.
- Please note that questionnaire disclosed in this section is coded with variables used for SPSS analysis. The coding starts with "q" and a numerical value for each question

The University Of Sheffield.

Online survey (AFA II):

Doctoral Research Study on Understanding and Improving Innovation in IT companies

Please contribute to understanding of how IT companies innovate

This survey is a part of a doctoral research study at the University of Sheffield, School of Management with the aim understanding further how IT companies innovate, with the goal of identifying factors associated with successful innovation.

Practical application of this research is aimed at helping IT organizations to improve their innovation activities.

Please note that the results of this study can be shared with you if you choose so at the end of this survey. Please note that individual responses will not be linked to participants and findings will be presented in categories of response ensuring anonymity of your participation.

The survey should take about 10-20 minutes of your time. Your participation is greatly appreciated, as it will contribute to understanding innovation practices in IT companies.

Qualification

The survey is intended for IT professionals working in private sector organizations. If you are this person, your contribution is greatly appreciated, as it will help contribute to understanding innovation practices in IT companies.

In order to proceed, please confirm the following:

[q0001] Are you an IT professional working in ANY of the following: software development, R&D, technology innovation? *

Please select only one.

- ◯ Yes
- ◯ No

Next

[Action -> Selecting "**Yes**" leads to the **next page**.
Selecting "**No**" leads to "**Sorry for bothering you**" page.]

Participant Information Sheet

Dated 2017-08-10

About this research

The university procedure requires that all participants are informed of research details regarding anonymity, information protection, storage and information usage prior to responding to the survey questions -- please find such details provided at this page.

Your participation is anonymous, confidential and your data is protected

Information collected through this survey is intended to be used for the purposes of writing a doctoral thesis on innovation management in order to understand and improve innovation performance in companies by the primary researcher (PhD student), for publications of summarized findings in academic papers and presentation of such findings at academic conferences.

Please rest assured that your participation is anonymous and that your responses are confidential. Data collected through this survey will be combined together from all participants and summarized into a statistical anonymous overview through which it will not be possible to trace back individual responses to any participant.

Please note that your participation is voluntary and that you can withdraw from participation at will. Please note that your responses are not recorded automatically as you fill them out on each page due to which you can abandon participation in this survey through just closing off your web browser at any point in time. Only when you click on the "Submit" button at the last page of the survey will your responses be anonymously recorded in our database.

What to expect

The survey consists of several sections with questions asking you to evaluate on a scale what works and what does not work for innovation based on your experience.

The survey questions will not ask you for any confidential, business personal or proprietary information. If you do not wish to respond to a certain question, just skip it. At the end of the survey there will be an additional section for demographics data which will conclude the survey.

Questions or concerns

If you should have any questions or concerns regarding this research, please do not hesitate to reach out first to the PhD student conducting this study. In case of any issues or concerns, you are welcome to escalate your complaint to student's supervisors or the dean of the department.

Contacts

(1) Reach out in case of any questions or concerns as a first point of contact regarding this study to:

- Danimir Ljepava, Principal researcher, PhD candidate, Email: danimir.ljepava@sheffield.ac.uk

(2) Reach out to one of the following two supervisors in case you have an issue you could not resolve with the student:

- Dr. Leslie Szamosi, Supervisor, Senior Lecturer, Email: l.szamosi@sheffield.ac.uk
- Dr. Robert Wapshott, Supervisor, Senior Lecturer, Email: r.wapshott@sheffield.ac.uk

(3) Reach out to the Dean of the department in case you have an issue you could not work out with supervisors:

- Prof. David Oglethorpe, Dean of the Department, d.oglethorpe@sheffield.ac.uk

Consent to participate

Your feedback is greatly appreciated as it will help contribute to understanding of how IT companies innovate, and how such process can be improved.

University procedure requires that you provide consent to participate in this research through agreeing to the following:

- I confirm that I have read and understand the information sheet dated 2017-08-10 explaining the above research project and I have had the opportunity to ask questions about the project.
- I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences.

In addition, should I not wish to answer any specific question or questions, I am free to decline. (Primary researcher contact: danimir.ljepava@sheffield.ac.uk).

- I understand that my responses will be kept strictly confidential.
- I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.
- I agree for the data collected from me to be used in future research
- I agree to take part in the above research project.

[q0002] Please select only one. *

◯ I ACCEPT
◯ I DO NOT ACCEPT

Next

[Action -> Selecting "**I ACCEPT**" leads to the **next page**.
Selecting "**I DO NOT ACCEPT**" leads to "**Sorry for bothering you**" page.]

(a) About your organization

In this section we would like to understand more about the organization you are working for. This information will be used to understand and interpret your responses.

[q0003] Are you a locally or internationally owned organization?
Please select only one.

◯ Wholly locally owned	◯ More local, some foreign owned	◯ 50/50 local and foreign owned	◯ More foreign, some local owned	◯ Wholly foreign owned

[q0004] Size of your organization
Please select only one.

- ◯ Self-employed
- ◯ 1-9 employees
- ◯ 10-50 employees
- ◯ 51-250 employees
- ◯ > 250 employees

[q0005] How long has your organization been in existence?
Please type in your response.

[ ] years

[q0006_001] What is your organization's primary activity?
Please check all that applies.

- ◯ Software Development
- ◯ Cloud Services (SaaS, PaaS products)
- ◯ Professional services (i.e. IT outsourcing)
- ◯ Hardware software development
- ◯ R&D
- ◯ Other:

[ ]

Next

(1) Knowledge transfer - what works for innovation?

In order to be able to produce innovation in most cases you need to **learn** from **experiences** and **knowledge** of **other** firms (partners, suppliers, vendors, service providers, et sim.), end-users, customers, universities or government.

In this section I would like to ask you to evaluate from your experience on the scale from *strongly disagree* to *strongly agree* **what works** in producing a successful innovation through knowledge transfer with others.

Answer the following:

Thinking back about my innovation activities on knowledge transfer with others that were SUPPORTIVE of my innovation: I DID ….

