

Do I Really Need You? A Team-Centred Analysis of Task Interdependence in Innovation Systems

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The candidate confirms that the work submitted is his own, except where work which has formed part of jointly authored publications has been included. The contribution of the candidate and the other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

Some of the work in paragraph 2.2.2 of the thesis has appeared in publication as follows:

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I was responsible for the empirical research, analysis, and write up of the paper. The co-author is my PhD supervisor who supported the research process with feedback, criticism, and suggestions.

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Abstract

The innovation-era has seen firms adopting a variety of organisation designs with teams as their basic building blocks. The increasing competitive importance of innovation and the prevalence of team-based organisation designs have confronted firms with the challenge to manage complex task interdependence configurations. Firms therefore resort to structural linking to integrate dispersed innovation activities across a multitude of teams. I find that structural linking in innovation-led firms occurs by means of linking teams: i.e. teams which are created by top managers to support or manage the innovation process across other teams.

Within this context, I have set out to answer the central question of this study: how and why do teams shape the development of task interdependence? I examined how teams shape task interdependence over time through an inductive, longitudinal study of four high-technology firms. 122 interviews were conducted over a period of 24 months including a 3 month ethnographic stage.

My central contribution is a model of how teams shape the development of task interdependence. Overall, I present the conjunction of task and social interdependence as a dynamic, cyclical, process, which is shaped by the collective agency of teams. This study proposes that studying task interdependence from the perspective of teams requires the inclusion of social interdependence because teams form different perceptions of the designed task interdependence which can be positive, negative, or individualistic. These perceptions emerge in response to perceived goal structures between teams and as a response to how task interdependence relates to the identity and autonomy of the involved teams. These perceptions produce distinct patterns of interaction between teams in innovation systems, which subsequently instigate reconfigurations of both task and social interdependence.

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1. INTRODUCTION

1.1. Motivation

This research took form as a result of several motivations and opportunities. First, as a Marie Curie Fellow I was part of the EU Marie Curie FP7 network “Management of Emergent Technologies for Economic Impact”. My interest in strategic management in technology-led firms resonated with the research theme of the network. The work package assigned to me revolved around the notion of agency in innovation systems and specifically how agency interacts with organisational processes pertaining to innovation. Before joining the Marie Curie network I examined technology alliances; i.e. inter-organisational collaboration in the chemicals industry, doing empirical work in firms as Dow Chemical. During those studies I explored the intricate nature of interdependence. The combination of collaboration, interdependence, agency, and innovation management coalesced into the present study which is a treatise of the role of teams in the development of task interdependence in innovation systems. Innovation systems in this study are defined as intra-organisation designs for managing innovation. Hence, these are systems *within* the firm as opposed to innovation ecosystems which span organisational boundaries.

Much has been written about firms as systems and how links between their components are established and evolve over time (e.g. Cheng, 1983; Siggelkow, 2011). Earlier organisation theory research argues that these systems develop over time as a result of exogenous evolutionary forces (Hannan and Freeman, 1984; McCann and Galbraith, 1981; Thompson, 1967). More recent research adds to this the important and complementary role of managerial intentionality (Volberda and Lewin, 2003) suggesting therewith that the development of organisational systems concerns a more

nuanced scheme of drivers beyond ‘blind evolution’. As a particular important organisational system in the present era, innovation systems have a number of distinctive features. First, innovation systems are represented by the differentiation of activities and decomposition of tasks which are subsequently allocated to small specialist teams (Baer et al., 2010; Barua et al., 1995; Zhou, 2013). Indeed, an important common characteristic of designs for managing innovation is that they accommodate team-based structures which act as autonomous units. Although academics have seen the birth of a myriad of organisation designs in the current “innovation-era”, an overarching trend is that these developments have introduced the team as the core unit in the organisational system. This can be explained by one hand a volatile environment in which technological breakthroughs have become more rule than exception, and on the other that, within the firm, the novelty, complexity and uncertainty inherent to the overall organisational task of ‘innovation’ has caused firms to decompose this task into a variety of subtasks which have become the responsibility of adaptive teams that cooperating with other teams in firm-wide innovation projects. Hence, task interdependence as an academic topic is no longer about the study of straightforward configurations in factory assembly lines (Thompson, 1967; Victor and Blackburn, 1987) or publishers (Cheng, 1983) but about more complex configurations with increased interaction and more ambiguity regarding causal structures. In an era that is known by short communication lines, decentralised power and less hierarchy, one could therefore expect less deterministic and dictative forces behind the evolvement of innovation systems. We know that managerial agency also plays a role in driving organisational systems’ evolvement (Volberda and Lewin, 2003), but what about the collective agency of teams which, again, have come to fulfil such a critical role in today’s organisations; particularly with respect to innovation? Hence, the academic

rationale for this study is that, based on the preceding presentation of the distinctive features of innovation systems, the development of task interdependence as a foundational feature of these systems is expected to also include a role for teams. I therefore aim to investigate the role of teams in the evolution of task interdependence, studied within the context of innovation systems.

Finally, this topic is significant because it meets current interests in innovation management in academia but also in industry, specifically around the notion of teams. For example, Stanford's Graduate School of Business has a separate program¹ called 'Managing Teams for Innovation and Success'. The below referenced website explains that "the program is appropriate for executives who are responsible for the performance of teams, task forces, or autonomous work groups". All of these themes come together in this study. Moreover, many firms are trying to get people to work and compete in teams for the purpose of innovation output. Alcatel-Lucent's 'Entrepreneurial Bootcamp'² is an example of how teams from throughout the large Alcatel-Lucent organisation compete for resources to have their innovative ideas transformed into sustainable businesses.

All in all, this study was completed not only based upon personal and academic motivation and but also resonates with trends in the academic and innovation management practitioner community. However, a PhD research study should be embedded and contextualised in what we already know about this topic. The next paragraph therefore introduces the theoretical scope of the central research question.

¹ <http://www.gsb.stanford.edu/exed/mtis/>

² http://www3.alcatel-lucent.com/press/innovationatwork/episode_5_09.html

1.2. Research question and theoretical scope

“Technological progress is increasingly becoming the business of teams of trained specialists who turn out what is required and make it work in predictable ways.”

(Schumpeter, 1942: p. 132).

Organisation design has evolved over the last century in roughly three eras: from standardisation, to customisation, and innovation (Miles et al., 1997). The standardisation era is characterised by hierarchy, centralised authority, a functional design, and having specialisation and segmentation as core capabilities to enable mass production. The customisation era had companies grouping in networks while internally shifting to divisional and matrix designs. Moreover, the core capabilities became flexibility and responsiveness (Volberda, 1999). Then, the innovation era revolved more around teams and autonomous cells as the building blocks of organisation design. The significance of technological advancement and threat of creative destruction have made innovation crucial to the survival and success of companies. Innovation is no longer the sole concern of the R&D department, it is now a strategic activity of which the responsibility is carried by the entire organisation. This development has caused firms to experiment with a multitude of organisation designs due to the absence of ‘up-to-date’ reference theories (Gulati et al., 2012) for prescribing to organisations how to manage the complex yet pivotal task of innovation.

Examples of organisation designs adopted by firms in the innovation era are: the virtual organisation (Markus et al., 2000), the spin-out organisation (Ambos and Birkinshaw, 2010), the cellular organisation (Miles et al., 1999), the spaghetti-

organisation (Foss, 2003), the modular organisation (Galunic and Eisenhardt, 2001), and the ambidextrous organisation (Tushman and O'Reilly, 1996). An important common characteristic of these novel organisation designs is that they harbour team-based structures which operate as self-organising units.

The innovation era has led to a “growing importance of the team as the basic unit in an organisation” (Barua et al., 1995: p. 487). Teams are defined as any formal whole of at least two interdependent individuals who are collectively responsible for the achievement of one or several tasks defined by the organisation (Gladstein, 1984; Rousseau et al., 2006; Sundstrom et al., 1990). In earlier organisation design research it was argued that firms should join together individuals into team arrangements to manage complex tasks (Van de Ven et al., 1976). More recent research complements this theoretical perspective with empirical research which suggests that teams in innovation-driven organisations are adaptive, dynamic entities that change over time (Baer et al., 2010). Furthermore, present day employees are accustomed to working in teams. Simon (1948) even proposed that one of the incentives for individuals to work for an organisation is the relationship they have with their team. In teams, individuals cooperate on a daily basis and interact frequently which is likely to lead to the development of some form of collective agency which relates to purposive collective action in pursuit of team level goals (Johnson and Johnson, 2006; Weick & Roberts, 1993). An intriguing question is how this collective agency of teams relates to some form of structure within firms; i.e. how do firms remain efficient and effective in the innovation era despite the emergence of organisation designs consisting of teams as “independent entities”; each pursuing their own goals (Rivkin and Siggelkow 2003: p.293)?

Implicitly and consequently, team-based organisation designs require integration and coordination mechanisms to establish coherence across activities (Nadler and Tushman, 1997). These coordination mechanisms allow managers in these new organisation designs to sustain ‘leadership without control’ (Daft and Lewin, 1993); i.e. different to the type of control present in traditional bureaucratic and hierarchical designs prevalent in the standardisation and to a lesser extent in the customisation era. Nadler and Tushman (1997) posit that the integration of dispersed activities is an integral part of organisation design. They refer to this as ‘structural linking’ which is crucial to ensure teams keep contributing to corporate goals in lieu of diverging into unrelated or even conflicting directions (Taylor, 2010; Zhou, 2013). This is important because although teams may seem autonomous in performing their task, they will still depend on other teams to perform their tasks to attain innovation performance. Different types of interdependence can exist between teams which will be introduced later in this paragraph. For now, I argue that in order to manage the interdependence between teams, particularly in the innovation era with team-based structures and complex organisation designs, firms resort to structural linking.

The most prevalent structural linking mechanism included in the organisational design of large organisations is the cross-functional interface (Jansen et al., 2009). Cross-functional interfaces generate horizontal linkages between units. Examples are cross-functional teams, task forces, and liaison positions (Gupta and Govindarajan, 2000). The term ‘functional’ points toward the functional organisation design which was dominant in the standardisation era. The innovation era, with its diversity in organisation design, is less about functions but more about autonomous teams. It would be a daunting design problem to create a team that contains representation from all teams as was the case for the cross-functional interface with its members coming from

product development, marketing, finance and any other function(s) firms deemed relevant for the purpose of structural linking. The cross-functional team therefore seems an outdated structural linking mechanism with respect to its terminology and with respect to its structural properties. Research is required, therefore, to shed light on how innovation-led firms achieve structural linking by means of 'linking teams' - a term devised for the purpose of this study instead of the seemingly less appropriate term of 'cross-functional interface'. More specifically, how do linking teams integrate and manage other teams in different interdependence configurations underlying the variety of organisation designs in the innovation era?

Central to the system paradigm of organisations is the notion of interdependence among units or components (Thompson, 1967; Levinthal, 1997). The classic literature on organisation design (e.g. Burns and Stalker, 1961; Lawrence and Lorsch, 1967; Thompson, 1967) has devoted much attention to the most basic organisational element that underpins complex organisation; i.e. a dyad of interdependent units. The study of interdependence has a long research tradition that spans multiple paradigms within the field of organisation theory. This stream of work has developed the theoretical basis for a range of interdependence types, *viz.* task interdependence (Van de Ven et al., 1976; Astley & Zajac, 1991; Adler, 1995); goal interdependence (Wageman and Baker, 1997); reward interdependence (Kelly & Thibaut, 1978); resource interdependence (McCann & Ferry, 1979); decision interdependence (Siggelkow, 2011); and social interdependence (Baer et al., 2010). One of the most extensively theorised types of interdependence in organisation theory is task interdependence. Task interdependence is defined as the extent to which the organisation's tasks require its members to work with one another because of interdependent workflows (Thompson, 1967). Thompson (1967) identified three types of task interdependence. First, pooled interdependence means an absence of

workflows between units; i.e. the whole is a pooled outcome of its parts with each independently contributing to the overall goal. Second, serial interdependence represents a unidirectional workflow where each unit's inputs are the outputs from another unit. Third, reciprocal interdependence is a bi-directional work flow where each unit's inputs are its own outputs, recycled through other units. A fourth type, "team interdependence" was later added by van de Ven et al. (1976) which relates to situations where individuals work simultaneously on the completion of the same task, without any observable time-lapse between their activities.

The majority of studies on task interdependence focus on how it relates to basic organisation theory constructs such as coordination, integration, performance, or effectiveness (Cheng, 1983; Janssen et al., 1999; Sorenson, 2003). Whenever complexity in tasks increases, the need for coordination increases. It is commonly understood and accepted that innovation is a critical activity with considerable uncertainty. The decomposition and differentiation of tasks in complex organisation designs therefore ever increases the need for a coordinated effort to ensure the firm's predefined innovation objectives are correctly, coherently, and consistently pursued. So whereas task interdependence relates to the degree to which the firm's tasks require its members to interact because of interdependent workflows (Thompson, 1967; Wageman, 1997), coordination concerns how these collective set of tasks are integrated. Examples of coordination mechanisms are routines, meeting, schedules, timetables, and team structures (Van de Ven et al., 1976; Becky and Ockhuysen, 2009). Coordination in essence consists of different approaches to bring together the inputs from specialised tasks, carried out by different teams, into an integrated output (Scott and Davis, 2007).

In many studies on task interdependence, an organisational-level perspective is adopted, and a workforce is assumed which simply performs tasks in accordance with the organisation design. Organisational actors are commonly referred to as “sub-units” (Astley & Zajac, 1991: 481); “groups” (Wageman, 1995: 145); or “agents” (Puranam et al., 2012: 419). I argue researchers need to consider a different view because organisations are known to accommodate a highly heterogeneous internal community represented by several teams with specialised tasks, collective agency beyond the mere execution of tasks, and distinctive professional identities (Hogg & Terry, 2000; Huy, 2011; Weick and Roberts, 1993). Hence, it’s important for research on interdependence to focus on teams as a unit of analysis and to formulate more fine-grained descriptions for differences between teams as regards to their function and hierarchical position. This is argued to be of particular importance considering the advent of the team-based organisation design in the earlier discussed innovation-era which enables firms to handle complex tasks requiring flexibility, agility, and fluidity to cope with dynamic environments haunted by technological discontinuities (Miles et al., 1997; 1999). If it is argued that teams possess collective agency, than how does this relate to task interdependence?

Surprisingly, little research has been devoted to the role of teams in shaping task interdependence. Extant literature can be divided in studies focusing on task interdependence within teams versus those focusing on task interdependence between teams. Regarding interdependence within teams, researchers have demonstrated the merits of high levels of task interdependence between team members (Wageman, 1995; Wageman and Baker, 1997; Campion et al., 1996; Van Der Vegt et al., 1998; 1999; Langfred, 2007). Interdependent teams are characterised by knowledge sharing and collaboration between team members (Van der Vegt et al., 1999); increased

productivity and effectiveness (Wageman, 1995; Wageman and Baker, 1997); and less conflict (Langfred, 2007).

Interestingly, Langfred (2007) shows that teams autonomously resort to changing the structure of their composition and role allocation in situations of conflict and low performance. This study's results indeed confirm collective agency with respect to shaping organisation design and task interdependence. These findings contrast conventional wisdom in task interdependence literature which attributes changes in task interdependence to shifts in task technology or environmental demands (Galbraith, 1973; Thompson, 1967). The changes can apparently also originate from social factors as conflict, and can be initiated and implemented by teams before and without the interference of top management. I argue therefore that conceptualising the development of task interdependence as a matter of design exclusively is problematic and improbable because it inhibits any notion of collective agency coming from anywhere but the upper echelons.

The studies examining task interdependence between teams demonstrate how task interdependence can be more dynamic in organisational activities with a degree of uncertainty (Adler, 1995); and how teams need to increase task interdependence to become more central (Astley and Zajac, 1991). These studies address the process of task interdependence development and the consequences of this process for/on teams. Within teams it has been shown that structural changes are deployed to deal with unfavourable situations as conflict (Langfred, 2007), but research is required to confirm whether such responses also occur *between* teams. In other words, will teams attempt to shape task interdependence in social situations that occur on the inter-team level and if yes; how and why does this take place?

A subtle but important point made in different literatures, is that the task interdependence that is designed, and the interdependence that is experienced, are not necessarily equal (Kumar et al., 1995; Nickerson and Zenger, 2002; Puranam et al., 2012; Ramamoorthy & Flood, 2004; Sherman & Keller, 2011). This issue has not received much attention from researchers from the organisation design field. Few studies on task interdependence were found which include team perceptions (Kumar et al., 1995; Ramamoorthy & Flood, 2004; Sherman & Keller, 2011). This modest body of work deals with the role of perceived interdependence. Meaning, it goes beyond the assumption that designed and perceived interdependence are equal. Sherman and Keller (2011) for example demonstrate how perceptual error in the evaluation of inter-team task interdependence can decrease coordination performance. Kumar et al. (1995) and Ramamoorthy and Flood (2004) show that the way task interdependence is perceived by employees strongly determines their attitudes and their interaction patterns. Notwithstanding the contributions these studies have made, the following possibilities for further research have been identified. First, while the antecedents and effects of perceived interdependence in a given configuration have been investigated, the process through which these perceptions further develop is overlooked. If differences in perception of a given task interdependence configuration lead to different attitudes among teams then what would happen subsequently? Do different perceptions of task interdependence matter at all for a given design or does the given design persist over time despite different perceptions thereof?