Item	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0007_001] Plan for the type of knowledge I needed to acquire	○	○	○	○	○	○	○
[q0007_002] Focus on acquiring specific knowledge	○	○	○	○	○	○	○
[q0007_003] Have flexibility in discovering new knowledge useful to my innovation	○	○	○	○	○	○	○
[q0007_004] Clearly understand my innovation objectives	○	○	○	○	○	○	○
[q0007_005] Understand the big picture of the innovation problems I needed to solve	○	○	○	○	○	○	○
[q0007_006] Acquire knowledge regularly from external sources	○	○	○	○	○	○	○
[q0007_007] Source information on the latest industry trends	○	○	○	○	○	○	○
[q0007_008] Actively source knowledge from a large network of partners	○	○	○	○	○	○	○
[q0007_009] Actively source knowledge from other industries	○	○	○	○	○	○	○
[q0007_010] Strive to understand the original source of knowledge	○	○	○	○	○	○	○
[q0007_011] Learn from customers in order to develop my innovation	○	○	○	○	○	○	○
[q0007_012] Seek to understand the way customers use my products and/or services	○	○	○	○	○	○	○
[q0007_013] Obtain feedback from pilot group testing	○	○	○	○	○	○	○
[q0007_014] Obtain feedback from academia	○	○	○	○	○	○	○
[q0007_015] Obtain feedback from investors	○	○	○	○	○	○	○
[q0007_016] Obtain feedback from the local government	○	○	○	○	○	○	○

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0007_017] Openly accept feedback from unexpected sources	○	○	○	○	○	○	○
[q0007_018] Actively combine multiple sources of knowledge to acquire new knowledge	○	○	○	○	○	○	○
[q0008_001] Practice frequent knowledge transfer activities	○	○	○	○	○	○	○
[q0008_002] Regularly organize formal knowledge exchange events	○	○	○	○	○	○	○
[q0008_003] Use a standardized process for knowledge transfer activities	○	○	○	○	○	○	○
[q0008_004] Use simplified processes for knowledge transfer activities	○	○	○	○	○	○	○
[q0008_005] Encrypt information exchanged with others	○	○	○	○	○	○	○
[q0008_006] Regularly improve knowledge transfer activities based on my own experiences	○	○	○	○	○	○	○
[q0009_001] Openly exchange information with external parties	○	○	○	○	○	○	○
[q0009_002] Frequently exchange experiences with subject matter experts	○	○	○	○	○	○	○
[q0009_003] Exchange knowledge face to face	○	○	○	○	○	○	○
[q0009_004] Use informal channels to source knowledge	○	○	○	○	○	○	○
[q0009_005] Regularly document knowledge obtained verbally	○	○	○	○	○	○	○
Please tick 6 on the scale for verification purposes.	○	○	○	○	○	○	○
[q0010_001] Use IT infrastructure for knowledge management activities	○	○	○	○	○	○	○
[q0010_002] Use rich communication media (e.g., video, presentation, animations) that were not text-only	○	○	○	○	○	○	○
[q0010_003] Reach out directly to sources of knowledge without intermediaries	○	○	○	○	○	○	○
[q0011_001] Engage experts from various fields in knowledge transfer activities	○	○	○	○	○	○	○
[q0011_002] Engage highly educated employees to work on my innovation	○	○	○	○	○	○	○
[q0011_003] Critically evaluate the knowledge acquired prior to using it	○	○	○	○	○	○	○
[q0011_004] Filter out communication noise in knowledge transfer activities	○	○	○	○	○	○	○
[q0011_005] Actively disseminate knowledge acquired from others	○	○	○	○	○	○	○
[q0011_006] Proactively apply the new knowledge acquired	○	○	○	○	○	○	○

Item	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0011_007] Strive to enable unlimited access to corporate knowledge for my team	○	○	○	○	○	○	○
[q0011_008] Strive to understand my organization's knowledge limitations	○	○	○	○	○	○	○
[q0011_009] Strive to understand my organization's knowledge capabilities	○	○	○	○	○	○	○
[q0011_010] Strive to align my innovation team with our corporate values	○	○	○	○	○	○	○
[q0011_011] Strive to establish compatibility between my team and external parties	○	○	○	○	○	○	○

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(2) Knowledge transfer - what does not work for innovation?

In this section I would like to ask you to evaluate from your experience on the scale from *strongly disagree* to *strongly agree* **what does <u>not</u> work** in producing a successful innovation through knowledge transfer with others.

Answer the following:

Thinking back about my innovation activities on knowledge transfer with others that were NOT SUPPORTIVE of my innovation: I DID NOT ….

Item	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0012_001] Attempt to understand the type of knowledge that I needed to acquire	○	○	○	○	○	○	○
[q0012_002] Create a plan for the type of knowledge I needed to acquire	○	○	○	○	○	○	○
[q0012_003] Take market conditions into consideration	○	○	○	○	○	○	○
[q0012_004] Take customer needs into consideration	○	○	○	○	○	○	○
[q0012_005] Source knowledge from multiple sources	○	○	○	○	○	○	○
[q0012_006] Source feedback from customers who understood my products or services	○	○	○	○	○	○	○
[q0013_001] Document knowledge verbally sourced from external parties	○	○	○	○	○	○	○
[q0013_002] Strive to have a good quality of recorded knowledge (i.e., documentation)	○	○	○	○	○	○	○
[q0013_003] Strive to piece together all the components of the knowledge acquired	○	○	○	○	○	○	○
[q0013_004] Proactively apply the knowledge acquired in practice	○	○	○	○	○	○	○

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0013_005] Involve knowledgeable staff (i.e., with high level of education) in knowledge transfer activities	○	○	○	○	○	○	○
[q0013_006] Regularly communicate with stakeholders	○	○	○	○	○	○	○
[q0014_001] Strive to understand my innovation team's knowledge transfer capabilities	○	○	○	○	○	○	○
[q0014_002] Strive to understand my innovation objectives	○	○	○	○	○	○	○
[q0014_003] Strive to spend as little time as possible in meetings	○	○	○	○	○	○	○
[q0014_004] Avoid dealing with red tape (i.e., extensive formal approvals)	○	○	○	○	○	○	○
Please tick 7 on the scale for verification purposes.	○	○	○	○	○	○	○
[q0015_001] Avoid communication overload situations	○	○	○	○	○	○	○
[q0015_002] Filter out communication noise in knowledge transfer activities	○	○	○	○	○	○	○
[q0015_003] Practice transparent communication with stakeholders	○	○	○	○	○	○	○
[q0015_004] Strive to enable unrestricted access to corporate knowledge	○	○	○	○	○	○	○
[q0015_005] Initiate knowledge transfer activities with parties outside of my time zone	○	○	○	○	○	○	○
[q0015_006] Communicate in simple terms to non-technical personnel	○	○	○	○	○	○	○
[q0015_007] Strive to eliminate language barriers between parties	○	○	○	○	○	○	○
[q0015_008] Communicate via rich communication mediums (e.g., video, animations, multimedia) versus text-only messaging	○	○	○	○	○	○	○
[q0015_009] Mind taking into consideration feedback from external parties that seemed incorrect, inaccurate and dishonest	○	○	○	○	○	○	○

Next

(3) Organizational relationships - what works for innovation?

In order to be able to produce innovation in most cases you need to **cooperate** with other firms, end-users, customers, universities or government in order to gain additional value, resources, skill or capability you do not have on your own.

In this section I would like to ask you to evaluate from your experience on the scale from strongly disagree to agree **what works** in producing a successful innovation through cooperating with others.

Answer the following:

Thinking back about my innovation activities in cooperating with others that were SUPPORTIVE of my innovation: I DID ….

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0016_001] Strive to form partnerships in a large and diversified partner network	○	○	○	○	○	○	○
[q0016_002] Strive to form partnerships with those outside of my own industry	○	○	○	○	○	○	○
[q0016_003] Strive to have readily available access to a network of international partners	○	○	○	○	○	○	○
[q0016_004] Strive to ensure strong collaboration between geographically dispersed partners	○	○	○	○	○	○	○
[q0016_005] Form partnerships with compatible partners	○	○	○	○	○	○	○
[q0016_006] Form partnerships with my end users (customers)	○	○	○	○	○	○	○
[q0017_001] Regularly cooperate with partners in order to introduce novel views into my organization	○	○	○	○	○	○	○
[q0017_002] Regularly measure the values that a partner relationship was bringing to me	○	○	○	○	○	○	○
[q0017_003] Provide ‘free of charge’ value to my partners	○	○	○	○	○	○	○
[q0017_004] Recognize my partner's work as valuable	○	○	○	○	○	○	○
[q0017_005] Invest into partnership relationships even if it was more than I got back from the partners	○	○	○	○	○	○	○
[q0017_006] Take care of partnership joint interests above my own interests	○	○	○	○	○	○	○
[q0017_007] Form partnerships with partners that had approximately the same delivery capability as I did	○	○	○	○	○	○	○
[q0017_008] Form partnerships with partners that had a better delivery capability than I did	○	○	○	○	○	○	○
[q0018_001] Actively invest into my partner relationships	○	○	○	○	○	○	○
[q0018_002] Have partnership interests aligned	○	○	○	○	○	○	○

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0018_003] Have a clear collaboration plan defined between partners	○	○	○	○	○	○	○
[q0018_004] Combine resources with my partner’s	○	○	○	○	○	○	○
[q0018_005] Have an alignment of business and technical objectives between partners	○	○	○	○	○	○	○
[q0018_006] Have a decentralization of partnership responsibilities	○	○	○	○	○	○	○
[q0018_007] Have a decentralized decision-making process in my partnerships	○	○	○	○	○	○	○
[q0018_008] Make myself open to multiple trial and error iterations in order to make the partnership work	○	○	○	○	○	○	○
[q0018_009] Make myself flexible to adapt to my partner’s specifics	○	○	○	○	○	○	○
[q0018_010] Openly accept partner feedback without prejudice	○	○	○	○	○	○	○
[q0018_011] Provide a quick turnaround time to my partners	○	○	○	○	○	○	○
[q0018_012] Strive to create a sense of belongingness with my partners	○	○	○	○	○	○	○
[q0018_013] Take responsibility for my own actions in my partnerships	○	○	○	○	○	○	○
Please tick 4 on the scale for verification purposes.	○	○	○	○	○	○	○
[q0019_001] Need to believe that I was dealing with a trustworthy partner	○	○	○	○	○	○	○
[q0019_002] Need to believe that I was dealing with a reliable partner	○	○	○	○	○	○	○
[q0019_003] Trust my partners from the start	○	○	○	○	○	○	○
[q0019_004] Make myself open to disclosing confidential information	○	○	○	○	○	○	○
[q0019_005] Have transparent communication	○	○	○	○	○	○	○
[q0019_006] Honour my partnership commitments	○	○	○	○	○	○	○
[q0019_007] Openly share IP (Intellectual Property) with partners	○	○	○	○	○	○	○
[q0019_008] Establish close personal relationships with individuals in a partnership	○	○	○	○	○	○	○
[q0019_009] Build a good reputation as a trustworthy partner to others	○	○	○	○	○	○	○
[q0019_010] Understand my partner’s decision-making process	○	○	○	○	○	○	○
[q0019_011] Involve partners regarding all issues concerning them	○	○	○	○	○	○	○
[q0019_012] Provide dedicated support to my partners	○	○	○	○	○	○	○

Item	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0020_001] Make myself open to learn from my partner's cultural specificities	○	○	○	○	○	○	○
[q0020_002] Have a clear delineation of responsibilities between myself and my partners	○	○	○	○	○	○	○
[q0020_003] Have clear expectations of my partner responsibilities	○	○	○	○	○	○	○
[q0020_004] Proactively and openly disseminate information to my partners	○	○	○	○	○	○	○
[q0020_005] Allow sufficient time for my partners to make decisions	○	○	○	○	○	○	○
[q0020_006] Encourage my partners to learn from each other	○	○	○	○	○	○	○

Next

(4) Organizational relationships - what does not work for innovation?

In this section I would like to ask you to evaluate from your experience on the scale from *strongly disagree* to *strongly agree* **what does not work** in producing a successful innovation through cooperating with others.

Answer the following:

Thinking back about my innovation activities in cooperating with others that were NOT SUPPORTIVE of my innovation: I DID NOT ….