A useful framework for explaining how perceptions of interdependence play out in social situations within teams is found in social interdependence theory (Deutsch, 1949; Johnson and Johnson, 2006). Social interdependence theory stems from the social psychology discipline and explains how perceptions of mutual, conflicting, or unrelated

goal structures between individuals or teams in a given situation can lead to cooperative, competitive, or individualistic interaction patterns between them. This has mainly been studied in classroom settings and to a lesser extent in organisations (Wageman, 1995). Studies that use the theory in organisational settings reveal how perceptions of cooperative goal structures lead to collaborative interaction patterns and outcomes as creativity (Baer et al., 2010; Gong et al., 2013; Hirst et al., 2009); team effectiveness (Van Ginkel et al., 2009), and team performance (Tjosvold, 1989; Chen and Tjosvold, 2008). These contributions however do not mention how the interactions *between* teams impact the designed task interdependence. An integration between task and social interdependence would lead to a better understanding of the role of teams and perceived task interdependence in driving the development of designed task interdependence.

The preceding discussion has questioned current conceptualisations of task interdependence and the potential role of teams in contributing to its development. This alludes to the argument or assumption that task interdependence actually develops or changes over time after the initial designed configuration. An additional theme in this study therefore is task interdependence development as an unfolding process. Very few studies have looked at task interdependence as a process (Siggelkow, 2002) whilst prior theorising has in fact recommended to "treat interdependence as a variable rather than a constant" (Weick, 1974: p. 357). It seems unlikely that any given configuration of task interdependence would remain constant over time. Siggelkow (2002) examined how an organisation's configuration of core and elaborating elements evolves over time. While treating interdependence as an implied constituent of the "organizational system" (p. 144), the author neatly demonstrates how interdependence between central and less central entities evolves from an initial to several subsequent configurations. A useful

complementary research effort to this study would be a more detailed and explicit look at the task interdependence construct, how teams are affected by these changes, and whether their collective agency actually shapes these changes in any way or form.

Overall, regarding the theoretical scope of this study, extant task interdependence research primarily focuses on examinations of this construct in fixed configurations. Little is known about the process of task interdependence development and how it relates to social interdependence. Few studies take a process view, yet typically do not emphasise the role of teams despite their major importance in contemporary innovation-led organisations. Moreover, while task interdependence has been conceptualised as the outcome of top management design decisions (Puranam et al., 2012), I believe a more prominent role for teams in the development of task interdependence is appropriate considering teams taking centre stage as essential components of organisation design (Barua et al., 1995). Thus, there is an extraordinary opportunity to develop a more complete and theoretically rich understanding of task interdependence by studying the drivers, process, and consequences of its development from a team perspective. The research question of this study becomes, *How and why do teams shape the development of task interdependence?*

Having established the personal, practical, and academic relevance of this study, this research should also, however, be conducted rigorously in contexts that are relevant and interesting for the academic community and society as a whole while meeting the academic standards as a prerequisite for sound research. This, consequently, should lead to significant contributions to knowledge in peer-reviewed journals. The subsequent paragraph therefore summarises the empirical basis of this study.

1.3. Empirical basis

In order to assess the development of task interdependence and the role of teams with respect to this process, it is necessary to identify a context which a) is likely to be sufficiently dynamic to allow observations of shifts in task interdependence, and b) consists of team-based organisational structures. Innovation is a central theme in the Marie Curie project that will integrate this study in the wider context of ‘managing emerging technologies for economic impact’. The empirical context I chose for this study is innovation systems – again: I am referring to innovation systems *within* the firm - in two specific industries: information technology and chemicals. These industries are characterised by rapid advancements in technologies which suggest firms need to be responsive, flexible, and prioritise the management of technological innovation (Ahuja, 2000; Turban et al., 2008). This context seems to fit condition a), because managing innovation is a process characterised by fluid structures and evolving organisation designs which implies shifts in the configuration of task interdependence (Schreyogg & Sydow, 2010) and hence the process of task interdependence development can be observed. The second condition b), was met by selecting four organisations for the main empirical study which had adopted team-based designs for managing their innovation activities.

Innovation has become a strategic organisational activity and a determining factor for survival and success. However, little empirical research on task interdependence within the context of innovation has been done beyond the dyad of product design versus manufacturing (Adler, 1995). Moreover, the strategic challenge of managing innovation has led firms to adopt a variety of structures (Daft and Lewin, 1993) and hence looking at the drivers of task interdependence development in this context is both relevant and interesting to organisational research and practice. Moreover, the advent of the team-based organisation design in the latter part of last century has led to the creation of new

team-roles in the innovation process whereas formerly it was the R&D department that commonly held the innovation authority in firms (Birkinshaw et al., 2002; Colombo and Delmastro, 2002; Leonardi, 2011; Menzel et al., 2007; Moenaert, 2004; Tushman et al., 2010).

At the first stage of the empirical research process I designed a pre-study in which I interviewed managers and executives in the innovation (management) field to explore relevant research topics. The companies I identified and subsequently contacted stressed innovation on their websites as part of their identity and strategy. Based on this pre-study and the concurrent literature review, the focal issue of the role teams in the development of task interdependence emerged. More information on the pre-study process, participated companies and informants is provided in chapter three.

After arriving at the research question I designed the main empirical study to study the process and drivers of task interdependence in depth across a number of firms and industries. The nature of the research question ‘How and why do teams do team contribute to the development of task interdependence?’ requires research methods which allow the study of in-depth processes. I therefore chose the multiple case study design (Eisenhardt, 1989; Eisenhardt and Graebner, 2007) which is a robust and rigorous approach to studying organisational processes. I chose two industries which are known for a high rate of technological rate and R&D intensity: information technology and chemicals. These industries are characterised by rapid advancements in technologies which suggest firms need to be responsive, flexible, and prioritise the management of technological innovation (Ahuja, 2000; Turban et al., 2008).

Over the course of my empirical investigations, these industries have proven to be a fertile and intriguing source of research data because the companies in these industries operate under high levels of environmental turbulence which reflected on the intra-

organisational degree of dynamism observed. The diversity between teams, their roles, position in the organisation, and internal structure allowed the analysis and comparison of different task interdependence configurations; how they developed over time; and the role of teams in the development of task interdependence.

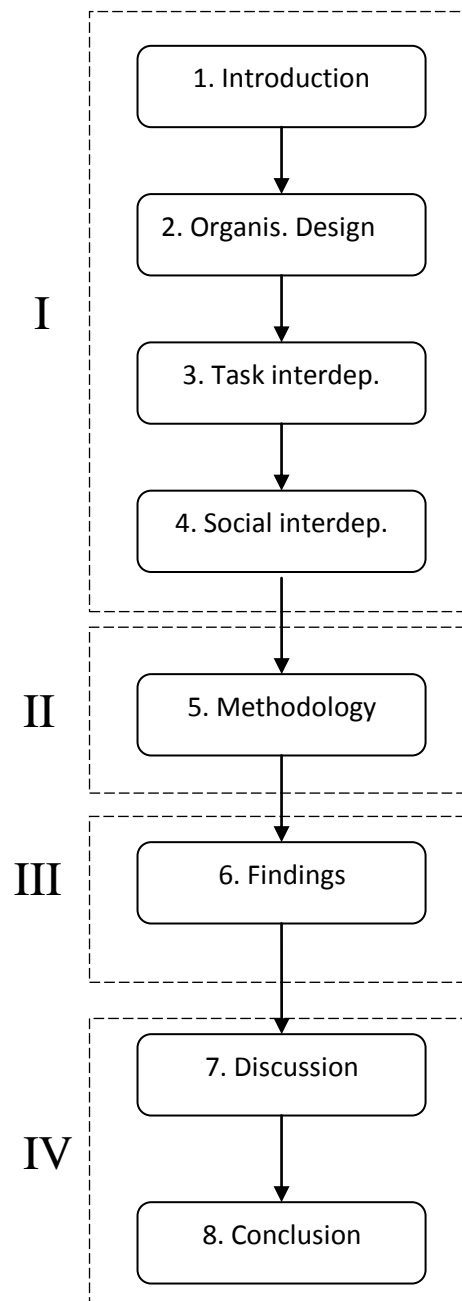
Furthermore, the selection of two cases per industry provided an opportunity to select pairs of cases (i.e. same industry) and then to analyse the similarities and differences between each pair. The juxtaposition of similar cases for the purpose of finding differences is an effective tactic for elaborating initial categories (Eisenhardt, 1989). Additionally, this multi-industry setting allowed the investigation of different approaches to organisation design for innovation which provided different task interdependence configurations. Simultaneously, the general presence of a cross-functional interface – ‘innovation management teams’ – offered me sufficient degree of comparability across cases and industries. It also enabled me to focus my analysis from the perspective of this particular team, how interacted with other teams, and how it attempted to contribute to task interdependence development in a number of intriguing ways. This approach benefited the degree of conceptual clarity and parsimony in this study required for extending and building theory (Eisenhardt, 1991).

To answer my research question I collected and analysed data from 122 interviews with 101 individuals over a period of 24 months. In addition, the informants provided an extensive set of company documents such as PowerPoint presentations, project documentation, and process flows. An interesting opportunity emerged when one of the firms – ‘Plastica’ (pseudonym) – offered a 3-month access to its innovation office in the Netherlands where I was allowed to closely observe a range of different innovation professionals. This was a fascinating experience which strongly corroborated the findings generated from other sources of data. Moreover, it was during this

ethnographic element of the empirical study that the importance of social interdependence was confirmed as I had closely witnessed how teams formed different perceptions about each other, and about the task interdependence configuration in which they operated. These social processes considerably seemed to influence how teams interacted, but also how the innovation management team in Plastica manoeuvred from unfavourable to favourable task interdependence configurations. These ethnographic insights considerably informed subsequent data collection process as it corroborated interview data pertaining to the interaction between administrative and social forms of interdependence which are reviewed in detail in the next chapter. An outline of all chapters is offered in the next and final paragraph of the introduction.

1.4. Overview of the thesis

To provide the reader with an a priori grasp on the issues covered in this thesis, I present an overview of the remaining chapters in this paragraph. This thesis contains nine chapters, including this chapter. The connectedness between the chapters is illustrated in figure 1.1.

Figure 1: overview of and relationships between chapters

As depicted in figure 1.1., this thesis consists of four interrelated parts. Part I consists of four chapters (one, two, three, four) and represents the theoretical and empirical introductions and foundations of this study. The purpose of the first (present) chapter serves as a general introduction to specify the motivation for this study and to introduce the research question that guided the design and execution of this study. The second, third, and fourth chapter provide an integrative theoretical framework. The second chapter reviews literature on organisation design, its origins, how it evolved, and the recent advent of the team-based organisation design. Chapter three reviews literature on interdependence as it is a direct derivative – both in practice and in theory – of organisation design. I first distinguish between different forms of interdependence before I go through the literature on task interdependence. I also discuss the roots of the construct and what extant research tells us about the role of teams in task interdependence. At the end of this chapter I introduce studies which elucidate the notion of perceived task interdependence. These studies argue that designed and perceived task interdependence are not necessarily equal. To better understand perceived interdependence and its implications for teams I continue to introduce social interdependence theory in the fourth chapter. In this chapter I trace the history of social interdependence and its relevance to task interdependence development. I also look at the distinction between social interdependence within teams versus between teams. At the end of this chapter I conclude the literature review by integrating chapters two, three, and four into a framework which integrates the aforementioned research streams in light of the research question. This final section explains how the research question requires an interdisciplinary approach to properly investigate the drivers, process, and consequences of task interdependence development from the perspective of teams.

I then move on to introduce the methodology in chapter five. I head off with a discussion of the ontological and epistemological foundations of the multiple case study and my personal reflections on the philosophy of science behind the methodological decisions I made. I continue with a description of the design of the study which is followed by an overview of the research setting of the four cases. I then provide a treatment of the research ethics, data collection, to conclude this chapter with the analysis process.

Part III of this work contains chapter six which covers the findings of the multiple case study. I report a process of task interdependence development with a central role for innovation management teams in shaping this process. This chapter is set up by three sections: the first sections shows the design decisions related to the establishment and roles of the innovation management teams in each case. Section two reveals my observations regarding the perceptions between teams that emerged as a result of the designed task interdependence in each case's innovation system. I close this chapter with the final section which provides an account of how – based on these perceptions – interactions between teams shaped the development of task, and even social interdependence. Moreover, I also present data on why these teams interacted in distinct ways based on maintaining a positive team social identity.

Part IV is the final set of chapters seven and eight. In chapter seven the findings of this study are discussed in light of the research question. In this chapter the contributions to theory are specified from the perspective of how and why teams contribute to task interdependence development. In this chapter the notion of collective agency is theorised and confirmed to shed new light on the traditional organisation theory construct of task interdependence. In addition, I discuss the limitations of this research project, particularly in terms of the research design, chosen unit of analysis,

and research setting. I then provide an agenda for future research which builds on some of the identified limitations. Then, in chapter eight the overall conclusions of this research are summed up. Furthermore, based on the findings of this study I formulate a number of implications for the practice of innovation management. Moreover, in this last chapter I reflect on the experience of doing this study, including some noteworthy moments of failure, success, and above all: learning.

Finally, some paragraphs of this thesis include work from jointly-authored publications where I was the lead author. First, the notion of ‘agency’ in the literature review is taken from a book chapter which I wrote in collaboration with my primary PhD supervisor in 2011 and which was published in 2012 (Es-Sajjade and Pandza): 'Reconceptualizing Dynamic Capabilities: A Design Science Study on the Role of Agency', in *Practical Aspects of Design Science, Communications in Computer and Information Science* Volume 286, 2012, pp 158-170. Springer Berlin Heidelberg. Second, the discussion in the literature review chapter on ambidextrous designs originates from a journal paper currently under review in the *Journal of Management Studies*. I am the lead author of this paper, but I collaborate with my primary PhD supervisor and Professor Henk Volberda from the Erasmus University Rotterdam School of Management. All the sections in these two publications were written by me under close supervision of Professor Krsto Pandza (tutor) and in collaboration with Professor Henk Volberda.

2. LITERATURE REVIEW

2.1. Overview

The following review of the literature covers three fields of research: organisation design, task interdependence, and social interdependence. These fields have largely evolved independently of each other while being closely associated within the overarching fields of organisation theory and social psychology. Each paragraph addresses the development of the given literature stream and identifies factors relevant to answering the research question of this study. As is common for multiple case studies using a grounded approach and inductive logic, the literature review serves to inform a broad research question to determine whether it is relevant vis-à-vis extant knowledge. The research question was initially formulated through interviews in a pre-study. However, it was subsequently adjusted and revised by holding it against available knowledge in the literature of which the review is presented in this chapter. The research question was used as a navigation instrument to prevent the researcher from being overwhelmed by the amount of data generated from several cases (Eisenhardt, 1989).

The first chapter covers issues around organisation design, viz. the theoretical roots of the organisation design field, the evolution of organisation design, organisation design for managing innovation, and the emergence of the team-based organisation design.

The second chapter deals with an important implication of organising tasks into subunits: task interdependence between teams. Task interdependence is an administrative form of interdependence and is closely linked to the organisation design literature. It shifts the attention from firm-level organisational features to inter-unit work

processes. In this paragraph the origin and development of the task interdependence construct are reviewed while analysing the role of teams.

In the third and final chapter of the literature review I discuss a social form of interdependence which I argue to be an important complement to task interdependence. The discussion includes the origins of this theory; its current conceptualisation; its relevance for organisations and teams; and complementarities with task interdependence.

2.1.2. The process of literature search

To find a relevant research question within the broad phenomenon of interest, a literature search was conducted. A significant amount of literature on interdependence exists; however, limited research was found regarding the role of teams in shaping task interdependence in innovation driven organisations. Moreover, most studies were found in the timeframe during and shortly after Thompson's (1967) first introduction of the term 'task interdependence'. During the assessment of task interdependence literature a significant amount of studies on organisation design occurred, hence I discovered the central role of organisation design in determining task interdependence. When searching for task interdependence research focused on teams I found several studies looking at the interdependence between individuals within teams. I could not however detect research elaborating how teams actually shaped task interdependence over time. The literature review process failed however to identify direct literature connecting the topics of organisation design of innovation driven firms, the development of task interdependence, and the role of teams.

The keywords and terms used in the searches included: ‘task interdependence’, ‘task interdependence process’, ‘interdependence’, ‘team interdependence’, ‘organisation design’, ‘innovation management’, ‘innovation organisation’, and ‘innovation teams’. The use of various combinations of the previously stated terms enhanced the search results.

I used a number of sources to find relevant literature. Sources include but were not limited to, peer-reviewed journals from the University of Leeds’ electronic databases, Business Source Premier, EBSCOhost, ProQuest, Digital Dissertations, Sage Full-Text Publications, and Science Direct. Furthermore, several Google Scholar searches were carried out as a launching point for further literature searches in peer-reviewed sources. Information from books, e-books, journal papers, and conference proceedings was accessed. I next turn to an analysis of recent research in organisation design.

2.2. ORGANISATION DESIGN

2.2.1. Conceptualising organisation design

A wealth of studies has been dedicated to highlighting the importance of organisation design for organisations’ structure, strategy, technology, and environment (e.g. Burns and Stalker, 1961; Handy, 1990; Miles and Snow, 1978; Mintzberg, 1989).

Organisation design serves the purpose of identifying and allocating tasks to give direction to the activities of different parts of the organisation for the achievement of the organisation’s goals (Mabey et al., 2001). A basic objective of organisational research has been to discover what types of organisational structures will be most effective in different contexts (Tushman and Nadler, 1978). Burns and Stalker (1961) propose the notion of different models of designing organisations may be differentially effective

under changing conditions or contingencies. The emergence of contingency theory was the result of criticisms of classical theories such as the bureaucratic organisational form (Weber, 1946) and scientific management (Taylor, 1912) which were argued to have lost their explanatory power because they failed to incorporate various contingency factors. Contingency theory revolves around the assumption that there is no universal way to design an organisation because organisation design and its subsystems must 'fit' with the environment (Burns and Stalker, 1961).

Furthermore, effective organisations not only have a proper 'fit' with the environment but also between their subsystems (Siggelkow and Rivkin, 2005). Contingency theory is rooted in the work of Joan Woodward (1958), who observed that successful organisations across different industries had adopted different organisation designs. Much work has been conducted since to identify the contingencies of design and consensus has been reached regarding the premise that the design of an organisation should match or fit characteristics of specific variables, endogenous and exogenous to the organisation. Hence, design decisions are therefore argued to pertain to the demands of an organisation's internal tasks and to its environment (Hatch and Cunliffe, 2006).

Design decisions about an organisation's architecture belong to the most powerful controls available to top managers (Gulati et al., 2012). Despite the importance of design decisions to organisational research little is known about the precedents and implications of these decisions. Albeit it has been established that a fit with the firm's environment and tasks is important (Van de Ven et al., 1976) research still needs to reveal the precise connections in this two-fold relationship. Moreover, the theoretical foundations and associated language of the organisation design literature is decades old. More recent studies have attempted to revisit and revive the field by means of both conceptual (Puranam et al., 2012) and methodological (Siggelkow, 2002) innovations.

Siggelkow (2002) argues that contributions to the organisation design literature need to be specific about the definition of organisation design and the elements it constitutes.

A useful definition of organisation design is found in the seminal paper by Kogut and Zander (1996) who define it as “organizing principles that structure work and define the task specialization of individuals. More abstractly, the division of labour is the encoding of social knowledge into a structure that defines and coordinates individual behaviour” (p. 505). This definition is relevant to the present study because both (i.e. definition and present study) combine elements of organisation design and organisational behaviour. In broad terms, organisation design can be divided into three categories (Miller and Friesen, 1982): division and differentiation of tasks (e.g. divisionalisation and decentralisation); integration and coordination of dispersed activities (e.g. linking groups and committees); and uncertainty reduction (e.g. rules and procedures). Design decisions relate to issues in each of these respective categories. Researchers have called for empirical work to deepen our understanding of how managers shape the elements of organisational architecture (Siggelkow, 2011). More specifically, the ambiguity regarding “the factors that shape organisational architecture as well the mechanisms that underlie the consequences of organisational architecture” (Gulati et al., 2012: p. 1) require organisational scholars to carefully and adequately select appropriate methods and introduce novel theoretical lenses to further advance the understanding of this intriguing but socially complex phenomenon. For the purpose of making sense of the nature and origin of organisation design the next paragraph provides a historical analysis and description of how organisation design has evolved over time.

2.2.2. The evolution of organisation design

Table 1: organisational evolution in different historical eras (adapted from Miles et al. 1999)

Organisational Evolution			
Historical Era	Standardisation	Customisation	Innovation
Key Design Variables	Hierarchy, centralised authority	Network	Teams, autonomous cells
Dominant Organisation Design	Functional design	Divisional design, matrix	No dominant design
Key Resource	Capital Goods	Information	Knowledge
Influential Manager	Chief Operating Officer	Chief Information Officer	Chief Knowledge Officer
Core Capability	Specialization and Segmentation	Flexibility and Responsiveness	Design and Creativity

The evolution of organisation design in the Western world can be divided into three historical eras: standardisation, customisation, and innovation (Miles et al., 1999). In each era, the progression of environmental demands caused managers to seek novel means to organise resources for the development of products and services requested by customers. When an organisation develops knowledge that could enable it to move into new areas but that exceeds the capacity of the *modus operandi*, then managers experiment with new designs – often initially on a peripheral level – that allow the exploration and utilisation of these new opportunities. Table 1 summarises the three historical eras across four dimensions.

The standardisation-era

The first era is standardisation in which organisational design revolved around the exploitation of knowledge to utilise physical resources, e.g. plants and raw material. In the latter part of the nineteenth and the first part of the twentieth centuries, firms

developed mass production capabilities by standardising products. The common organisation design in this era was the functional design which was characterised by centralised decision making and a vertically integrated hierarchical structure. The continuing exploitation of knowledge in a limited number of product lines allowed firms to reduce the amount of time and costs required to manufacture products on a large scale, in an increasingly global environment.

The customisation-era

The second era – ‘customisation’ – commenced during the standardisation era because the environments in which firms operated had become more demanding in general, and because some firms had developed knowledge that could not be applied in the range of a limited number of product lines. Therefore, firms were driven to the diversification of their product portfolio to utilise the knowledge available to them for the entrance to new markets to fuel further growth. These developments led to the rise of the divisional design or ‘M-form’ (Chandler, 1962) which facilitated firms to enter adjacent markets with a differentiated product portfolio. Furthermore, this design allowed knowledge generated by a division in one market to be used by a new division to serve other, related markets. Top managers could now decide to move into new markets by using available cash from current divisions. The divisions operated semi-autonomously with each division managing a standard product. The divisional design enabled firms to reach a limited level of customisation, also referred to as ‘market segmentation’. The transition from standardisation to customisation continued into the 1960s and 1970s when some firms also started experimenting with hybrid forms such as the matrix to balance managerial focus between current and new markets. Indeed, the matrix design brought firms a more effective solution for the utilisation of their know-

how across a wide range products and markets than the divisional design could. By the 1980s the global markets were subject to deregulation which created more opportunities for firms to use their knowledge in a wider scope, i.e. customisation had become even more important. This led to new players offering customers more options in terms of product models and versions.

Firms existing at that time period experienced challenges in dealing with the new environmental demands of deregulations and new entrants and therefore resorted to again a new organisation design to resolve these challenges: the network design. The network design was needed because whereas the divisional and matrix designs were appropriate for less turbulent and competitive markets, they proved unfit in the new environment where firms had to develop current *and* create new capabilities. The network design emerged from the late 1970s to the 1990s which supported firms in more efficient management of the customisation process across the industry value chain, in both backward and forward directions which enhanced firms' responsiveness and adaptability. Concurrently, firms started to outsource capabilities which they considered as 'non-core' to partners in the network which led to downsizing and restructuring. As these networks of firms further matured, their globally positioned partners occupied positions along the industry value chain which increased the overall flexibility and options for customisation. Furthermore, product and service quality benefited from the firm-level specialisation in core capabilities which created a need for improved information and production technologies. The network design supported value creation within and across firms by combining the specialised knowledge of individual firms and consequently reaching more optimal levels of knowledge utilisation. A specific network design emerged during the late 90's as a result of environmental changes; consequently firms searched for new organisation designs to

manage the innovation process (Grönlund et al., 2010). This led to a specific network design labelled the 'open innovation model' (Chesbrough, 2003).

Innovation was becoming more important and while during the customisation era most firms adhered to the closed innovation model, more firms were moving to the open innovation model. The difference between these two designs is that in the open innovation model, knowledge and technology can be sourced and outsourced beyond a firm's boundaries. A cancelled innovation project would typically disappear in the closed model, but in the open model such projects would still have options outside the firm boundaries as spin-offs or licensing deals. The main principles of the open model are: firms need to realise that they do not employ the all of the most competent individuals; that research coming from external sources can be at least as profitable as research coming from internal sources; and that they need to utilize internal as well as external ideas (Chesbrough, 2003). However, in many open-innovation networks organisational boundaries became less clear and cross-company units led to issues with interface management. Moreover, because firms were confronted with more complex markets and technological advancements, they became more complex inwardly which led to issues in dividing management attention between internal and external demands (Miles et al., 1999).

Summarising, a number of trends can be derived from the evolution in organisation design across the preceding two eras. First, whenever a new organisation design was introduced during these two eras, it required increasingly more units to be self-organising around tasks pertaining to operations, market development, and partner management. Second, each new design called for a larger part of the organisation to manage innovation or entrepreneurial tasks for the purpose of applying un-utilised knowledge. Third, new designs brought more autonomy and ownership of specific

elements of the organisation such as market, products, or customers. In addition, the importance of aligning the interests at more locations and at more levels in firms became essential to the overall performance. These high-level trends shaped the characteristics of organisation designs in the succeeding twenty-first century.

The innovation-era

In the twenty-first century, some industries still provide standard products and services while others go through continuous innovation. Much has been written about the cataclysmic changes in organisations' environments which have confronted firms with conundrums, forcing managers to re-examine and rethink the science and art of organisation design (Lewin and Stephens, 1993). Present day organisations are required to deal with discontinuities created by knowledge-based competition through which new industries mushroom while others become obsolete (Tushman and Anderson, 1986). Beyond the customisation of existing designs, product and service innovation is now a core capability in an increasing number of firms. Specifically knowledge intensive businesses - e.g. engineering services, advanced electronics, biotechnology, computer software design, health care, consulting, and nano-technology - are involved in a continuous cycle of innovation which produces more, and more complex markets and industries (Kauffman, 1995).

While these developments are onerous for managers in most firms considering the uncertainty involved in product and technological innovation, they also provide them with new options for designing organisations (Daft and Lewin, 1993). The increasingly strategic importance of innovation has shifted this complex activity from a task assigned to the R&D unit to a corporate concern, which affects and involves many parts of the organisation and cuts across functions, divisions, and teams. As a consequence, for

managing innovation, top managers' design decisions revolve to a large extent on a specific 'design category' proposed by Miller and Friesen's (1982), viz.: the differentiation of tasks into smaller, autonomous units, to bring about a flexible organisation that can handle the threat of technological discontinuities.

The importance of technological advancement and the threat of technological discontinuities have established innovation as a key capability for the survival and success of companies. This development has caused firms during the transition from the twentieth to the twenty-first century to explore a multitude of organisation designs due to the earlier mentioned lack of contemporary reference theories (Gulati et al., 2012) for informing organisations of how to manage complex tasks as innovation. Examples of organisation designs adopted by present day firms are: the virtual organisation (Markus et al., 2000), the spin-out organisation (Ambos and Birkinshaw, 2010), the cellular organisation (Miles et al., 1999), the spaghetti-organisation (Foss, 2003), the modular organisation (Galunic and Eisenhardt, 2001), and the ambidextrous organisation (Tushman and O'Reilly, 1996). These novel organisation designs have a number of characteristics in common (Daft and Lewin, 1993). First, these designs seem to include less hierarchical layers to allow rapid decision making and short hierarchical communication lines. Second, decision making is decentralised which provides units with autonomy, flexibility, and accountability. Third, external and internal organisational boundaries are permeable to foster interaction with the environment, and facilitate interaction between many different units involved in fragmented activities. Fourth, they contain small self-organising units and finally, integration or coordination mechanisms are set in place to introduce coherence across units' activities. These coordination mechanisms support top management in these new organisation designs to sustain leadership without having to exercise dictative and hierarchical control (Daft

and Lewin, 1993), i.e. the type of control in more traditional bureaucratic designs which were more common in the standardisation and customisation eras.

Albeit organisation designs in the innovation era are still developing, the amount of designs that has emerged indicates that organisation design is no longer merely about making minor adjustments to dominant traditional organisational forms (Lewin and Stephens, 1993). This does not mean that traditional organisation designs as the functional form, the divisional, or the matrix do not exist; they still exist but are often configured as a hybrid design with features of both traditional and novel models (Daft, 2009) to instil sufficient capacity for flexibility and adaptation. For example, firms may adopt a divisional or matrix design with innovation as a separate division, or with autonomous innovation project teams (Jansen et al., 2009). This separation of innovation from ‘business-as-usual’ is labelled ‘structural ambidexterity’ (Tushman and O’Reilly, 1996).

In essence, ambidextrous designs build internally inconsistent architectures and cultures into business units so an organisation can simultaneously explore new technologies, customers, and markets, and exploit current ones (Adler et al., 1999). Ambidextrous designs are supposed to create structurally independent groups with their own cultures, reward systems, and strategies (Benner and Tushman, 2003; Gilbert, 2005). Structural ambidexterity is an “interdependent, simultaneous phenomenon, involving the compartmentalizing and synchronizing of exploitation and exploration within different structural units or divisions of a firm” (Simsek et al., 2009: p. 884). Although units are operationally independent, they are strategically interdependent at firm level for the achievement of ambidexterity. Hence, although structural ambidexterity means ambidexterity should be solved on lower hierarchical levels, firms

must coordinate these separated activities into a firm-level outcome (O'Reilly and Tushman, 2007).

Structural linking

Structurally separating innovation activities in autonomous units, however, may inhibit cross-unit organisational learning (Birkinshaw et al., 2002; Scarbrough et al., 2004) and decrease synergies among units (Tushman and O'Reilly, 1996). This issue can be resolved by combining structural differentiation with integration mechanisms in which structural differentiation enables local adaptability and exploration of novel businesses, and integration mechanisms ensure strategic coherence and knowledge transfer between different organisational units (O'Reilly and Tushman, 2004).

Nadler and Tushman (1997) argue that integration mechanisms are part of a pivotal step in the process of organisation design which they refer to as 'structural linking'. Structural linking relates to the establishment of formal relationships between groups separated by structural boundaries. The trend in the innovation era of decomposing tasks and allocating these to small team arrangements, and the structural separation of innovation activities, causes coordination problems for firms. The coordination problems revolve around ensuring that all those dispersed processes and autonomous teams still contribute to corporate goals instead of diverging into unrelated or even conflicting directions (Zhou, 2013). Moreover, as mentioned previously, innovation has become a corporate concern and is no longer a responsibility that belongs to the exclusive domain of the R&D department. This implies that albeit top managers create an organisation which enables the exploration of new technologies and markets in separate divisions or units, they simultaneously need to safeguard the development of

innovation capability that cuts across different functions and teams for the sake of transferring knowledge and achieving synergies.

An important example of a structural linking mechanism included in the organisational design of large organisations is the cross-functional interface (Gupta and Govindarajan, 2000). Cross-functional interfaces generate horizontal linkages between units. Examples are cross-functional teams, task forces, and liaison positions (Gupta and Govindarajan, 2000). Installing cross-functional interfaces is costly, increases complexity and scholars have also argued that such mechanisms may have detrimental effects in cases of units with low levels of interdependence (Tushman and Nadler, 1978). Moreover, this type of structural linking mechanism inhibits the coexistence of multiple timeframes across differentiated units by imposing a formal integrative architecture (Repenning and Sterman, 2002). However, it is still the most widespread in use of all structural linking mechanisms (Jansen et al., 2009) because although it increases the amount of complexity in an organisation's design it can be very effective in bringing teams together. It remains unclear however *how* cross-functional interfaces integrate teams and groups by creating horizontal linkages. Moreover, the term 'cross-functional interface' seems outdated considering the type of organisation designs observed in the innovation era. The functional form is a traditional form from the standardisation era and hence the type of groups and teams present in organisations have less to do with functions as they have with teams and autonomous cells (Miles et al., 1999) with a myriad of specialisations and activities. Hence, the organisation design field could benefit from more up-to-date terminology to more accurately describe and conceptualise cross-functional interfaces in innovation driven organisations with complex team-based architectures.

In addition to cross-functional interfaces, there is also evidence for the effectiveness of defining collective goals (Tsai and Ghoshal, 1998) as linking mechanisms. These are however less 'structural' than cross-functional interfaces because they are less salient in the organisation design and open to different interpretations. Defining and managing collective goals as a design-related integration mechanism however, has been shown to result into increased access to and interaction between differentiated organisational units (Gupta and Govindarajan, 2000). A shared language on the meaning of innovation in terms of strategy and process is vital for effective communication (Cohen and Levinthal, 1990), and fosters knowledge exchange and combination (Nahapiet and Ghoshal, 1998). This collective understanding is essential to bring forward innovations in firms consisting of separated units with disparate thought worlds. Indeed, collective goals increase the willingness of organisational members to consider and integrate opposing views which facilitates the legitimacy of innovation activities scattered throughout the organisation (Subramaniam and Youndt, 2005). In addition, collective goals are found to increase collaboration and create commitment from teams (Bloom, 1999) because they positively affect communication, knowledge sharing and cooperation across individuals and units (Collins and Smith, 2006). Also, collective goals reduce interpersonal competition and allow mutual adjustment between teams which is pivotal to the coordination of complex organisations (Pfeffer, 1995). Hence, collective goals facilitate team members to direct attention and behaviour to achieving integrative value across differentiated units (Smith and Tushman, 2005). Whilst the nature and importance of collective goals had already been established by earlier research (England, 1967; Simon, 1964; Thompson and McEwen, 1958), less is known about the process of how goals become 'collective'. What is the role of top management versus the rest of the organisation? Is it merely a design exercise or do sub-executive

level teams – such as the cross-functional interface - have an impact on the emergence and acceptance of collective goals?