Item	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0021_001] Strive to have good access to partner networks for my partnerships	○	○	○	○	○	○	○
[q0021_002] Form partnerships with compatible partners	○	○	○	○	○	○	○
[q0021_003] Form partnerships with partners that had a better delivery capability than my own	○	○	○	○	○	○	○
[q0021_004] Strive to have correct information about my partner's national or regional environments	○	○	○	○	○	○	○
[q0021_005] Strive to have good support from the local environment for my partnerships	○	○	○	○	○	○	○
[q0021_006] Allow partners to make an independent decision on forming a relationship without me forcing them into it	○	○	○	○	○	○	○
[q0022_001] Learn from partners	○	○	○	○	○	○	○
[q0022_002] Combine resources in a partnership	○	○	○	○	○	○	○
[q0022_003] Have an understanding of the business problems in partnerships	○	○	○	○	○	○	○
[q0022_004] Clearly set expectations in my partnerships	○	○	○	○	○	○	○

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0022_005] Align technology solutions with business objectives in the partnership	○	○	○	○	○	○	○
[q0022_006] Solicit feedback for my innovation from partners	○	○	○	○	○	○	○
[q0022_007] Have stable communications with my partner network	○	○	○	○	○	○	○
[q0022_008] Openly share Intellectual Property (IP) in my partnerships	○	○	○	○	○	○	○
[q0023_001] Understand my own capabilities prior to forming a partnership	○	○	○	○	○	○	○
[q0023_002] Provide 'free of charge' value to my partners	○	○	○	○	○	○	○
[q0023_003] Involve partners in decisions concerning them	○	○	○	○	○	○	○
[q0023_004] Involve senior management in partner relationships	○	○	○	○	○	○	○
Please tick 5 on the scale for verification purposes	○	○	○	○	○	○	○
[q0024_001] Trust partners freely from the start of a relationship	○	○	○	○	○	○	○
[q0024_002] Take responsibility for problems or failures in the partnership	○	○	○	○	○	○	○
[q0024_003] Avoid making judgements on my partner relationships based on what my partners said to me	○	○	○	○	○	○	○
[q0024_004] Avoid engaging with partners who had a history of being involved in damaging relationships	○	○	○	○	○	○	○
[q0024_005] Strive to deliver on committed promises to my partners	○	○	○	○	○	○	○
[q0025_001] Work with globally dispersed partner networks	○	○	○	○	○	○	○
[q0025_002] Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships	○	○	○	○	○	○	○
[q0025_003] Allow partners to make decisions independently without my influence	○	○	○	○	○	○	○

Next

(d) About you

In this section we would like to understand more about you.
This information will be used to understand and interpret your responses.

[q0026] **What is your gender?**
Please select only one.

- ◯ Male
- ◯ Female

[q0027] **Your age?**
Please select only one.

- ◯ < 20 years of age
- ◯ 20-24 years of age
- ◯ 25-29 years of age
- ◯ 30-34 years of age
- ◯ 35-39
- ◯ 40-44
- ◯ 45-49
- ◯ Over 50 years of age

[q0028] **What is your highest level of education attained to date?**
Please select only one.

- ◯ High school or less
- ◯ Undergraduate degree (University)
- ◯ Master's degree
- ◯ PhD
- ◯ Other:

[q0029] **What is your current job position?**
Please type in your response.

- ◯ Software Developer
- ◯ Software Architect
- ◯ IT Engineer
- ◯ Researcher (R&D)
- ◯ Entrepreneur (owner)
- ◯ Project Manager / Scrum Master
- ◯ Product Owner
- ◯ Middle Management
- ◯ Senior Management
- ◯ Director
- ◯ CEO (GM)
- ◯ Other:

[q0030] **How many years of professional experience do you have?**
Please select only one.

- ◯ Less than 1 year of experience
- ◯ 1-5 years of experience
- ◯ 6-10 years of experience
- ◯ 11-15 years of experience
- ◯ 16-20 years of experience
- ◯ More than 20 years of experience

[q0031] **Your primary place of residence is:**
Please select only one.

[DROP-DOWN LIST OF GLOBAL COUNTRIES]

[q0032] **How were you referred to our questionnaire?**
Please select one of the below.

- ◯ Directly by a researcher
- ◯ Friend/colleague
- ◯ Social Media
- ◯ LinkedIn
- ◯ Other - please state _____________

Please click on DONE button below to submit the survey.

Otherwise all of your responses will be lost. Thank you!

[Action -> Clicking on "**Done**" leads to the "**Thank you**" page.]

Thank you page

["Thank you" page - displayed once the survey has been submitted]

Thank you very much for your participation.
Your survey responses have been successfully recorded.

Sorry for bothering you page

["**Sorry for bothering you" page** - displayed if participant has stated he/she is not part of the target group for this research, or has not consented to participate in the research following a review of the info sheet]

You have opted out from participation in the survey.

Thank you on your time.

Would you like to participate in a follow up study? Click here to be taken to an external page not connected to this survey ensuring anonymity of your responses.

[Action: "**Click here**" leads to "Sign up for a follow-up study" page.

Sign up for a follow-up study (external page)

[**“Sign up for a follow up study” page** - displayed if participant has opted in the previous step. This is a separate **external page** that does not link participants with the survey filled out. This ensures separation of personally identifiable information and anonymity of participation.]

Sign up for a follow up and receive the final results of the study on innovation in IT companies (AFA II).

Please note that you are now on a **separate web page** and that your **contact details will not be linked** with the responses of the survey you have just filled out ensuring **anonymity** of your participation.

Please select all applicable options

☐ - **I would like to sign up to participate in a follow-up study.***
* Please help through filling one more follow-up questionnaire as a final piece of this study.

☐ - **I would like to email this survey to other colleagues from the IT industry.****
** Please help collect statistically large enough sample for the better quality of this study.

☐ - **I would like to sign up to receive final results of this study.*****
*** Once the final study is completed you will receive a copy of the findings that you could potentially apply in your environment.

Please enter your email address for a follow-up with you:

Enter text...

Please click on the DONE button below to submit your responses.

Done

[Action -> Clicking on “**Done**” submits the responses.]

APPENDIX XV: Research Instrument - Questionnaire for AFA III Phase

In this section please find included a copy of the survey used for the 3rd phase of the field research (AFA III).

Note:
- The questionnaire was built online, and data collection was conducted fully online.
- Please note that questionnaire disclosed in this section is coded with variables used for SPSS analysis. The coding starts with "q" and a numerical value for each question.

The University Of Sheffield.

Online survey (AFA III):
Please contribute to our understanding of how IT companies innovate

Welcome!

Your participation in this study at the University of Sheffield, School of Management is seeking to help understand **how innovation works in IT companies** and how it can be **improved**. Understanding how innovation works is important as it is a major driving force of **economic growth**, especially in our region.

If you are an **IT professional** having just a little bit, some, or a lot of experience innovating in IT, we would very much welcome your participation in this study.

We estimate needing no more than about 10 minutes of your valuable time and your participation in this study is completely **anonymous**.

Upon completion the results of this study can be **shared with you** and will be **released into the public domain** for anyone interested.

Thank you on your consideration and contribution to influence a positive change in the society we live in.

Yours truly,

Danimir Ljepava

PhD candidate

Email: danimir.ljepava@sheffield.ac.uk

LinkedIn: https://www.linkedin.com/in/danimir/

Qualification

In order to proceed, please confirm the following:

[q0001] Are you an IT professional working for a private sector company in any of the following areas: software development, engineering, R&D? *

Please select only one.

- ◯ Yes
- ◯ No

Next

[Action -> Selecting "**Yes**" leads to the **next page**.
Selecting "**No**" leads to "**Sorry for bothering you**" page.]

Participant information sheet

Participant information sheet

The University of Sheffield procedure requires that all participants are informed of research details regarding anonymity, information protection, storage and information usage prior to responding to the survey questions -- please find such details provided in this section, and please accept participation in this survey.

Participant information Sheet

Your participation is anonymous, confidential and your data is protected.

Information collected through this survey is intended to be used for the purposes of conducting a research on innovation management in order to understand and improve innovation performance in IT companies. Findings of this research will be used for writing a PhD thesis by the principal researcher, for publications of summarized findings in academic papers and presentation of such findings at academic conferences.

Please rest assured that your participation is anonymous and that your responses are confidential. Data collected through this survey will be combined from all participants and summarized into a statistical anonymous overview through which it will not be possible to trace back individual responses to any participant.

Please note that your participation is voluntary and that you can withdraw from participation at will. Please note that your responses are not recorded automatically as you fill them out on each page, due to which you can abandon participation through just closing off your web browser at any point in time. Only when you click on the "Done" button at the last page of the survey your responses will be anonymously recorded.

What to expect

The survey consists of several sections with questions asking for demographics information about yourself and the company you work for, and it is asking you to evaluate, based on your personal experience, on a scale from "what works" (what is supportive) to "what does not work" (what is not supportive) for innovation success based on your experience. The survey questions will not ask you for any confidential, business, personal or proprietary information.

Estimated average time to complete the main survey is about 10 minutes of your valuable time. At the end of the main survey, you will be asked if you would like to help with filling out additional questions for a deeper understanding of innovation processes or to end your participation. In case you choose to help filling out additional questions, this effort is expected to take additional 10 - 15 minutes of your valuable time.

Please note that you can leave your browser window open and fill out survey sections throughout the day. If you chose to do so, please do not close the browser window as your responses will be lost and you will not be able to continue from where you left off.

Questions or concerns

If you should have any questions or concerns regarding this research, please do not hesitate to reach out first to the PhD student conducting this study. In case of any issues or concerns, you are welcome to escalate your complaint to student's supervisors or the dean of the department.

Contacts

(1) Reach out in case of any questions or concerns as a first point of contact regarding this study to: Danimir Ljepava, Principal researcher, PhD candidate, Email: danimir.ljepava@sheffield.ac.uk

(2) Reach out to one of the following two supervisors in case you have an issue you could not resolve with the student:

- Dr. Leslie Szamosi, Supervisor, Senior Lecturer, Email: l.szamosi@sheffield.ac.uk
- Dr. Robert Wapshott, Supervisor, Senior Lecturer, Email: r.wapshott@sheffield.ac.uk

(3) Reach out to the Dean of the department in case you have an issue you could not work out with supervisors:

- Prof. David Oglethorpe, Dean of the Department, d.oglethorpe@sheffield.ac.uk

Consent to participate

Your consent to participate

[q0002] The university procedure requires that you provide consent to participate in this research through agreeing to the following:

- I confirm that I have read and understand the information sheet disclosed above explaining the above research project and I have had the opportunity to ask questions about the project.
- I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline
- I understand that my responses will be kept strictly confidential. I give permission for members of the research team to have access to my anonymized responses.
- I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.
- I agree for the data collected from me to be used in future research and publications
- I agree to take part in the above research project.

[Please select only one. *

◯ I ACCEPT
◯ I DO NOT ACCEPT

Next

[Action -> Selecting "**I ACCEPT**" leads to the **next page**.
Selecting "**I DO NOT ACCEPT**" leads to "**Sorry for bothering you**" page.]

Demographics: Company

About your company

In this section we would like to understand more about the company you are working for.
This information will be used to understand and interpret your responses.

[q0003_001] Are you a locally or internationally owned organization? (Please note "locally" would mean the country where you work)
Please select only one.

◯ Wholly locally owned	◯ More local, some foreign owned	◯ 50/50 local and foreign owned	◯ More foreign, some local owned	◯ Wholly foreign owned

[q0004] What is the country of your company's primary residence?
Please select only one.

[DROP-DOWN LIST OF GLOBAL COUNTRIES]

[q0005] In which country do you primarily work in?
Please select only one.

◯ Same as my company's primary residence
◯ I work in a different country than my company's primary residence - please select:

[DROP-DOWN LIST OF SEE COUNTRIES: Slovenia, Serbia, Kosovo, Croatia, Bosnia Herzegovina, Bulgaria, Romania, North Macedonia, Montenegro, Greece, Albania]

Other (please specify): ____

[q0006_001] Where is the core of your innovation primarily been developed?
Please note "locally" would mean the country you work in.
Please select only one.

◯ Developed entirely locally	◯ More locally, some abroad	◯ 50/50 locally and abroad	◯ More abroad, some locally	◯ Entirely developed abroad

[q0007] What is the size of your organization
Please select only one.

◯ Self-employed
◯ 1-10 employees
◯ 11-50 employees
◯ 51-250 employees
◯ 251-500 employees
◯ 501-1000 employees
◯ > 1000 employees

[q0008] What is your organization's primary activity?
Please check all that applies.

◯ Software Development
◯ Cloud Services (SaaS, PaaS products)

◯ Professional services (i.e. IT outsourcing)
◯ Hardware software development
◯ R&D
◯ Other:

[q0009] How long has your organization been in existence?
Please select only one.

◯ < 1 years
◯ 1-2 years
◯ 3-5 years
◯ 6-10 years
◯ 11-15 years
◯ 16-20 years
◯ > 20 years

Next

Demographics: Participant

About you

In this section we would like to understand more **about you**. No personally identifiable questions are asked ensuring the anonymity of your participation.