Overall, in the innovation era, organisation design is a dynamic activity which has become crucial to defend against and take the lead in the innovation based competition in many industries, particularly the knowledge-intensive ones. In fact, organisation design has become a crucial source of sustained competitive advantage (Csaszar, 2012) in environments demanding fluid designs and frequent reconfiguration (Schreyogg and Schidow, 2010). As earlier mentioned, to facilitate fluidity and adaptability organisations group individuals into teams and decompose innovation into subtasks (Applegate, 1994). Consequently, to bring together the activities of differentially positioned teams in complex architectures of the innovation era, firms create structural linking mechanisms in the form of cross-functional interfaces and collective goals. These developments call for a novel perspective on interdependence which includes new designs, new teams, and the crucial objective of structural linking. Considering the prevalence of firms that experiment with and implement more fluid team-structures the next paragraph goes into more depth about teams and inter-team processes and dynamics.

2.2.3. The team-based design

The innovation era has established teams as the core building block in an organisation (Barua et al., 1995: p. 487). As mentioned in the introduction: teams are defined as any formal whole of at least two interdependent individuals who are collectively responsible for the achievement of one or several tasks defined by the organisation (Gladstein, 1984; Rousseau et al., 2006; Sundstrom et al., 1990). Teams in innovation-driven organisations are best viewed as “complex and dynamic entities that adapt and change

over time” (Baer et al., 2010: p. 827). Earlier research theorises that organisations should group individuals into team arrangements to manage tasks having high uncertainty and complexity (Van de Ven et al., 1976). Rivkin and Siggelkow (2003: p.293) argue that in innovation systems “groups should be formed so that, as nearly as possible, the firm is decomposed into independent entities.” Much earlier, Nadler and Tushman (1972) suggested that for complex, costly tasks with high information processing requirements such as innovation, organisations should adopt a team-based structure – which the authors refer to as ‘lateral relations’ - for the purpose of effective coordination.

Employees have become used to working in teams and Simon (1948) asserted that one of the incentives for individuals to work for an organisation is the relations they have with the team to which they belong. Organisations are known to accommodate a highly heterogeneous internal community represented by a multitude of teams (Huy, 2011). Individuals who cooperate on a daily basis, interact frequently, and share practices, are likely to develop some form of collective agency (Weick & Roberts, 1993). Furthermore, it has been argued that cognition varies across teams, which is an additional indicator for heterogeneity on a more collective level (Tyler & Gnyawali, 2009). This heterogeneity between teams in innovation teams is likely to give shape to social situations which are more complex than the performance of tasks in pooled, serial, or reciprocal configurations (McCann and Galbraith, 1981; Victor and Blackburn, 1987).

Due to the rise of innovation as a discipline that cuts across intra-firm boundaries, distinctive teams have been created to invent, build, manage, and commercialise new technologies, products, services, and processes. Where the R&D team used to be the main building block of innovation performance in the standardisation and customisation

era, novel teams have surfaced to meet the task and environmental requirements of the innovation era: e.g. corporate venturing teams (Birkinshaw et al., 2002); incubators (Colombo and Delmastro, 2002); intrapreneuring teams (Menzel et al., 2007); product innovation teams (Moenaert et al., 2003); dedicated innovation units (Tushman et al., 2010); and innovation analysts (Leonardi, 2011). The increasing diversity and heterogeneity in innovation teams can be seen as an indicator for the complexity of tasks underlying innovation and innovation management. This can lead to diverging views on the importance of each relative subtask and disagreements between different teams regarding how to prioritise and manage different facets of the innovation process; and even about the technological features of innovations (Leonardi, 2011). Because of their specialisation and attachment to the teams to which they belong, individuals across teams tend to be 'blind' to the reasons behind any dissensus. It is suggested that the solution resides in having the right organisation design (Tushman et al. 2010) or "by reorganizing boundaries in ways that provided a structural context in which ambiguity could succeed" (Leonardi, 2011: p. 363). However, other studies have shown that design alone does not enhance effective collaboration across teams (Birkinshaw and Gibson, 2004; Burgers et al., 2009; Nadler and Tushman, 1997). Grouping individuals in a certain way and expecting this architecture to work by design goes against earlier contributions, because as discussed previously, structural linking mechanisms need to be put in place. Extant innovation research does not, however, address the notion of structural linking between innovation teams; i.e. how are the efforts of different innovation teams across the organisation integrated? Which type of team would be required to manage this internal boundary spanning activity? To answer these important questions, empirical examinations are needed into firms with a distinct organisation design for managing innovation, including different innovation teams. Such a research

inquiry would shed light on how these firms approach the structural linking between their teams and which type of interface they use for fostering productive inter-team interactions.

Inter-action between innovation teams

A great deal of research on interaction between teams in the context of innovation revolves around competition (e.g. Adler, 1995; Baer et al., 2010; Kaplan, 2008; March, 1991; Taylor, 2010). Indeed, to effectively manage innovation many organisations are increasingly relying not only on team-based designs (Griffin, 1997; Lawler, Mohrman, & Ledford, 1995; Leenders, Van Engelen, & Kratzer, 2007; Sundstrom, 1999) but also on the internal competition between teams (Birkinshaw, 2001; Leonardi, 2011; Kanter, Kao, & Wiersema, 1997) under the premise of ‘productive competition’.

Taylor (2010) for example suggests a model of innovation that illustrates an endogenous process of internal competition. Based on evidence from a field study on new-technology product development in technology led firms, the author shows that and how internal competition between product development teams positively influences the transition of technologies into the next generation. Going even further, she argues for the positive benefits of conflict – i.e. strong or fierce competition – for knowledge exchange between teams. Prior research however demonstrates how competition can greatly reduce the likelihood of success of innovation projects (Leonard-Barton, 1992; Dougherty and Heller, 1994). A more recent study by Baer (2010) also concludes that fierce competition hardly offers any benefits and may even undermine innovation by constricting collaboration. Hence, there is inconclusive evidence as regards the benefits of competitive interaction between teams on innovation.

One particular source of conflict and political behaviour is undermanaged interdependencies between teams (McCann and Galbreith, 1981). From earlier theorising (Simon, 1947; March and Simon, 1958) it can be derived that when individuals identify with teams, this may “generate subgoal conflict and differentiation, as different organisational subunits generate subunit identification, and individuals in organisations come to identify with the values of their respective subunits rather than with the organisation as a whole” (Gavetti, 2007: p. 4). March (1991) states that the “internal competitive processes pit individuals in the organization against each other in competition for scarce organizational resources and opportunities” (p. 81). It is mostly this type of competitive interaction that has been explored in the context of innovation (Kaplan, 2008; Leonardi, 2011; Taylor, 2010). By means of this study other types of interactions between teams and the role of organisation design in driving these interactions are investigated to provide a more comprehensive account of the drivers, process, and consequences of interactions between teams in technology led firms. It is important to look into other types of interaction such as collaboration because “cooperation among conflicting parties is a key achievement of organisations, rather than an underlying assumption of individual or collective behaviour” (Gavetti, 2007: p. 4). Indeed, collaboration between teams in complex tasks with high uncertainty is integral to leveraging diverse expertise in collective work that requires linking and integration (Bruns, 2013). It remains a challenge for top managers, however, to foster the right type and amount of interaction between teams by means of organisation design.

Top down decisions regarding the division of tasks have been argued to be the central factor in determining which teams interact (Puranam et al., 2012; Siggelkow & Rivkin, 2005). The way in which a team is positioned and configured in the organisation design

seems to play a vital role in its interaction pattern with other teams. Some studies in the literature on organizational power highlight the importance of team centrality in shaping interactions between teams (Astley and Sachdeva, 1984; Astley and Zajac, 1991; Brass and Burkhardt, 1993). Astley and Sachdeva (1984) argue that teams need to interact to achieve collective goals but in some cases teams may experience a resistance to interaction on the end of other teams. This is particularly relevant for teams that have been designed as linking mechanisms between other teams such as the earlier discussed cross-functional interface. I will refer to these teams as 'linking teams' in lieu of cross-functional interfaces in the remainder of the theory chapter because of my earlier argument regarding the datedness of this term. It is essential for linking teams to interact with other teams in order to fulfil the purpose of 'linking'. Hence, in case linking teams are confronted with resistance then they need to be able to overcome this resistance. Astley and Sachdeva (1984) mention a number of sources for teams to gain greater influence.

First, the authors refer to hierarchical authority as an obvious source. Albeit the authors mention the importance of formal authority, they do not expand *how* teams could utilise hierarchy to interact with other teams. This is a critical gap because linking teams are usually not positioned on the executive level of an organisation (Jansen et al., 2009) and therefore do not automatically possess hierarchical authority. The second source of power is resource control. If linking teams can obtain crucial resources which are needed by other teams then obviously the other teams will accept and even seek interaction. This is based on the main premise of resource dependence theory that inter-organisational power originates from the distribution of valuable resources. The unit of analysis is obviously different here since the discussion revolves around teams, not organisations. The third source of power is the one emphasised by the authors which is

centrality. The degree to which teams are more or less centrally positioned in an organisation determines how much influence they have. A linking team, therefore, that is positioned on a peripheral level will find difficulties interacting with teams in other parts of the organisation. An argument could be for linking teams to be located as central as possible in the organisation design for them to exert more influence, to have a greater scope of interaction, and consequently have a greater impact on the integration of teams for the purpose of contribution to collective goals. This notion of centrality contrasts with other scholars' who recommend to decompose tasks as much as possible and allocate these tasks to groups which act as independent entities (Rivkin and Siggelkow, 2003) because this implies less centrality and less resource interdependence. By contrast, the power literature proposes teams benefit from a more central position in the organisation design because it offers them more possibilities to influence and interact with other teams. But how do linking teams become more central; i.e. how do linking teams address and utilise these – and perhaps other – sources of power? This is a critical question that warrants further research to elucidate the relationship between linking teams and the process of organisation design. Studies from a variety of literatures have defined firms as systems of highly interdependent elements (e.g., Cheng, 1983 Porter, 1996; Johnson and Johnson, 2006; Levinthal, 1997; Siggelkow and Rivkin, 2005; Whittington et al., 1999). We know from the power literature that teams need to increase other teams' dependence on them; but also increase their dependence on others to enhance centrality (Astley and Zajac, 1991). However, the drivers (why), process (how), and consequences of centrality attainment in a given interdependence configuration remain unclear. Finally, organisation design in the innovation era is not a static phenomenon; instead recent research presents organisation design as a process in lieu of a static snapshot configuration (Siggelkow, 2002). Linking teams are therefore

likely to co-evolve with organisation design, and their success may hinge upon their ability to increase their centrality over time, by moving into an interdependence configuration that lends them more power to interact with and influence other teams.

2.3. INTERDEPENDENCE: ADMINISTRATIVE AND SOCIAL FORMS

2.3.1. Overview

Managers within firms have to make design decisions across a considerable number of dimensions – e.g. which organisation design to adopt; how to set up activities involving manufacturing, logistics, marketing, and innovation; how to organise and allocate tasks; and how to group individuals in specialised units (Siggelkow, 2011). The long-standing premise that these decisions interact with each other – i.e. they are interdependent - has its roots in the Carnegie School, a group of academics from the Carnegie Mellon University led by Herbert A. Simon, James March, and Richard Cyert. The focus of their intellectual agenda was on organisational behaviour viewed through theories from the disciplines of management science, decision analysis, and psychology. In short, this group of scholars propagated a bounded rationality view of decision making and organisational behaviour with an important critique on traditional neo-classical economics assumptions of utility maximisation and rational agents. This caused the theoretical focus in management studies to shift to more nuanced behavioural explanations in the analysis of organisational processes and decisions, to incur more plausibility in the assumptions underlying management theories (Gavetti et al., 2007). ‘Organizations’ (March and Simon, 1958), ‘Administrative Behavior’ (Simon, 1947), and ‘A Behavioral Theory of the Firm’ (Cyert and March, 1963) are three highly influential works from the Carnegie School. The foundations laid by the Carnegie-

School have been further elaborated by next generation or ‘neo-Carnegian’ scholars as Daniel Levinthal, Nicolaj Siggelkow, Jan Rivkin, and Giovanni Gavetti.

The notion of firms as systems of interdependent elements is a *filis de pensées* from the Carnegie-school that is core to this study. The concept of interdependence is a fundamental overarching principle in organisation design which is commonly perceived as a thing well understood among organisation theorists who converse with other theorists without specifically defining the construct (McCann and Galbraith, 1981). Even March and Simon (1958), despite their valuable contributions in adding rigour to the field of interdepartmental relations, saw no need to define interdependence. It was only from the late 60s that scholars defined the interdependence construct and identified how variations in interdependence may help understand variations in organisational phenomena.

I distinguish between two major forms of interdependence: administrative and social forms. Table 2 provides an overview of studies on different forms and types of interdependence. Administrative forms are related to organisation design and they reveal the workflows, task design, interdependence between tasks, and more broadly: they reveal the teams that are expected to interact with each other by design (Adler, 1995; Cheng, 1983; McCann and Ferry, 1979; Thompson, 1967; Victor and Blackburn, 1987). Administrative form interdependence was an important but implicit concept in the works of systems theorists (Katz and Kahn, 1966) who focused on processes and part-whole connections which inevitably led to the elaboration of interdependence. Ashby (1956) extended the conceptualisation of a system as a set of interacting parts by explaining that the parts interact in distinct ways, based on the way they are coupled: serial, parallel, or feedback coupling which is depicted in figure 2.1 below. James Thompson (1967) extended Ashby’s (1956) conceptualisation by making it less abstract

and more informative in terms of distinguishing how each part relates to the other.

Thompson's typology is further elaborated in the next paragraph.

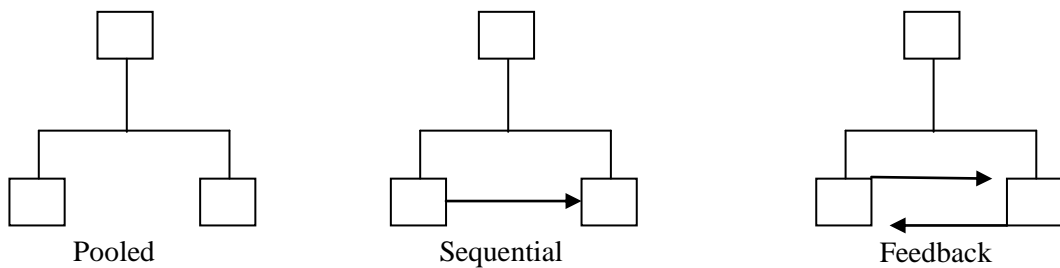


Figure 2: Ashby's (1956) types of interdependence

Social forms of interdependence emerge between individuals as a consequence of how teams are structured and positioned, how goals and rewards are configured and communicated, and more importantly: how individuals perceive their relative position in a given social context (Baer et al., 2010; Deutsch, 1949; Jansen and Veenstra, 1999; Kramer et al., 1996; Lewin, 1948). Furthermore, while administrative forms of interdependence are more tangible and can be deduced from the organisation design, social forms of interdependence are more abstract, less predictable and more dynamic (Johnson and Johnson, 2006).

The (Neo-)Carnegie-school attributes decision interdependence – a tradition stemming from the information processing perspective – to organisation design. However, interdependence can originate from a number of sources, viz.: a) task design, work flows and the technology that defines the work, for example: individuals behind a conveyor belt versus teams building entire products (e.g. Shea and Guzzo, 1989; Sorenson, 2003; Thompson, 1967; Van de Ven et al., 1976); b) the way performance is rewarded: e.g. based on individual performance, team performance, or a hybrid reward

system (Kelly and Thibaut, 1978) ; and c) the way goals are defined and perceived (Kumar et al., 1995; Ramamoorthy & Flood, 2004; Gong et al., 2013). But while prior work has argued that systems of interdependent activities play an important role in sustaining competitive advantage at the firm level (Milgrom and Roberts, 1995; Porter, 1996), existing research has been less explicit on the theoretically and managerially relevant question of how interdependence shapes processes and behaviour at the team level; an important unit of analysis considering the earlier discussed prevalence of teams as the basic building block in firms throughout the innovation era.

Admittedly, researchers have suggested potential links to a more micro-level analysis, i.e. at the level of managerial action (Johnson et al., 2003; Whittington, 1996), but the more collective level of teams has received less attention. In this research, I focus on two types of interdependence because of an expected relationship between them which is elaborated later in this chapter. The first type derives from the organisation design and allocation of tasks to different teams, which I refer to as task interdependence (e.g. Thompson, 1967). The second derives from the degree to whether and how teams perceive their goals to be related, whether and how any interdependence exists between them, and the consequences of these inter-team perceptions, which I refer to as social interdependence (e.g. Deutsch, 1949). The following two paragraphs elucidate task and social interdependence, with a focus on interdependence *between* teams.

Table 2: studies on different forms and types of interdependence

Author(s)	Theoretical/Empirical	Base disciplines/ theories	Form	Type	Levels/unit of analysis	Definition
Deutsch (1949)	Theoretical	-Social psychology, Gestalt psychology -Social interdependence theory	Social	Social	Intra-team	The structure of the goals of the people in a given social context determines how participants interact
Thompson (1967)	Theoretical	-Sociology, organisation theory -Contingency theory	Administrative	Task	Intra-team and inter-team	The task technology determines the degree of interdependence between units or individuals
Van de Ven et al. (1976)	Empirical	-Organisation theory - Contingency theory	Administrative	Team	Intra-team	Intensive task technology requires team structures with high interdependence within teams
McCann and Ferry (1979)	Theoretical	- Organisation theory - Resource dependence theory	Administrative	Transactional	Intra-team	The flow of resources determines the degree of interdependence between individuals
McCann and Galbraith (1981)	Theoretical	- Organisation theory - Contingency theory	Administrative	Inter-departmental	Inter-team	The process and purpose of work flow shape inter-departmental relations

Table 2 Continued

Author(s)	Theoretical/Empirical	Base disciplines/ theories	Form	Type	Levels/unit of analysis	Definition
Victor and Blackburn (1987)	Theoretical	- Social psychology - Interdependence theory, game theory	Social	Team interdependence	Inter-team	the amount of interunit interdependence is defined as the extent to which a unit's outcomes are controlled directly by or are contingent upon the actions of another unit.
Wageman (1995)	Empirical	- Organisation theory - Contingency theory	Administrative	Task and goal interdependence	Intra-team	Interdependence between team members derives from task design and reward structures
Adler (1995)	Empirical	- Organisation theory - Contingency theory	Administrative	Task	Inter-team	Project uncertainty and time-pressure shape the development of task interdependence between units
Astley and Zajac (1991)	Empirical	- Organisation theory - Power theory	Administrative	Task and functional interdependence	Inter-team	The degree of functional centrality determines the amount of interdependence between teams

Table 2 Continued

Author(s)	Theoretical/Empirical	Base disciplines/ theories	Form	Type	Levels/unit of analysis	Definition
Baer et al. (2010)	Empirical	- Social psychology, org. theory - Structural adaptation, social interdep. theory	Social	Social interdependence	Intra-team and inter-team	The intensity of inter-team competition shapes the nature of interdependence within teams.
Adner and Kapoor (2010)	Empirical	- Strategic management - Interdependence theory	Administrative	Technology interdependence	Inter-organisational	The complementarity between technologies in an ecosystem shape inter-organisational interdependence.
Sherman and Keller (2011)	Empirical	- Organisation theory - Contingency theory	Administrative	Perceived task interdependence	Inter-unit	Task Interdependence between units is a phenomenon that is perceived by managers and not always equal to designed task interdependence.
Puranam et al. (2012)	Theoretical	- Organisation theory - Information processing theory	Administrative	Epistemic interdependence	Inter-individual	Epistemic interdependence is a situation in which one agent's optimal choices depend on a prediction of another agent's actions.

Table 2 Continued

Author(s)	Theoretical/Empirical	Base disciplines/ theories	Form	Type	Levels/unit of analysis	Definition
Bruns (2013)	Empirical	- Organisation theory - Practice-based coordination theory	Administrative	Functional interdependence	Inter-team	Interdependence between cross-functional fields relates to their engagement in collaborative practices.
Gong et al. (2013)	Empirical	- Social psychology - Team theory	Social	Goal interdependence	Intra-team	The degree to which team members are oriented toward a common goal enhances the interdependence between them.
Zhou (2013)	Empirical	- Organisation theory - Team theory	Administrative	Divisional interdependence	Inter-divisional	The decomposition of tasks and hierarchical structure shape the extent to which divisions are interdependent.

2.3.2. Task interdependence

In the organisation theory literature a task is defined as “the means by which the work is accomplished” (Wageman, 1995: p. 145). Two tasks are said to be interdependent if the value generated from performing each task, is different when the other task is also performed, versus when it is not performed (Puranam et al., 2012). The interdependence construct in the organisation design literature includes both asymmetric (one-sided) and symmetric (two-sided) dependence. I adhere to conventional usage and use “interdependence” for both categories but specify whether I refer to symmetric or asymmetric interdependence when the difference matters.

Whereas task interdependence pertains to the extent to which the completion of tasks requires interaction between involved actors; coordination is about the integration of the in- and outputs of tasks under conditions of uncertainty (Becky and Ockhuysen, 2009). The notion of uncertainty was added to the discussion on coordination in organisations by organisation design scholars (Adler, 1995; Perrow, 1967; Woodward, 1970) because they argue that the uncertainty found in the task technology shapes the structure of coordination. A crucial form of uncertainty proposed by this research is indeed task interdependence itself (Thompson, 1967). A central argument coming from the organisation design field is: the more complex the task technology, the higher the task interdependence involved in that particular configuration, i.e. members need to interact more (intense) to accomplish the task. Moreover, if the complexity of the task technology increases, then the coordination required to integrate the collective set of tasks will decreasingly depend on impersonal forms of coordination such as hierarchy, rules, and programmes, but more on interpersonal forms of coordination emphasising communication and feedback (Becky and Ockhuysen, 2009; Van de Ven et al., 1976).

An important example of the latter form of coordination is team-based organisation design.

Thompson's conceptualisation of task interdependence

The task interdependence construct was first conceptualised by James David Thompson in his seminal book 'Organizations in Action' (1967) which was based on a multidisciplinary study as it presented an elegant sociological analysis of complex organisations. Thompson recognised that the work processes associated with a specific task technology, differ in the degree to which they are interrelated, which he referred to as 'task interdependence'. This construct stresses the topic of dependence on others for the accomplishment of tasks. Thompson's typology links the task interdependence produced by the technology of the task to different coordination mechanisms that could be installed by organisation design. Hence, task interdependence is a direct consequence of organisation design.

Thompson (1967) distinguishes between three types of task technologies and task interdependence. First, in a *mediating* task technology a number of organisational units perform their tasks independently of one another in terms of actual work flows between these units. Yet, they may be interdependent in the sense that if one unit performs inadequately, the entire organisation experiences a difference in performance. This type of low task interdependence system is managed by a "summative" composition rule, i.e. the whole is an additive or pooled outcome of its parts. Ergo, this type of interdependence is described as 'pooled interdependence'. An example would be a typing pool with each individual typist working on a chapter of a novel manuscript. The system outcome is equal to a summation of the members' individual contributions (Cheng, 1983). Thompson further asserts that units operating in this configuration of

interdependence require little coordination. He suggests that in order to sustain consistent performance across units firms need to introduce rules and standard procedures for the accomplishment of routines.

A second type of task technology is *long-linked* technology which, in addition to pooled interdependence, also gives shape to 'sequential task interdependence'. A long-linked task technology involves units which perform tasks in a fixed sequence. This configuration is more complex because each unit is dependent on other units located at task sequence positions prior to their own. For example, individuals working on the same assembly line depend on each other as they sequentially complete the work process leading to a finished product. If workers early in the process are not performing their task adequately, then those further down the process directly experience the impact thereof.

Coordination of sequential task interdependence necessitates more 'planning' and 'scheduling' than in the case of pooled interdependence. All tasks must be designed, assigned, planned and scheduled to achieve the correct and appropriate sequential fulfilment of tasks. Any discrepancy in the sequence can interrupt the system and hence in addition to rules and standard procedures for performing each individual task, plans and schedules need to be put in place to manage the combined tasks.

Third, if the task technology is *intensive* then the complexity of the task goes beyond the transformative capacity of a single individual or unit. In this setting there is a need for interaction between workers during the execution of their tasks. Thompson labels this 'reciprocal task interdependence'. An example is a restaurant (Hatch and Cunliffe, 2006) where the kitchen is typically dependent on wait staff to collect and communicate the orders. The wait staff on its turn depends on the kitchen to provide meals that fit the customer's requirements. The fundamental difference between sequential and reciprocal

interdependence is that in sequential interdependence work flows are unidirectional, while in reciprocal interdependence work flows these are bi- or multidirectional. For the sake of illustration this simple example is used but one could easily imagine more complex configurations in innovation systems.

Coordination of intensive task technologies occurs through ‘mutual adjustment’ between the individuals or units involved to manage their reciprocal task interdependence. If intensive task technologies demand immediate coordination, then mutual adjustment takes the shape of ‘team-work’ in which inputs to the transformation process are acted upon simultaneously. In configurations of less intensive task technologies these inputs are passed back and forth.

The notion of team-work as a coordination mechanism is important here as it clearly links to the types of advanced organisation designs in the innovation-era with more complex tasks, more types of teams, and a volatile external environment characterised by technological disruptions. Hence, the emergence of team-based organisations is unsurprising considering the intensive task technology of innovation as both a firm level task (innovation capability development), and a team level task (e.g. venturing).

Van de Ven et al. (1976) extend Thompson’s task interdependence typology with the ‘team arrangement’. Their argument for this is that contrary to sequential and reciprocal interdependence, there is no measurable temporal lapse in the flow of work between individuals in the team arrangement because tasks are handled jointly and simultaneously. Among the examples the authors provide are group therapy sessions in mental health units, a football team playing a game, or a research group designing a study as a ‘think tank’. But while both studies by Thompson (1967) and Van de Ven et al. (1976) argue teams to be important for the management of intensive task technologies as innovation, the question of how and when task interdependence within

and between teams develops over time remains unanswered. For example, if one team or one individual in a reciprocal task interdependence configuration is more knowledgeable and skilful than the others, than how does this affect the interaction between them? Moreover, if a unit or individual perceives their position in a given configuration to be different than the position they would prefer; what would this actor then do? Would they remain in the same position during endless cycles of the transformation process or are they likely to attempt to enhance their position? In a later paragraph I will return to the important matter of collective agency on the level of teams and interdependence; i.e. how do teams contribute to task interdependence?

What the preceding types of task interdependence (pooled, sequential, reciprocal, team arrangement) have in common is that each represents the degree to which the task requires collective action. Whereas low interdependence systems are managed by a "summative" composition rule, i.e. the whole is an additive or pooled outcome of its parts, high interdependence systems are managed by a "constitutive" composition rule, that is, the whole is a "superadditive" (Miller, 1965) or collective outcome of its parts (Cheng, 1983). It is important to note that sequential interdependence also includes pooled interdependence in that each individual or unit still performs their work independently, but the relatedness is different in that in sequential interdependence each worker depends on the one preceding them in the sequence. Similarly, intensive task technology also includes pooled and sequential interdependence. Moreover, as interdependence increases, coordination mechanisms are added. Whereas pooled interdependence requires rules and procedures, sequential interdependence demands rules, procedures, and scheduling. Reciprocal interdependence uses all of these, adding mutual adjustment and team-work. This type of cumulative scale in which each level of a variable implies all the correlates of lower levels of the same variable is referred to as

the Guttman scale (Guttman, 1944). The suggested relationship between task interdependence, complexity, and coordination contradicts the trend in the innovation-era in which firms decompose tasks and allocate these to smaller, autonomous units, leading to complex organisation designs as the cellular structure (Miles et al., 1997). Firms resort to structural linking and integration mechanisms to confront the challenge of coordination the tasks of a high number of units. Pooled task interdependence is explained in the organisation design literature as the simplest configuration but what if the increase of interdependence among teams in an evolving system would be a desired objective, as is the case for firms which intend to converge and integrate the activities of their autonomous subunits? Moreover, when each unit becomes more autonomous and matures at peripheral levels of the organisation to a more complex form, then standard rules and procedures are unlikely to produce the desired effect; particularly in organisations characterised by decentralised decision making and flat hierarchies which are typical organisation design features in the innovation era. Sic, even pooled interdependence configurations can entail complicated managerial challenges in terms of coordination.

Although Thompson's conceptualisation is the most commonly referred to, there are several other perspectives on task interdependence. Thompson defined task interdependence as a feature of work that is inherent in the technology of the task (e.g. assembly line work is inherently sequentially interdependent). Others (e.g., Shea and Guzzo, 1989), however, have described task interdependence as a feature of the way people behave in doing their work (e.g., assembly line workers who support each other have a higher task interdependence than workers who do not). The present study adheres to Thompson's definition: i.e. task interdependence is a structural feature of work that is a direct consequence of organisation design. This viewpoint was chosen for

the sake of argumentative consistency because earlier in this chapter I have explained and argued how organisation design determines the task interdependence configuration. Moreover, the adherence to task interdependence as a structural feature of work enables its classification as an administrative form of interdependence, and consequently, facilitates conceptual clarity in later paragraphs in which social forms of interdependence are distinguished from administrative forms.

Post-Thompson treatises of task interdependence

In the decades succeeding Thompson, the task interdependence construct was highly cited and further elaborated by numerous researchers (e.g. Adler, 1995; Astley and Zajac, 1991; Cheng, 1983; Langfred, 2007; McCann and Ferry, 1979; McCann and Galbraith, 1981; Sorenson, 2003; Van de Ven et al., 1976; Victor and Blackburn, 1987; Wageman, 1995; Weick, 1979). A number of observations were made when studying this stream of literature. First, while task interdependence was initially juxtaposed with the requirements inherent in a task's technology, later studies examined the relationship between task interdependence and a multitude of other variables as power (Astley and Zajac, 1991); coordination strategies (Cheng, 1983; Sorenson, 2003; Victor and Blackburn, 1987); cooperation (Shea and Guzzo, 1989); group effectiveness (Wageman, 1995); interdepartmental relations (Adler, 1995); and conflict (Langfeld, 2007). Second, Post-Thompson research (e.g., Johnson et al., 1984) did not consistently distinguish between task interdependence and other types of interdependence while these different types (e.g. task and outcome interdependence) are conceptually distinct (Wageman and Baker, 1997). A third important characteristic of task interdependence research after Thompson's articulation of the construct is that from the 90's more research on task

interdependence within the context of teams emerged (Adler, 1995; Astley and Zajac, 1991; Wageman, 1995; Wageman and Baker, 1997; Campion et al., 1996; Van Der Vegt et al., 1998; 1999; Langfred, 2007). This increase in scientific attention for task interdependence and teams can be attributed to the fact that teams were taking an increasingly prominent place in organisations in the innovation era as discussed in the earlier organisation design paragraph.

Teams and task interdependence

According to team theorists, organisations should divide tasks among subunits for three reasons: bounded rationality of individual agents (March and Simon, 1958), the pressure to adapt to volatile external environments (Lawrence and Lorsch, 1967), and the technological requirements of their tasks (Thompson, 1967). The majority of studies that explicitly incorporate teams in their analysis focus on task interdependence *within* teams (Wageman, 1995; Wageman and Baker, 1997; Campion et al., 1996; Van Der Vegt et al., 1998; 1999; Langfred, 2007). Wageman (1995) for example presents a comprehensive study on team effectiveness within 150 teams of service technicians of a large U.S. corporation. The author finds that task design should either suggest interdependence or independence but not both (hybrid) because those teams seem to perform the worst; i.e. have the lowest team effectiveness. In her analysis the author links task interdependence and outcome interdependence which is defined as “the degree to which the significant outcomes an individual receives depend on the performance of others” (p. 147). Furthermore, Wageman shows how team effectiveness increases with increasing levels of task interdependence; hence teams consisting of

individuals with high task interdependence perform better than those with lower levels of interdependence.

Langfeld (2007) presents evidence for the relationship between conflict and task interdependence in a sample of 35 self-managing teams of MBA students. The author shows that high levels of conflict negatively impact task interdependence and autonomy within teams, and consequently negatively affect team performance. Individuals seem to eschew collaboration with other team members in teams with fierce competition. These results contrast the earlier argument that competition, even fierce competition, may enhance team performance (Taylor, 2010). In addition, Langfred demonstrates how conflict is not only the effect of team design, but also a determinant. Teams with high levels of conflict responded with structural changes to cope. These findings illustrate how changes in task interdependence within teams - which usually occur after top management design decisions in response to shifts in task, environment (Galbraith, 1973; Thompson, 1967) – can also occur in response to team dynamics, such as conflict and trust between team members. Thus, within teams, individuals can change the team design to deal with issues as conflict. This is a promising finding considering the present study's interest in collective agency and task interdependence.

There is a small amount of studies explicating task interdependence as a phenomenon *between* teams (Adler, 1995; Astley and Zajac, 1991). Adler (1995) focuses on the normative question of how teams should coordinate in order to govern their interdependence. A central issue covered by this study is the required reconceptualisation of task interdependence to include new organisation designs. The author finds that during the lifecycle of new product development projects, interdependence changes and different types of coordination mechanisms are required. Furthermore, he highlights the dynamic nature of task interdependence in contexts of

uncertainty and time-pressure. Several coordination mechanisms are suggested which revolve around enhancing communication and information processing. The author emphasises that his study focused on the normative question of how to coordinate teams in different task interdependence configurations rather than on the descriptive/positive theory of how departments actually do coordinate which leaves issues as competition, collaboration, and power in the background. Finally, Adler focuses on task interdependence in the design/manufacturing dyad while teams in the innovation era are known to operate in more complex settings due to the emergence of new teams in the innovation discipline.

Astley and Zajac (1991) argue that the task interdependence between teams or “work units” develops through organisation design. Moreover, the authors suggest that it is not so much the resource exchange between individuals that’s important – i.e. a reference to resource dependence theory -but instead the interdependence configuration. More specifically, the more central a team is positioned in the task interdependence configuration, the more functional dominance it can exert. The authors also empirically demonstrate that sub-units may increase their power if they increase: a) their dependence on others (counter-intuitive and in contrast with exchange dependence theory); b) Others’ dependence on them. It is particularly point a) that seems counterintuitive since depending on others is commonly seen as a lack of power on the end of the depending team. An interesting question arising from this study is: how and why do teams increase the interdependence with others teams? The authors explain the search for more power as a determinant but do not elaborate on how this translates to the collective agency of teams; that is which specific types of actions or interactions result in more power? Moreover, the reference to teams as ‘sub-units’ is understandable

for the sake of clarity and simplicity, but it does not represent the heterogeneity between teams that is characteristic for organisations in the innovation era.