This information will be used to **understand** and interpret your responses.

[q0010] What is your gender?
Please select only one.
◯ Male
◯ Female

[q0011] What is your age?
Please select only one.
◯ < 20 years of age
◯ 20-24 years of age
◯ 25-29 years of age
◯ 30-34 years of age
◯ 35-39 years of age
◯ 40-44 years of age
◯ 45-49 years of age
◯ 50-59 years of age
◯ 60-65 years of age
◯ > 65 years of age

[q0012] What is your highest level of education?
Please select only one.
◯ High school
◯ Undergraduate degree (University)
◯ Master's degree
◯ PhD
◯ Other:

[q0013] What is your current job position?

Please select only one.

- ◯ Software Developer
- ◯ Software Architect
- ◯ IT Engineer
- ◯ Researcher (R&D)
- ◯ Entrepreneur (owner)
- ◯ Project Manager
- ◯ Product Owner
- ◯ Scrum Master
- ◯ Middle Management
- ◯ Senior Management
- ◯ Director
- ◯ CEO (GM)
- ◯ Other (please specify):

[q0014] How many years of professional experience do you have?

Please select only one.

- ◯ < 1 year of professional experience
- ◯ 1-5 years of professional experience
- ◯ 6-10 years of professional experience
- ◯ 11-15 years of professional experience
- ◯ 16-20 years of professional experience
- ◯ > 20 years of professional experience

[q0015] How many years of innovation experience, specifically, do you have?

Please select only one.

- ◯ < 1 year of innovation experience
- ◯ 1-5 years of innovation experience
- ◯ 6-10 years of innovation experience
- ◯ 11-15 years of innovation experience
- ◯ 16-20 years of innovation experience
- ◯ > 20 years of innovation experience

[q0016] How were you referred to this questionnaire?

Please select one of the below.

- ◯ Directly by the researcher
- ◯ Colleague
- ◯ Friend
- ◯ LinkedIn
- ◯ Twitter
- ◯ Facebook
- ◯ Newsletter (email)
- ◯ Other (please specify):

Next

(1) Knowledge transfer positives

Knowledge transfer: What WORKS FOR INNOVATION?

In order to be able to produce innovation, in most cases you need to learn from experiences and knowledge of other firms (partners, suppliers, vendors, service providers, et sim.), end-users, customers, universities or government.

Based on your experience to date, in this section we would like to ask you to evaluate from strongly **disagree** to strongly **agree** on **what works** in producing a **successful innovation** through **knowledge transfer** with others.

Answer the following:

Thinking back about my innovation activities on knowledge transfer with others that were SUPPORTIVE of my innovation: I DID ….

[q0017_001] Seek to understand the way customers use my products and/or services	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0017_002] Have flexibility in discovering new knowledge useful to my innovation	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0017_003] Learn from customers in order to develop my innovation	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0017_004] Actively combine multiple sources of knowledge to acquire new knowledge	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0017_005] Use rich communication media (e.g., video, presentation, animations) that were not text-only	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0017_006] Proactively apply the new knowledge acquired	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0017_007] Use IT infrastructure for knowledge management activities	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree

Next

(2) Knowledge transfer negatives

Knowledge transfer: What DOES NOT WORK FOR INNOVATION?

Based on your experience to date, in this section we would like to ask you to evaluate from strongly **disagree** to strongly **agree** on **what does NOT work** in producing a **successful innovation** through **knowledge transfer** with others.

Answer the following:

Thinking back about my innovation activities on knowledge transfer with others that were NOT SUPPORTIVE of my innovation: I DID NOT ….

[q0018_001] Document knowledge verbally sourced from external parties	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0018_002] Strive to have a good quality of recorded knowledge (i.e. documentation)	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0018_003] Strive to spend as little time as possible in meetings	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0018_004] Source knowledge from multiple sources	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0018_005] Take market conditions into consideration	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0018_006] Create a plan for the type of knowledge I needed to acquire	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0018_007] Attempt to understand the type of knowledge that I needed to acquire	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree

Next

(3) Interorganizational relationship positives

Organizational relationships: What WORKS FOR INNOVATION?

In order to be able to produce innovation in most cases you need to cooperate with other firms, end-users, customers, universities or government in order to gain additional value, resources, skill or capability you do not have on your own.

Based on your experience, in this section we would like to ask you to evaluate from strongly **disagree** to **agree** on **what works** in producing a **successful innovation** through **cooperating** with **others**.

Answer the following:

Thinking back about my innovation activities in cooperating with others that were SUPPORTIVE of my innovation: I DID ….

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0019_001] Take responsibility for my own actions in my partnerships	○	○	○	○	○	○	○
[q0019_002] Make myself open to learn from my partner's cultural specificities	○	○	○	○	○	○	○
[q0019_003] Build a good reputation as a trustworthy partner to others	○	○	○	○	○	○	○
[q0019_004] Recognize my partner's work as valuable	○	○	○	○	○	○	○
[q0019_005] Honour my partnership commitments	○	○	○	○	○	○	○
[q0019_006] Need to believe that I was dealing with a trustworthy partner	○	○	○	○	○	○	○
[q0019_007] Need to believe that I was dealing with a reliable partner	○	○	○	○	○	○	○
[q0019_008] Have transparent communication	○	○	○	○	○	○	○
[q0019_009] Have clear expectations of my partner responsibilities	○	○	○	○	○	○	○

Next

(4) Interorganizational relationship positives

Organizational relationships: What DOES NOT WORK FOR INNOVATION?

Based on your experience, in this section we would like to ask you to evaluate from strongly **disagree** to strongly **agree** on **what does** not **work** in producing a **successful innovation** through **cooperating** with **others**.

Answer the following:

Thinking back about my innovation activities in cooperating with others that were NOT SUPPORTIVE of my innovation: I DID NOT ….

[q0020_001] Make decisions based on 'gut' feeling (intuition) without due diligence in my partnerships	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0020_002] Allow partners to make decisions independently without my influence	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0020_003] Openly share Intellectual Property in my partnerships	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0020_004] Avoid engaging with partners who had a history of being involved in damaging relationships	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0020_005] Trust partners freely from the start of a relationship	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0020_006] Avoid making judgements on my partner relationships based on what my partners said to me	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0020_007] Allow partners to make an independent decision on forming a relationship without me forcing them into it	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree

Next

(5) Working with others

About your innovation: What WORKS FOR INNOVATION?

Based on your experience, in this section we would like to ask you to evaluate strongly **disagree** to strongly **agree** on **what works** in producing a **successful** innovation in **working** with **others**.

Answer the following:

Thinking back about my innovation activities, please state to which degree do you AGREE with the following STATEMENTS:

Statement	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0021_001] The majority of innovations developed in my company are based on the adaptation of existing inventions from developed countries abroad	○	○	○	○	○	○	○
[q0021_002] The higher the frequency of interorganizational knowledge transfer between my company and companies I work with, the more successful the outcome.	○	○	○	○	○	○	○
[q0021_003] The stronger the interorganizational relationships between my company and companies I work with, the more successful the outcome.	○	○	○	○	○	○	○
[q0021_004] The stronger the social relationships between my company's employees and employees in companies I work with, the more successful the outcome.	○	○	○	○	○	○	○
[q0021_005] The higher the social capital is (i.e. trust, mutual favours, reputation) is between my company and companies I work with, the more successful the outcome.	○	○	○	○	○	○	○
[q0021_006] The higher the involvement is of communities of practice (professionals sharing their experiences) between my company and companies I work with, more successful is the outcome.	○	○	○	○	○	○	○

Next

(6) Country specifics

Country specifics: What WORKS FOR INNOVATION?

Based on your experience, in this section we would like to ask you to evaluate from strongly **disagree** to strongly **agree** on **what works** in producing a **successful** innovation in **working internationally**.

Answer the following:

Thinking back about my innovation activities that were SUPPORTIVE of my innovation: I DID ...

[q0022_001] Hire expatriates to move back to my country and contribute their experience for my innovation	0. N/A	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0022_002] Develop my innovation in countries with a similar culture with my company's home country	0. N/A	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0022_003] Develop my innovation in countries with a well-functioning government system	0. N/A	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0022_004] Develop my innovation in countries with highly educated human resources	0. N/A	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0022_005] Develop my innovation in countries with good foreign direct investment potential	0. N/A	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0022_006] Adapt to the competition of the countries my innovation was distributed to	0. N/A	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree

Next

Opt-in for extra questions

You have successfully completed the main part of the survey - thank you!

Please respond to the question below and click on the Next button in order for your answers to be recorded.

Extra questions

We have some extra questions in order to understand deeper how innovation processes, working in teams, corporate culture and organizational structure affect the innovation outcome.

We would appreciate it greatly if you would have about 10-15 more minutes of your valuable time to respond to these extra questions.

If you would like to participate, please select "Extra questions", or please select "Thanks – I'm done" option to conclude the survey, and please click on the Next button in either case.

[q0023] Would you like to participate in answering some extra questions?

Please select only one. *

◯ Yes, I would like to answer some **extra questions**.
◯ No, Thanks – **I'm done**.

Next

[Action -> Selecting "**Yes**" leads to the **next page**. Selecting "**No**" leads to "**Thank you**" page.]

Innovation process: What WORKS FOR INNOVATION?

Based on your experience, in this section we would like to ask you to evaluate from strongly **disagree** to strongly **agree** on **what works** in producing a **successful** innovation from the perspective of your **innovation processes**.

Answer the following:

Thinking back about my innovation process and activities that were SUPPORTIVE of my innovation: I DID ...

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0024_001] Carefully select which innovative ideas to pursue developing	○	○	○	○	○	○	○
[q0024_002] Set my innovation goals before starting my innovation activities	○	○	○	○	○	○	○
[q0024_003] Prioritize innovation activities based on the expected commercial benefits	○	○	○	○	○	○	○
[q0024_004] Openly recognize emerging (unplanned, unexpected) innovation	○	○	○	○	○	○	○
[q0024_005] Adopt existing proven solution in producing my innovation	○	○	○	○	○	○	○
[q0024_006] Analyse customer market segmentation (i.e. understand well who are my customers)	○	○	○	○	○	○	○
[q0024_007] Rapidly generate product prototypes (i.e. mock-ups, wireframes) for my innovation	○	○	○	○	○	○	○
[q0024_008] Form a group of pilot customers to test my innovation	○	○	○	○	○	○	○
[q0024_009] Continuously obtain customer feedback in order to improve innovation developed	○	○	○	○	○	○	○
[q0024_010] Promptly change innovation development direction based on customer feedback	○	○	○	○	○	○	○
[q0024_011] Transparently inform customers on new innovative products I was working on	○	○	○	○	○	○	○
[q0024_012] Educate customers about my innovative products	○	○	○	○	○	○	○
[q0024_013] Carefully consider the timing of releasing my innovation to the marketplace	○	○	○	○	○	○	○
[q0024_014] Please tick 4 on the scale for verification purposes	○	○	○	○	○	○	○

Next

Innovation Teams: What WORKS FOR INNOVATION?

Based on your experience, in this section we would like to ask you to evaluate from strongly **disagree** to strongly **agree** on **what works** in producing a **successful** innovation from the perspective of forming your **innovation teams**.

Answer the following:

Thinking back about my innovation activities and forming my teams that were SUPPORTIVE of my innovation: I DID ...

[q0025_001] Prefer building smaller (up to 10 people) innovation teams	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0025_002] Promote a sense of teamwork with the team	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0025_003] Encourage the team's support for innovation activities	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0025_004] Encourage the team to be aware of its own capabilities	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0025_005] Adopt start-up alike culture in my team	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0025_006] Align team members' focus on our common innovation goals	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0025_007] Encourage the team's buy-in towards company's business objectives	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0025_008] Encourage collaborative decision making in my team	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0025_009] Make difficult decisions based on gut feeling (i.e. intuition)	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree

Next

(9) Company culture

Company Culture: What WORKS FOR INNOVATION?

Based on your experience, in this section we would like to ask you to evaluate from strongly **disagree** to strongly **agree** on **what works** in producing a **successful** innovation from the perspective of your **company's culture**.

Answer the following:

Thinking back about my innovation activities and my company's culture that were SUPPORTIVE of my innovation: I DID ...