In sum, the role of teams in task interdependence is predominantly analysed in extant literature as an intra-team phenomenon. The main findings of this body of literature is that team effectiveness increases with when interdependence increases and that fierce competition within teams leads to reduced interaction between team members. A more intriguing finding is that teams autonomously resort to structural change – i.e. organisation redesign – to manage conflict and performance issues. This suggests the existence of agentic activities to occur *within* teams with respect to shaping task interdependence. The studies focusing on task interdependence as an inter-team phenomenon demonstrate how task interdependence can be more dynamic in organisational activities with a degree of uncertainty; and how teams need to increase task interdependence to become more central. These studies do not cover the process of task interdependence development, how teams contribute to this process, and the consequences of this process for/on teams. Within teams it has been shown that structural changes are deployed to deal with unfavourable situations as conflict, but can such responses also be expected to occur *between* teams? Empirical research is needed to answer this important question.

Task interdependence development

The process of task interdependence development is a central issue, regarding this issue Siggelkow (2011) notes: “How do such systems evolve over time, because it is quite unlikely that firms are founded with such full-fledged systems?” (p. 1128). Currently, the organisation design literature attributes changes in task interdependence to top managers solely (e.g. Puranam et al., 2012; Rivkin and Siggelkow, 2003) because they

have the authority and power to (re)design. Puranam et al. (2012) for example argue that interdependence between agents can be modified by an ‘organisation designer’. They suggest that the more knowledge the organisation designer has, the more optimal the information processing between interdependent actors. This perspective however seems to overestimate the role of the designer in independently shaping organisation design, particularly in large decentralised organisations, with complex structures, where specialised teams operate autonomously. Siggelkow (2011) adds more nuances by proposing that there are likely to be many decision makers involved in managing a firm but that research on task interdependence should investigate how organisation design determines which decisions get adopted to shed light on the actual drivers of task interdependence development.

In an earlier study, Siggelkow (2002) looked into the process of how organisation design evolves, and how this evolution affects the interdependence between core and elaborating elements. A core element is defined by the author as having two characteristics: (1) a high interdependence with other organisational elements and (2) a strong influence on other organisational elements. An elaborating element reinforces a core element; i.e. it is subservient to it. This is coherent with team focused studies on task interdependence who argue that teams need to increase their centrality – i.e. become more ‘core’ – if they want to increase task interdependence to exert more influence on other teams; an obviously important objective for linking teams which aim to integrate the activities of dispersed teams.

Siggelkow (2002) further explicates that interdependence develops through three processes: “patching”, “thickening”, “coasting”, and “trimming”. Patching is the adoption of a new core element in the organization design; thickening is the reinforcing of an existing core element; coasting occurs if a core element is not reinforced over time

by the organisation; and trimming is the deletion of an existing core element and all of its elaborating elements. This study makes a significant contribution in terms of demonstrating how configurations of interdependence evolve over time. It empirically shows how interdependence relates to notions of centrality and how decisions can shape the distribution of core versus elaborating elements. The author argues the drivers of these developmental processes reside in the design-environment misfit.

However, the impetus for shifts in organisational reconfiguration of task interdependence can come from within the firm (Langfred, 2007). Specifically when considering the findings of studies suggesting that teams should increase interdependence to become more central, it can be argued that team collective agency can be a driver of task interdependence development. How, when, and why this occurs is relevant but remains unaddressed when combining thoughts from the organisation design, power, task interdependence, and team interdependence literatures.

A subtle but important point made in the organisation design literature on the relationship between task interdependence and organisational actors is that the task interdependence that is designed, and the interdependence that is experienced are not necessarily equal (Kumar et al., 1995; Nickerson and Zenger, 2002; Puranam et al., 2012; Ramamoorthy & Flood, 2004; Sherman & Keller, 2011). In other words, teams may have different perceptions about the same task interdependence configuration.

Perceived task interdependence

The literature does not extensively report on perceived task interdependence. A few studies on task interdependence were detected which include the notion of team perceptions (Kumar et al., 1995; Ramamoorthy & Flood, 2004; Sherman & Keller, 2011). Perceived task interdependence is the interdependence that is actually

experienced by teams, and which explains the way they execute their tasks. This is not necessarily different from the designed task interdependence, but also not necessarily equal.

Sherman and Keller (2011) for example examine the effects associated with differences in designed and perceived task interdependence between teams. A fundamental finding of this study is that when the deviation between designed and perceived task interdependence increases, the deviation between optimal and actual integration increases. This has important implications for the organisation designs in the innovation era which were discussed earlier and can be characterised by fluid designs, decentralised decision making, and the differentiation of tasks which are allocated to autonomous teams. These design features require integration (Nadler and Tushman, 1997) for which firms can use structural linking teams. If however, as Sherman and Keller (2011) argue, perceived interdependence is different from designed task interdependence, then this integration is less effective; i.e. the effectiveness of structural linking teams decreases. The authors further explicate that managers often do not implement optimal modes of integration because they incorrectly assess task interdependence between teams. This is an important departure from the inherent problematic assumption in the organisation design literature that managers correctly assess task interdependence. In their study of the U.S. Department of Defence (DOD) organisation which consists of four divisions with a total of 20 departmental branches, they found deviations in managerial assessment of task interdependence to occur in approximately one-third of the cases. These deviations were found to adversely impact coordination performance. The authors make some useful comments regarding how managers should respond to the risk of perceptual error; e.g. increasing the awareness of this error or by management education regarding managing task interdependence.

However, additional research could complement this study by showing how firms actually respond to deviations between perception and design, and how the teams involved respond to the negative effects of low coordination performance. Will these teams accept the status quo and continue performing their tasks in a suboptimal configuration or will they attempt to alter the configuration? Moreover, since the design authority is often in the hands of top managers, particularly in organisations as the U.S. Department of Defence, it is likely that teams wanting to shape task interdependence beyond the boundaries of their own team (Langfred, 2007), will sooner or later have to interact with the upper echelons. The process of how this may occur and what the consequences are, if any, is a matter requiring further investigation.

Kumar et al. (1995) also refer to perceived interdependence but from a different angle. They assert that in an interdependence configuration, one or more parties may perceive interdependence to be asymmetric. I mentioned earlier that the organisation design literature includes both asymmetric (one-sided) dependence and symmetric (two-sided) interdependence and that I would specify whether I refer to symmetric or asymmetric interdependence when the difference matters. In this study the distinction is explicitly made because they argue that if a unit may experience asymmetric interdependence then this has implications for conflict, trust, and commitment between the units involved. The findings result from survey data on a sample of 453 companies in the automobile industry. The authors find that, with increasing interdependence asymmetry, some units' trust and commitment to other units decrease, while conflict increases. Furthermore, configurations in which units perceived high symmetric interdependence led to higher trust, stronger commitment, and lower conflict. Thus, this study shows how perceived task interdependence, not necessarily the designed task interdependence, shapes the way teams interact.

A third empirical paper by Ramamoorthy and Flood (2004) revolves around the effects of perceived versus unperceived task interdependence between 204 blue collar workers in 24 Irish manufacturing firms. The researchers reveal how workers who perceive task interdependence to exist between them to display team loyalty and prosocial behaviour, the latter being defined by the authors as any voluntary behaviour that benefits the team or the company. In addition, this study shows that even individualists, i.e. workers who prefer to work alone and who give supremacy of their personal goals over team goals, tended to help and be cooperative with others when they perceived high task interdependence. This corroborates the findings of studies in other literature streams (Astley and Zajac, 1991; Brass and Burkhardt, 1993) which argue the importance of increasing task interdependence between teams to enhance inter-team interaction. The difference between Ramamoorthy and Flood's (2004) paper and the insights from the power literature is that the former incorporates the difference between designed and perceived task interdependence. These contributions are valuable and relevant for our understanding of how teams respond to organisation design with respect to the types of attitudes they adopt and the interaction in which they engage. What this study does not address is how workers, or teams, who/which perceived no or low task interdependence respond to this in terms of attitudes and interactions, particularly if there is a desire to attain (higher) task interdependence. Linking teams are a useful example because they benefit from high levels of task interdependence with other teams for the purpose of integration. If operational teams do not perceive any task interdependence to exist between them and linking teams, then how would the latter respond?

Conclusion

Altogether, these recent studies on perceived task interdependence revitalise the task interdependence construct by distinguishing between design and perception. This is an important distinction since research shows that they are not necessarily equal, and that when they are not equal, there are implications for how teams interact. First, if task interdependence is wrongly perceived by managers then this leads to coordination problems and lower performance. Second, if asymmetric interdependence is perceived then conflict between teams increases, while trust and commitment decrease. Finally, situations in which task interdependence is perceived are more beneficial for cooperation and team loyalty than situations in which no task interdependence is perceived.

Notwithstanding the contributions these studies have made, a number of central issues need to be addressed. First, while the consequences of perceived interdependence in a given configuration have been investigated, the process through which these perceptions further develop is overlooked. If different perceptions of a given task interdependence configuration arise, then one could ask: what would happen subsequently in terms of impact on the designed task interdependence? Research to date has not addressed how different perceptions affect task interdependence. Do different perceptions of task interdependence matter at all for a given design or does the given design persist over time despite different perceptions thereof? What these few studies on perceived task interdependence demonstrate, however, is that there is more to interdependence than formal design. Indeed, Nickerson and Zenger (2002) mention that a firm's formal structure strongly influences the shape of its informal structure because the latter often develops in response to the former; furthermore, there is also considerable overlap between the two. This is a key statement which proposes a

relationship between administrative and social forms of interdependence. This bifurcation which I mentioned at the beginning of the interdependence chapter supports the analysis of how task interdependence develops as an unfolding process including administrative and social elements. Moreover, Langfred (2007) suggests that managers may enforce certain tasks, structures or task designs upon a team which limit the team's ability to restructure (inwardly). However, he refers to other studies (Wageman and Baker, 1997) which presented evidence that even teams with identical task technologies often differed considerable in their task interdependence configuration, suggesting that teams may play a more profound role in shaping design – and consequently the development of task interdependence - than commonly believed.

A second issue is the notion of interaction between teams as resulting from perceived task interdependence. While collaboration is an obvious outcome of perceived task interdependence, more diverse forms of interaction between teams are likely when for example considering the competition prevalent between teams in innovation systems (Baer et al., 2010; Birkinshaw, 2001; March, 1991; Taylor, 2010). How and why different perceptions of a task interdependence configuration lead to distinct interaction patterns between teams is not adequately explained in the task interdependence literature. Moreover, the core issue of how teams shape task interdependence, possibly through interaction as is the case in shifts in task interdependence *within* teams (Langfred, 2007), remains unaddressed. Interaction between the components of a task interdependent system has been theorised in the organisation design literature (e.g. Levinthal, 1997; Siggelkow, 2011; Rivkin, 2000). These studies argue that two interdependent elements are said to interact if the value of one element depends on the presence of the other element. More specifically, two elements are reinforcing if they complement each other.

Finally, the above problematisations of the task interdependence literature introduce the notion of informal structures (perceptions), complementarity, and interactions into the discussion on how task interdependence develops over time. A useful theory of interdependence which deals with how interdependent actors perceive their complementarity; and which elaborates interaction in more types as an outcome of interdependence is social interdependence theory (Deutsch, 1949); which is a social form of interdependence. Moreover, social interdependence allows the theoretical conceptualisation of ‘perceived task interdependence’ which based on extensive research in the social psychology discipline is captured in one construct, viz.: social interdependence. I next review the literature on social interdependence to discuss the origins of the theory, its relevance to organisations, and the role of teams.

2.3.3. Social interdependence

Origins of social interdependence theory

Gestalt psychology

Social interdependence theory stems from the discipline of social psychology. This theory originates from a shift in physics from mechanistic to field theories (Deutsch and Krauss, 1965). This shift affected the field of psychology, specifically Gestalt psychology which emerged in the early 1900s. Because ‘the field’ became the unit of analysis in physics, the ‘whole’ – i.e. Gestalt – became the locus of attention for Gestalt psychologists who studied perception and behaviour. They argued humans to be mainly concerned with forming structured and meaningful views of the world surrounding them

by perceiving events as wholes. These perceptions arise in a field and are structured into interdependent components that form a system.

An additional premise was that the whole is greater than the sum of its parts. Kurt Koffka (1935), one of scholars who developed the Gestalt school of psychology, suggested that groups were dynamic wholes in which the interdependence among group members could vary. Extending the premises of Koffka, Kurt Lewin suggested that the core of a group is the interdependence between members so the group is a dynamic whole. This implies that changes in the state of any group member cause changes in the state of any other member. The interdependence among members arises from common goals, i.e. for interdependence to be present, at least two individuals or units must be involved, and these individuals or units must affect each other, which comes back to the idea that a change in one affects all others. Goals are defined as the “desired future state of affairs” (Johnson and Johnson, 2006: p. 292) and are not always explicit.

Thus, the perception of having common goals in combination with the motivation to attain these goals is the source of social interdependence. These perceptions are triggered by group members’ direct social environment. Indeed, the Lewinian principle of situationism (Ross and Nisbett, 1991), which posits that individual (and social) behaviour is a product of the immediate social environment, has become a key tenet of social psychology. This perspective proposes that individual and social behaviour is inconsistent and unpredictable across situations.

Morton Deutsch

Deutsch (1949) built on Lewin’s propositions by investigating the nature of interdependence in groups which he linked to the tension systems of group members.

He derived two types of social interdependence: positive and negative. Positive interdependence relates to a positive correlation among individuals' goal achievement. This means that individuals perceive that they can only attain their goals if the other individuals, to whom they are linked through a cooperative structure, also attain their goals. Conversely, negative interdependence implies a negative correlation among group members' goal attainments. Thus, individuals perceive that they can attain their goals if the other individuals, to whom they are competitively linked, do not attain their goals. No interdependence or individualistic perceptions arise when there is no correlation perceived among individuals' goal attainments, because they perceive that the attainment of their goals is unrelated to the goal attainment of others.

Deutsch' elaboration of social interdependence theory also includes how different types of social interdependence affect the interaction patterns among individuals. Social interdependence theory generally renders cooperation superior to competition (Deutsch, 1949). Although competition and individualistic efforts can be useful in certain contexts, research proposes that team members who perceive shared goals, vis-a-vis competitive or unrelated (individualistic) goals, engage in interactions that benefit team effectiveness (Chen and Tjosvold, 2002; Crown and Rosse, 1995; Lu et al., 2010). The proposed superiority of cooperation over competition stems from Morton Deutsch', who made an effort to refute Social Darwinism which was used as the rationale to promote competition in that period of time. He therefore developed social interdependence theory as a comprehensive conceptual structure, and a theoretical and empirical rationale on the general utility of cooperation in lieu of competition.

Current conceptualisation of social interdependence

After Morton Deutsch' (1949, 1962) conceptual work and subsequent research (Baer et al., 2010; Beersma et al., 2003; Johnson, 1970; Johnson and Johnson, 1989), social interdependence theory matured around the core premise that the goal structure of the individuals involved in a specific situation, determines the outcome of that situation. A goal structure determines the types of interdependence among individuals' goals; and the type interdependence determines how individuals should interact to attain their goals. The interaction can either (1) support and facilitate others' goal achievement or (2) hinder and block the goal achievement of others. Interaction is defined as the simultaneous or sequential actions of individuals that have an impact on the immediate and future outcomes of others in the situation. This interaction can be both direct and indirect. I will return to interaction patterns in a later paragraph when social interdependence between teams is discussed.

Research on social interdependence theory has mainly focused on contexts other than organisations; e.g. ethnic groups (Deutsch, 1949); classrooms (Ames, 1981; Mesch et al., 1988), and universities (Baer et al., 2010). Albeit the advent of the team-based organisation design stresses the importance of social interdependence theory as a lens to understand team dynamics, there is little research that explicitly uses the theory (Tjosvold, 1989). Some studies mention the notion of goal interdependence (Gong et al., 2013; Pieterse et al., 2013; Wageman, 1995; Wageman and Baker, 1997) as a construct separate from task interdependence. However, they do not integrate the well-grounded social interdependence theory which is far more informing when it comes to the drivers and consequences of goal structures between individuals in teams. The lack of studies using social interdependence theory is surprising, even more so considering Victor and Blackburn's (1987) elegant presentation of how social interdependence

theory can be used to accurately measure interdependence between units in firms. In the next paragraph a review is presented of studies applying social interdependence – directly, indirectly, or partly - in organisational contexts.

Social interdependence in organisations

The rise of the team-based organisation design in the innovation era emphasises the importance of social interdependence theory (Johnson and Johnson, 2006). I earlier conceptualised teams in present day organisations as “complex and dynamic entities that adapt and change over time” (Baer et al., 2010). In the organisation design chapter, the importance of common goals was discussed as an informal integration mechanism (Jansen et al., 2009) in the context of intra-firm complexity and dynamism. Perceptions of having shared goals between individuals or teams can partly explain why different levels of interdependence can be experienced for the same or similar task interdependence configuration(s) (Langfred, 2007). Increased interdependence leads to more team effectiveness (Wageman and Baker, 1997) and higher performance (Pieterse et al., 2013) because it moves individuals and teams into more collaboration. Social interdependence theory provides a comprehensive framework of why and how shared goals increase experiences of interdependence, and how it produces different types of behaviour for different experiences of interdependence.

Tjosvold (1989) for example demonstrates how common goals between managers and employees lead to cooperative interactions in a study based on interviews with 46 managers and employees. Cooperative goal structures were found to benefit knowledge exchange and team productivity. The author uses social interdependence as a framework and empirically shows how positive social interdependence led to superior performance vis-à-vis negative social interdependence. The cooperative interaction patterns between

managers and employees resulted in the completion of tasks, enhanced productivity, increased communication, and trust between groups that future collaboration would also be successful.

Burgelman (1983) examined a corporate venturing division by means of a qualitative inquiry generating 61 interviews with employees from the venturing division and from other divisions. The author found that the extent to which common goals were perceived between the venturing division and operating divisions increased the willingness of operating division employees to engage in interaction with the venturing division. Positive perceptions regarding the interdependence between the venturing division and the operating division, led to more helping behaviour on the end of the operating division. Where negative or no interdependence was perceived the operating division employees referred to their own action plans or having limited time, to avoid interaction with the corporate venturing division. Although the author does not directly refer to social interdependence theory it is still a relevant and interesting finding because it shows how structural separation of a specific type of innovation activity brings up issues of social interdependence. The task interdependence structure that was designed is straightforward; i.e. a venture is incubated and grown in the venturing division after which one of the operating divisions adopts it and scales it. However, in reality the cooperation between this venturing division and other divisions depended on perceptions of the designed interdependence; i.e. the extent to which shared goals were perceived on the end of the operating divisions led to willingness to collaborate.

In another study by Chen and Tjosvold (2008) the relationship between task interdependence, team procedures, and social interdependence is examined. A cross-sectional study of 102 Chinese firms was conducted in which task interdependence configurations were found to influence perceptions of social interdependence between

team members. More specifically, their results show how task interdependence can result in a cooperative goal structure. When team members are assigned a common task it creates the perception between them that they have mutual goals and that they can succeed as other team members succeed. Interesting to note here is that the explicit elaboration of common goals is unnecessary for a cooperative goal structure to emerge. It is the perceived task interdependence that leads to positive social interdependence and a cooperative team context. Moreover, the authors show that low levels of task interdependence lead to perceptions of competitive or independent goal structures which lead to a decrease in team performance. This clearly connects with the last paragraph of the previous chapter in which perceived task interdependence had implications on attitudes and interactions between team members, and between teams. Interestingly, in this study, which focuses on social interdependence explicitly, similar findings are presented.

Hirst et al. (2009) investigated a cross-national sample of 25 R&D teams consisting of 198 employees. They examined how team level goals influenced the relationship between individual level goals and individual creativity. Their results demonstrate that ‘team learning’ as a team level goal, brings out the best in team members and fosters creativity. This study confirms that having shared goals has positive effects on outcomes related to innovation by elaborating how the combination of individual disposition and shared goals enhances the creativity of team members. It also confirms the importance of shared goals and cooperative interaction patterns. However, how teams get to the articulation and adoption of shared goals remains unclear. For example, team level goals could be formal or informal, given by design or developed by team through consensus, and could be adopted through interaction or coercively through powerful individuals.

A related study by Gong et al. (2013) suggests that the interaction between team members moderates the positive relationship between shared team goals related to collective learning and performance, and team-level and individual-level creativity. Hence, interaction patterns play an important role in developing cooperative goal structures into beneficial outcomes on both the level of individuals and teams. In the same vein, Van Ginkel et al. (2009) point out that team members need to collectively reflect and understand a task to enhance interaction and consequently, effective team performance. By means of an experiment of 252 freshmen at a university in the Midwestern United States the researchers elucidate that the task in itself was insufficient to bring about productive interaction in teams. Teams needed to reflect on the task, which could lead to differentiated perceptions and understandings. In this study teams often worked from a suboptimal understanding of their task, a crucial objective in fostering team effectiveness therefore seems to be the attainment of shared understandings. A question derived from this study would be: how to reach a shared or similar perception of a task given by design? What types of interaction would stimulate reaching this understanding, and what types would not?

In line with social interdependence theory's main premise, Baer et al. (2010) find that shared goals enhance participation and collaboration in teams and benefit team creativity. In an experimental study involving 280 undergraduate students at a large university the authors analyse how different levels of competition between teams, affect the interaction and creativity within teams. Their findings suggest that fierce competition is detrimental to collaboration and creativity and hence the common conviction of organisations to instil competition between teams in to foster innovation is challenged. This study neatly connects innovation, interdependence between groups, and interdependence within groups. Additional research is needed however to study in

more detail how the interaction patterns between teams evolve. If fierce competition has adverse effect on creativity then how would firms develop competitive patterns into cooperative patterns of interaction?

Lu et al. (2010) surveyed 146 employees of a large Chinese I.T. corporation in several stages. Their findings suggest that cooperative goals benefit interaction within teams, leading to team creativity and innovation. Teams having a common goal structure displayed cooperative behaviour as constructive criticism, open discussion discussions, and willingness to be influenced. A more intriguing contribution of Lu et al.'s (2010) paper is their examination of social interdependence *between* teams, which is an under-examined unit of analysis in research on social interdependence theory. The authors find that when teams perceive their goals to be cooperatively structured, they are able to discuss opposing views openly and constructively. This positive social interdependence led to more creative approaches to handling tasks and increased team productivity. Although research using social interdependence theory to examine processes and dynamics between teams is lacking, this recent study suggests that social interdependence theory can indeed be conceptualised as a within- and as a between-team phenomenon.

The studies discussed in this paragraph either directly or indirectly use social interdependence theory to explain whether, why and how individuals or teams perceive interdependence. They show how perceptions of cooperative goal structures lead to collaborative interaction patterns and outcomes as creativity, team effectiveness, and team performance. But they do not mention how these interactions impact the development of social interdependence, particularly in the case of negative social interdependence. Langfred (2007) has reported teams to respond to situations of competition and conflict by redesigning their team structures and task interdependence.

These findings have not been examined or reported in the social interdependence literature; i.e. do inter-team interaction patterns matter for the development of interdependence, both the designed task interdependence and perceived social interdependence?

An additional point that has not been examined is the notion of asymmetric perceptions; e.g. one team may experience positive social interdependence, while the other team involved in a given situation may experience no interdependence. Hence where one team perceives goals to be shared, the other team views goals as being unrelated. What type of interaction is to be expected in similar configurations? To revisit the notion of linking teams; linking teams are designed to integrate the activities of other teams towards the objectives of the corporation. However, while linking teams obviously need other parts of the organisation to cooperate, it may be the case that this cooperation is not granted. More specifically, it could be that whereas a linking team perceives positive interdependence, another team perceives negative or no interdependence. The question “to what type of interaction patterns and outcomes would this type of asymmetric interdependence between linking teams and other teams lead?” is important and relevant to different strands of literature, viz. organisation design, task interdependence, and social interdependence.

Finally, the dominant methods of research using social interdependence theory are experiments or cross-sectional surveys. Albeit these methods have helped researchers shed light on a wide range of organisational phenomena linked to social interdependence theory, alternative methods are required to study the process of interdependence development. The interest of the present study concerns the process of task interdependence development and hence a process perspective on task interdependence would require case studies, using qualitative methods of inquiry (see

special issue *Academy of Management journal*, 2013, volume 56, on process studies). Moreover, experimental designs – particularly those involving subjects unfamiliar with organisational life – have the obvious issue of external validity (Van Ginkel et al., 2009). It remains questionable whether the results of these studies would be replicated in a field setting using teams that have existed for a while in lieu of the ad hoc team structures typical for experiments. Baer et al. (2010) mention that “future research is needed to investigate the generalisability of our results beyond the laboratory and the undergraduate student population”.

Interaction patterns have been mentioned several times in the above discussion of studies on social interdependence in organisational settings. This matter deserves more careful attention because of its expected importance in inter-team dynamics relevant for social interdependence. The next paragraph therefore defines and discusses the interaction patterns that have been found to result from different types of social interdependence.

Social interdependence and interaction patterns

Studies discussed in the previous paragraph mention several interaction patterns resulting from positive social interdependence: e.g. discussion and constructive criticism (Lu et al., 2010), increased communication (Tjosvold, 1989), and collaboration (Burgelman, 1983; 1985). Interdependence is considered to be a construct that can be used to “accurately predict interactions among and effectiveness of team members” (Van der Vegt et al., 1999, p. 202). Deutsch (1949a) posits that positive social interdependence leads to a process of cooperative interaction, whereas negative interdependence causes a process of competitive interaction. *Cooperative interaction* is defined as actions between individuals that increase the likelihood of each other’s

success in attaining the joint goal. *Competitive interaction* is defined as actions initiated by individuals that reduce the likelihood of others' successful attainment of goals.

Individualistic interaction is defined as individuals engaging in actions that promote the achievement of individual goals without impacting the goal attainment of others.

Here, individuals focus only on their own productivity and goal attainment and ignore the efforts of others. Whereas social interdependence theory predominantly focuses on interactions between individuals within teams, it does not explicitly shed light on the interaction between teams based on the assumption that these will be similar to those within teams.

In addition to cooperative, competitive, and individualistic (inter)actions, social interdependence also shapes 'inducibility' which pertains to the notion of influencing others, and being influenced by others (Johnson and Johnson, 2006). Within a cooperative setting, participants induce each other freely to engage in actions that contribute to goal attainment. Furthermore, inducibility is argued to occur in cooperative settings (positive social interdependence) because competitive or individualistic settings would lead individuals to reject influence attempts by others (Crombag, 1966; Deutsch, 1949; Frank, 1984).

Cooperation, competition, and individualism arise as individuals engage in actions for the achievement of shared, conflicting, or unrelated goals. The actions chosen by individuals therefore depend on the perceived social interdependence. The behaviour of individuals in a given situation unfolds as it responds to the perceptions and assumptions they hold about the situation at hand. This premise has implications for the development of task interdependence because in the organisation design literature (e.g. Puranam et al., 2012; Siggelkow and Rivkin, 2003) it is argued that it is organisation design that configures task interdependence between individuals or teams, which

consequently determines the interaction patterns required to fulfil a task. However, from social interdependence theory it can be derived that interaction does not only depend on task interdependence by design, but also on task interdependence by perception; i.e. social interdependence. This interplay between task and social interdependence seems therefore important in shaping the actions of individuals and teams in a given configuration.

Furthermore, as the interest of this study is the process of task interdependence development, it is important to examine how this development relates to interaction patterns. In other words, do interaction patterns impact the development of task interdependence; i.e. does (collective) agency matter? If yes, then this would challenge contingency theory's premise that task interdependence depends solely on the demands of a firm's environment and task technology. Rousseau et al. (2006) for example theorise that interactions (behaviour) are distinct from perceptions (cognitions) because interactions are observable and measurable. Moreover, the authors argue that interaction can affect the social and physical environment whereas perceptions are intrinsic to individuals and must be translated to interaction to engineer any effect on the environment. It is therefore plausible to argue that interactions between teams affect the task interdependence configuration. If and how this occurs is subject to further research.

Finally, albeit social interdependence theory provides a strong foundation for understanding how the nature of interdependence leads to distinct interaction patterns between teams in static configurations, it does not elaborate how these interaction patterns would manifest and evolve in dynamic environments which are more common for organisations in the innovation era dealing with technological discontinues (Baer et al., 2010). In other words, the earlier discussion of task interdependence in light of static versus dynamic configurations can also be extended to social interdependence; i.e. do

particular interaction patterns remain constant over time or do they change? Is there any relationship between potential changes and team collective agency?

Having discussed the literature on organisation design, task interdependence, and social interdependence I next turn to a brief chapter that connects these literature streams as the basis for formulating the central research question of the present study.

2.4. Conclusion - Teams, Tasks, and Social Interdependence

The trend in the innovation era of decomposing tasks and allocating these to small team arrangements (Miles et al., 1997; 1999), and the structural separation of innovation activities from ‘business-as-usual’, causes coordination problems for firms (O’Reilly and Tushman, 2004). The coordination problems revolve around ensuring that all those dispersed processes and autonomous teams still contribute to corporate goals instead of diverging into unrelated or even conflicting directions (Zhou, 2013). To ensure the activities of different teams contribute to collective objectives, managers install structural linking mechanisms (Nadler and Tushman, 1997). Structural linking establishes relationships between teams separated by structural boundaries.

A particular linking mechanism relevant for the present study is the cross-functional interface which for reasons explained earlier is referred to as ‘linking team’. Linking teams generate horizontal linkages between teams and they are known to increase the amount of complexity in organisation design. Nonetheless, it is still a widespread structural linking mechanism because of its potential effectiveness in bringing teams together (Gupta and Govindarajan, 2000). Extant research does not, however, address the notion of structural linking between innovation teams; i.e. how are the efforts of different innovation teams across the organisation integrated? What are the features and

structure of linking teams created to support the coordination of innovation activities? It is important for linking teams to interact with other teams in order to fulfil the purpose of 'linking'. The power literature suggests that teams need to increase other teams' dependence on them; but also increase their dependence on others to enhance centrality (Astley and Zajac, 1991). However, the drivers (why), process (how), and consequences of centrality attainment in a given interdependence configuration remain unclear.

The majority of studies that explicitly incorporate teams in their analysis focus on task interdependence *within* teams. Recent research (Langfred, 2007) shows that teams autonomously resort to structural change – i.e. organisation redesign – to manage conflict and performance issues. This suggests the existence of agentic activities to occur within teams with respect to shaping intra-team task interdependence. The studies focusing on task interdependence as an inter-team phenomenon demonstrate how task interdependence can be more dynamic in organisational activities with a degree of uncertainty; and how teams need to increase task interdependence to become more central. These studies address the process of task interdependence development, how teams shape to this process, and the consequences of this process for/on teams. Within teams it has been shown that structural changes are deployed to deal with unfavourable situations as conflict, but can such responses also be expected to occur between teams? Hence, an integration of the literature of within- and between-team task interdependence produces the important question: how and why do teams shape the task interdependence between teams?

Conventional wisdom in the task interdependence literature attributes changes in task interdependence to demands of the environment or task technology. The design decisions top managers make determine task design, grouping of individuals into teams,

and the allocation of tasks to different teams. However, I argue that the impetus for shifts in task interdependence can come from elsewhere but the upper echelons of the firm. Specifically when considering the findings of studies showing how teams increase interdependence to become more central, it can be argued that team collective agency can be a driver of task interdependence development. How, when, and why this occurs is relevant but remains unaddressed when combining thoughts from the organisation design, power, task interdependence, and team interdependence literatures.

An important point made in the organisation design literature on the relationship between task interdependence and organisational actors is that the task interdependence that is designed, and the interdependence that is experienced are not necessarily equal (Kumar et al., 1995; Nickerson and Zenger, 2002; Puranam et al., 2012; Ramamoorthy & Flood, 2004; Sherman & Keller, 2011). In other words, teams may have different perceptions about the same task interdependence configuration. If differences in perception of a given task interdependence configuration arise, then one could ask: what would happen subsequently? Research to date has not addressed how different perceptions affect task interdependence. Do different perceptions of task interdependence matter at all for a given design or does the given design persist over time despite different perceptions thereof?

Social interdependence theory provides a useful framework for how differentiated perceptions of task interdependence lead to different interaction patterns between teams. The studies discussed in the previous chapter either directly or indirectly use social interdependence theory to explain whether, why and how individuals or teams perceive interdependence. They show how perceptions of cooperative goal structures lead to collaborative interaction patterns and outcomes as creativity, team effectiveness, and team performance. But they do not mention how these interactions impact the

development of the designed task interdependence. Langfred (2007) has reported teams to respond to situations of competition and conflict by redesigning their team structures and task interdependence. These findings have not been examined or reported in the social interdependence literature; i.e. do inter-team interaction patterns matter for the development of task, and social interdependence?

Furthermore, an underinvestigated matter is the notion of asymmetric social interdependence between teams in organisations; e.g. one team could perceive goals to be mutual, while the other team views could view them unrelated. What type of interaction is to be expected in such and similar configurations? Linking teams provide a useful example; linking teams are designed to integrate the activities of other teams towards the objectives of the corporation but other teams may be unwilling to interact or cooperate. The question “to what type of interaction patterns and outcomes would this type of asymmetric interdependence between linking teams and other teams lead?” is important and relevant to different strands of literature, viz. organisation design, task interdependence, and social interdependence.

To conclude the literature review, the present study sets out to examine the role of teams in the development of task interdependence, integrating therewith the literature streams of organisation design, task interdependence, and social interdependence because of the argument that there is a relationship between administrative and social forms of interdependence, and that this relationship is driven not only by exogenous and hierarchical factors, but also by collective agency on the level of teams. This leads to the research question “how and why do teams contribute to the development of task interdependence?” This question has elements of the process (how), drivers (why) and consequences (how) of task interdependence development and therefore, I adopted a multiple case study design which lends itself well to this type of research question and

has also been used to investigate similar phenomena (e.g. Galunic and Eisenhardt, 2001; Martin and Eisenhardt, 2010).