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0026_001] Encourage employees to experiment with their ideas / innovate	○	○	○	○	○	○	○
[q0026_002] Encourage employees to work on projects they feel passionate about	○	○	○	○	○	○	○
[q0026_003] Drive innovation direction from management to employees (top-down)	○	○	○	○	○	○	○
[q0026_004] Drive innovation direction from employees to management (bottom-up)	○	○	○	○	○	○	○
[q0026_005] Proactively work on removing roadblocks for the innovation team	○	○	○	○	○	○	○
[q0026_006] Encourage thinking outside of the limitations of my organization's system	○	○	○	○	○	○	○
[q0026_007] Encourage innovation failure as a learning experience	○	○	○	○	○	○	○
[q0026_008] Support employees to work outside of the boundaries of our current corporate culture	○	○	○	○	○	○	○
[q0026_009] Actively adapt changes to the corporate culture	○	○	○	○	○	○	○
[q0026_010] 'Evangelize' (promote, advertise) innovation activities inside my organization	○	○	○	○	○	○	○
[q0026_011] Please tick 6 on the scale for verification purposes	○	○	○	○	○	○	○

Next

(10) Organizational structure

Organizational structure: What WORKS FOR INNOVATION?

Based on your experience, in this section we would like to ask you to evaluate from strongly **disagree** to strongly **agree** on **what works** in producing a **successful** innovation from the perspective of your company's **organizational structure**.

Answer the following:

Thinking back about my innovation activities and my company's organizational structure that were SUPPORTIVE of my innovation: I DID ...

	1. Strongly Disagree	2. Disagree	3. Somewhat Disagree	4. Neither Agree nor Disagree	5. Somewhat Agree	6. Agree	7. Strongly Agree
[q0027_001] Recruit the best available talent on the market	○	○	○	○	○	○	○
[q0027_002] Develop a strong organizational innovation capacity	○	○	○	○	○	○	○
[q0027_003] Introduce a flat organizational structure	○	○	○	○	○	○	○
[q0027_004] Develop continuous organizational learning systems	○	○	○	○	○	○	○
[q0027_005] Encourage Communities of Practice - a body of employees sharing experiences amongst each other	○	○	○	○	○	○	○
[q0027_006] Support innovation champions (people driving innovation) across my organization	○	○	○	○	○	○	○
[q0027_007] Seek for stakeholder buy-in (management, investors, et sim.) when introducing organizational changes	○	○	○	○	○	○	○
[q0027_008] Support charismatic and visionary leaders in my innovation teams	○	○	○	○	○	○	○

Next

(11) Behaviours having negative impact to innovation outcome

Obstacles to innovation: What DOES NOT WORK FOR INNOVATION?

Based on your experience, in this section we would like to ask you to evaluate from strongly **disagree** to strongly **agree** on **what does not work** in producing a **successful** innovation from the perspective of your organization.

Answer the following:

Thinking back about my innovation activities that were NOT SUPPORTIVE of my innovation: I DID NOT ...

[q0028_001] Understand well the specifics of the countries for which I was developing my innovation	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_002] Understand well the legal regulations affecting my innovation	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_003] Understand well the competitive landscape (i.e. competition offerings in the space of my innovation)	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_004] Change the direction of my innovation development in case of wrong assumptions	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_005] Focus my engineering efforts on solving customer problems	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_006] Align sales expectations with my delivery capabilities	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_007] Understand the well capacity of human resources in the countries where my innovation was developed	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_008] Understand well my customers' expectations	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_009] Support appropriate innovation champions	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_010] Please tick 7 on the scale for verification purposes	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_011] Have internal reward structures supportive of rewarding innovation activities	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_012] Communicate in non-technical language to executives	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_013] Communicate complete, non-fragmented, information to my stakeholders	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_014] Have informal communication channels	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_015] Promptly resolve issues	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_016] Take responsibility for own actions	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree
[q0028_017] Provide sufficient time for innovation to form	○ 1. Strongly Disagree	○ 2. Disagree	○ 3. Somewhat Disagree	○ 4. Neither Agree nor Disagree	○ 5. Somewhat Agree	○ 6. Agree	○ 7. Strongly Agree

[q0028_018] Move outside of my comfort zone | 1. Strongly Disagree | 2. Disagree | 3. Somewhat Disagree | 4. Neither Agree nor Disagree | 5. Somewhat Agree | 6. Agree | 7. Strongly Agree

[q0028_019] Open up to multiple trial and error iterations | 1. Strongly Disagree | 2. Disagree | 3. Somewhat Disagree | 4. Neither Agree nor Disagree | 5. Somewhat Agree | 6. Agree | 7. Strongly Agree

Please click on the Done button below
to submit your survey responses.

Thank you very much on your participation!

Done

[Action -> Clicking on "**Done**" leads to the "**Thank you**" page.]

Thank you page

["**Thank you page**" - displayed at the end of the survey.]

Thank you!

Your survey responses have been successfully recorded.

Sorry for bothering you page

["**Sorry for bothering you" page** - displayed if participant has stated he/she is not part of the target group for this research, or has not consented to participate in the research]

You have opted out from participation in the survey.

Thank you on your time.

APPENDIX XVI – Researcher's Profile

Academic Experience

- **2011 – 2020** – University of Sheffield - SEERC
    - PhD candidate, Innovation Management
- Graduated **2009** – University of Sheffield
    - MBA, Honours, Best in class
- Graduated **2002** – University of Windsor, Ontario
    - B.Sc. Computer Science, Honours

Industry Experience

- **2017 – present** – MDCS - Microsoft Development Center Serbia
    - Innovating industry leading database and AI (artificial intelligence) solutions for Microsoft's Azure cloud flagship data products
- **2016 – 2017** – Comtrade Digital Services, Serbia and Ireland
    - Delivery of digital technology solutions in the area of logistics and enterprise Internet applications
- **2014 – 2016** – Westum, Serbia and UK
    - Delivery of information technology solution in the area of enterprise eCommerce Internet applications
- **2013 – 2014** – Humanity (ShiftPlanning), Serbia and USA
    - Delivery of information technology products in the area of cloud HR applications
- **2011 – 2013** – Compuware Corporation, USA
    - Delivery of information technology solutions in the area of enterprise cloud applications for corporate travel and connected vehicles
- **2003** – **2011** – Psimetrics, Canada and Serbia
    - Innovation management consulting in information and communication technologies
- **2000** – **2003** – Planet-intra (Intra.net), Canada and USA
    - Delivery of information technology solutions in the area of cloud corporate intranet applications. Innovation technology patents registered in the US.

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