Finally, Brass and Burkhardt (1993: p. 442) state that “structure or behaviour is investigated as if it were unaffected by or unrelated to the other. We could not find any empirical intraorganisational research that tested both perspectives.” This study is in essence a treatise of the interaction between the organisation as a (structural) system and the organisation as the product of the social psychology of teams and their members. Hence, I seek to integrate these two meta-theoretical perspectives in this study because of the premise that both have their place and value in organisational life. This belief stems from a post-positivist stance elaborated in the next chapter, which goes into further detail concerning the epistemology and research method used to answer the research question.

3. METHODOLOGY

3.1. Overview

In the present chapter the foundations and technicalities of the multiple case study of how and why teams contribute to task interdependence is introduced. Task interdependence as an organisational phenomenon has mostly been examined using quantitative methods of inquiry belonging to positivism. While positivism is often associated with quantitative methods, it has also been propagated as an epistemological framework for qualitative methods (Eisenhardt; 1989; Yin, 2003). My research follows the latter tradition by using a multiple case study to examine the role of teams in the development of task interdependence in innovation systems. The rationale behind this is

that while interdependence is at the heart of organisation theory, there is hardly any empirical work regarding how and why interdependent teams influence task interdependence in organisations over time while “the team” as a unit of analysis is essentially the locus in which tasks are understood and performed. Hence, I aim to address this significant matter by looking at the process and reasons for the role of organisational teams in the development of task interdependence and these types of questions are typically answered using qualitative methods.

This chapter serves a threefold purpose. First, it addresses the ontological and epistemological foundations of the multiple case study approach. Second, it explains the decisions and reasons behind the method I have used in conducting this multiple case study. Third, it describes and explains the steps of the research process, viz. the design of the study, the setting in which the empirical research was done, the methods used to collect and analyse data, and on the procedures I adopted to countervail threats to reliability and validity.

3.2. Inductive logic in organisational research: ontological and epistemological considerations

Building theory from case studies is a research strategy which uses empirical evidence as the basis for creating theoretical constructs, propositions, and midrange theory (Eisenhardt, 1989). Case studies have been conducted from positivist (Yin, 1994) as well as from interpretive epistemological perspectives (Stake, 2006). Both camps have contributed significant methodological issues to be considered by organisational researchers (Benbasat et al., 1987; Corley & Gioia, 2011; Eisenhardt, 1991; Yin, 1994; Walsham, 1995; Cavaye, 1996; Darke et al., 1998; Nandhakumar & Jones, 1997; Klein & Myers, 1999). However, in organisational research the multiple case study method is

predominantly applied by proponents of the positivist school (e.g. Galunic & Eisenhardt, 2001; Kurkkio et al, 2011; Santos & Eisenhardt, 2005). An important driver for this has been the influence of Kathleen Eisenhardt who has greatly contributed to the acceptance of the multiple case study method as an appropriate means to building theory. The method she initially articulated in the highly cited Academy of Management Review paper from 1989 was a synthesis between grounded theory (Glaser & Strauss, 1967), positivistic case study research design (Yin, 2003), and analytical qualitative research methods (Miles & Huberman, 1984). This resulted in a rigorous approach to inductive theory building which treats cases as experiments while using observations in each subsequent case to test emerging theoretical propositions and structures, also referred to as replication logic. But while laboratory experiments isolate the phenomena from their context, multiple case studies emphasise the rich, real-world context in which the studied phenomena occur. Put differently, case studies differ from other positivistic research strategies in that they purposefully take contextual elements into account. Therefore, the multiple case study has particular utility when the understanding of contextual factors is essential to understanding the phenomenon embedded in them. For the present study, the organisational design in which teams are embedded is a central contextual element that is required to understand how and why teams shape the evolution of task interdependence.

The emphasis on close adherence to data and testing in a quasi-experimental manner in multiple case study research is rooted in a positivistic epistemology. Positivists argue that social phenomena should be perceived and conceptualised in a similar fashion as the natural world. Observation is what it all boils down to in the conviction that researchers are objective and distant from 'real' research objects, i.e. there is an objective world out there that is mind-independent and open to value- and context-free

tests and generalisations; a train of thought that stems from an empiricist ontology (Benton & Craib, 2001). The ultimate goal for positivists is to find causal mechanisms in the social world that are reliable and scientifically validated. These thoughts originate from the works of (a.o.) John Locke (1632-1704), a British empiricist who emphasised experience as the main source of knowledge and hence for him and his followers knowledge accumulation is solely possible through empirical observation.

An important reason for the prevalence of positivistic oriented multiple case study research is the way it connects to deductive quantitative research methods which have dominated organisational research for decades. Whether it is regression, simulation, or structural equation, the occurrence of deductive research outnumbers qualitative research by far (Miller & Tsang, 2010). Because multiple case study research inductively produces testable theory it hence complements deductive research. This compatibility with deductive research contributed to its acceptance in high impact journals such as the Academy of Management Journal, the Strategic Management Journal, and Organization Science. The following quote taken from Eisenhardt & Graebner (2007: p. 25) explains this complementarity:

“A major reason for the popularity and relevance of theory building from case studies is that it is one of the best (if not the best) of the bridges from rich qualitative evidence to mainstream deductive research. Its emphasis on developing constructs, measures, and testable theoretical propositions makes inductive case research consistent with the emphasis on testable theory within mainstream deductive research. In fact, inductive and deductive logics are mirrors of one another, with inductive theory building from cases producing new theory from data and deductive theory testing completing the cycle by using data to test theory. Moreover, since it is a theory-building approach that is

deeply embedded in rich empirical data, building theory from cases is likely to produce theory that is accurate, interesting, and testable. Thus, it is a natural complement to mainstream deductive research.”

The above reference to deduction and induction relates to the positivistic notion that researchers can transform observations into laws and statements (theory) through induction, or reduce laws and statements to observations to verify these (deduction). This premise originates from Moritz Schlick, a German philosopher, physicist and the founding father of logical positivism, who assembled a group of scholars in 1922 and gathered them in what is now known as the Vienna Circle to create a unity of science from three existing grand theories, namely: rationalism, empiricism and idealism (Friedman, 1999). Logical positivists pleaded for fundamental changes in the scientific world, one of which being that all laws and statements should be reducible to and verified by observations (deduction) and observations can be transformed into general laws and theories (induction). Karl Popper argued however that there are some problematic implications at the heart of logical positivism. Popper's contention in this matter was that it is not possible to have “pure” observational statements since observation is always theory laden, i.e. to observe something you already have to have some assumptions (theories) about what constitutes the object that should be observed (Van Willigenburg, 2008). He also referred to the problem of induction by arguing that one contradicting observation (e.g. ‘a black swan’ vs ‘all swans are white’) can falsify a theory or law. As a consequence, scientists minimise chances of falsification; hence they create statements with poor empirical content. Ultimately the aim of scientists, according to Popper, should be falsification and not verification.

3.3. Reflections on philosophy of science

Although the multiple case study method as developed by Eisenhardt (1989) is rooted in positivism, I do not consider myself a ‘pure’ positivist because of several reasons and critiques. First, in positivism there is an inevitable reliance upon untested assumptions because it is impossible to question all our beliefs at the same time. It is only possible to question some of our beliefs when holding these against other beliefs that are assumed (Polanyi 1962, cited in Miller and Tsang 2010, p. 143). Illustrative of the persistence with which social scientists attempt to encapsulate their practices in ways similar to natural scientists is Hannibal’s reply when he was told that it’s impossible to cross the French Alps by elephant: “*aut viam inveniam aut faciam*” (“I shall either find a way or make one”). Consequently, most positivistic studies aren’t able to provide conclusive evidence required for verification or refutation of theories without leaving space for other explanations.

Second, positivistic research often departs from an *exitus acta probat* viewpoint by adopting a research strategy that is aimed at verification or positive testing instead of putting equal effort into falsification (Klayman and Ha 1987, cited in Miller and Tsang p. 143). Journal review processes further stimulate this by preferring studies presenting theory-supporting results. Moreover, academics are appraised according to the number of publications so there is no incentive for following a protocol that is loyal to the philosophical underpinnings of empirical positivistic scientific inquiry based on falsifiability.

Third, positivism assumes an objective world which is why researchers look for facts defined in terms of specified correlations and associations among variables. Although my views are consistent with this in assuming that an objective, mind-independent

world exists, I also believe this world might not be readily understood and that many of the 'facts' or variable relations are at best probabilistic, not deterministic.

Fourth, positivists argue that value-free observations are possible and required in academic research because the researcher and the research subject are entirely independent of each other. I, however, am convinced that the theories I have studied, my personal and academic backgrounds, knowledge, and values can influence my research activities because it is not the case that my perception, interpretation, and creative thinking and writing processes consist of independently functioning layers which can be (de-)activated at any given point in time when value-free research needs to be conducted. Nonetheless, I do not disapprove of efforts to pursue or approach objectivity by identifying the potential effects of biases and reducing or removing these as much as possible in order realise a scientific portrait that comes close to the objective social world, but will never perfectly do so.

When I listed these similarities and differences between my own views and those of positivism I still discovered a place where I could find shelter which proved to be: 'post-positivism'. Post-positivism is a meta-theoretical perspective which critiques and adjusts positivism. This perspective was driven by the likes of Karl Popper and Thomas Kuhn, who systematically and thoroughly revealed a number of fundamental shortcomings of positivism. Thomas Kuhn for example in his book 'The Structure of Scientific Revolutions' refutes positivism by showing that science does not progress through the linear accumulation of knowledge but is strongly influenced by background views of the world which also need to shift in parallel or subsequence to the evidence presented by revolutionary research in order to bring about theoretical leaps. Post-positivism has seen an increased focus on qualitative methods which are emulated from positivistic methods (Miles and Huberman, 1984) but which are simultaneously used to

preserve contexts to address research questions where quantitative measurement is not possible. The grounded approach is an example. However, grounded approaches in post-positivism are different from uses of this approach in interpretive research. In post-positivistic research the approach is used to unravel relationships between variables while interpretive research seeks to understand differences and patterns in research participants' meanings (Gephart, 1999).

In sum, I adhere to post-positivism as the epistemology to study the role of teams in the development of task interdependence because I believe “organisations”, “teams”, “tasks”, and “interdependencies” are mind-independent organisational phenomena about which researchers can build theory using a multiple case study design. However, I also believe that organisational actors can perceive these phenomena in different ways because their values and preferences are not expected to be homogenous, despite their membership of the same firm. Therefore, I do not exclude the possibility that tasks and task interdependence can be ‘seen’ and experienced differently across teams in the firms I study. Similarly, I am aware that my own observations will be theory- and value-laden and shaped by my personal and academic preferences. Hence, the knowledge I gain and contribute by means of this study is not unchallengeable but instead fallible and it is likely that this knowledge for a considerable part will consist of conjectures. This emphasises the importance of future related research that builds on, justifies, or refutes my conclusions.

Finally, when embarking on a study aimed at theory building one can never know beforehand whether data will generate theory that is confirming, extending, or refuting existing theory but I have tried to keep an open mind throughout the research process; i.e. I did not restrict myself “theory-wise” by insisting on a specific type of contribution in a specific theoretical field. To illustrate this, initially this study was oriented toward

the role of agency in dynamic capabilities because that was the formal research question defined in the Marie Curie project I joined. As I started collecting data and initiated review of the literature, the role of teams (in lieu of individuals) became more prominent which drove me toward task interdependence and teams. As I spoke with more informants, I discovered that the way these organisations structured innovation tasks had a considerable impact on the experienced interdependence between teams and how these teams perceived and interacted with each other. This introduced the theory of social interdependence.

Having discussed the ontological and epistemological foundations of this study, the next section elaborates on decisions made pertaining to research design, research setting, data collection, and data analysis.

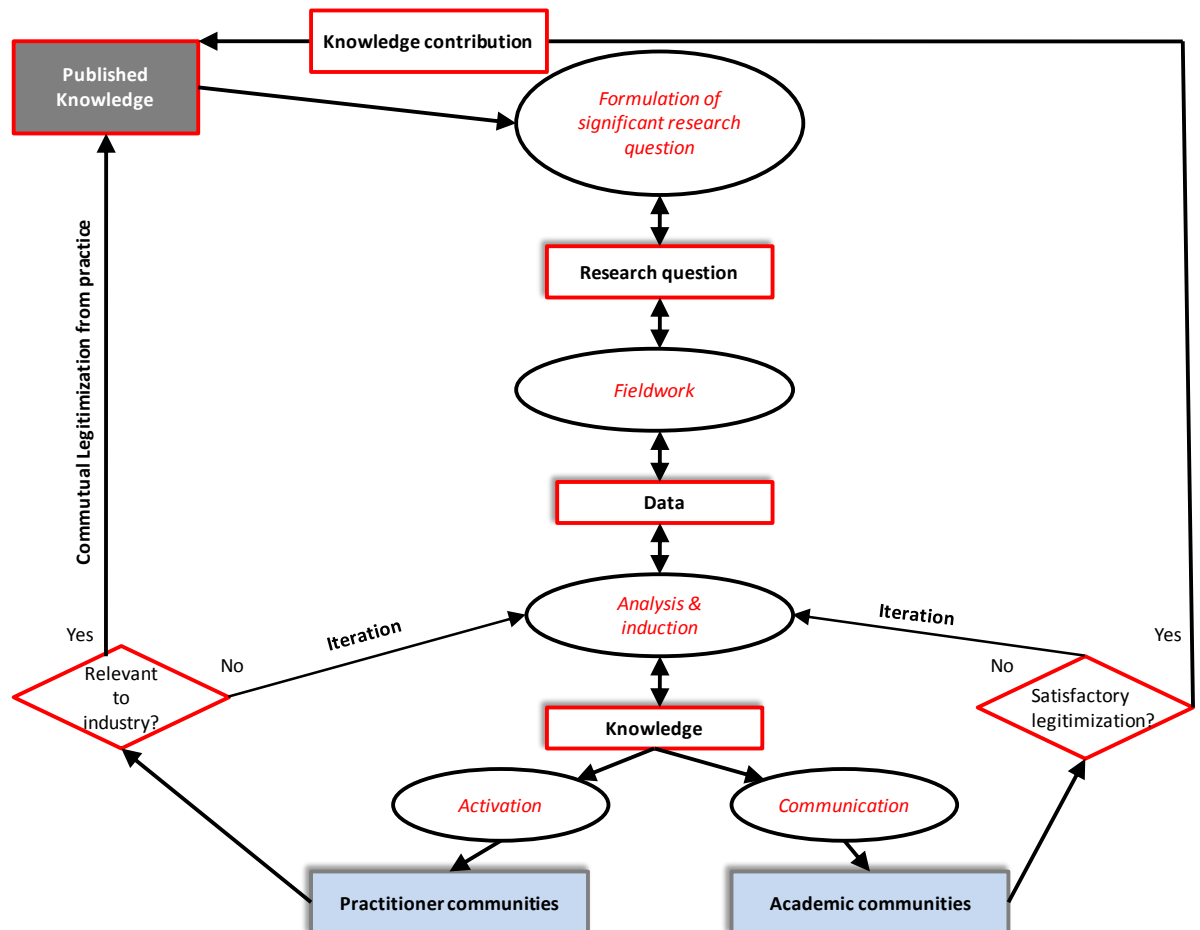
3.4. Method

Given limited theory about the role of teams in the development of task interdependence over time I chose inductive theory building using multiple cases (Miles & Huberman, 1984). The multiple case method is known as an effective instrument “to cut through idiosyncracies and unearth similarities across cases” (Siggelkow, 2007: 21). Moreover, this design allowed replication logic whereby I used each case to test emerging theory (Yin, 2003). Furthermore, using multiple cases enabled me to follow an iterative process whereby theory and data were juxtaposed to ensure theory is grounded in the data (Eisenhardt, 1989; Glaser & Strauss, 1967). In addition, it is suggested that investigating changes in organisation design requires “set-theoretic methods like qualitative comparative analysis” (Siggelkow, 2011: p. 1136). The following paragraphs describe the methodology – i.e. research design, research setting, research ethics, data collection, and data analysis - in more detail.

3.4.1. Research design

The design of the research process of this study constitutes of several iterative stages which are given in figure 3³ below. The explanation of the activities in figure 3 is given in subsequent paragraphs. It is important to consider that the last couple of stages preceding publication are ongoing. Regarding the activation of this research' findings in practitioner communities: I presented my findings to the management of two case firms. For these presentations I had to focus my findings on relevant strategic issues around managing innovation. For "Softy" (pseudonym), I presented to the CEO who was in the middle of restructuring the innovation process. My presentation to him revolved around the risks of introducing new innovation teams to coordinate other teams which were used to a certain level of autonomy and authority. The second firm to which I presented is "Plastica" (pseudonym). The director of Plastica's venturing organisation requested an analysis of how early stage ventures could be transferred to mainstream businesses. In my presentation to him and his colleagues I explained the importance of informal integration mechanisms to manage the interaction between venturing and mainstream teams. Presentations for the remaining two cases have not yet been scheduled.

³ Adapted from Avenier and Cabaija-Parmentier (2011)

Figure 3 : the research process

This dissertation is the outcome of a longitudinal study using data from four firms from 2002-2010. The real-time field study took 24 months in which I studied these firms' organisation design of task interdependence for managing innovation. I use pseudonyms for all four cases because three requested anonymity. Below, table 3 summarises characteristics of the sample firms, their innovation management teams, and the methods of data collection.

I looked at how these firms organised for innovation in terms of their product, service, and technology portfolio; i.e. a) which innovations tasks were created?; b) how were these divided among teams?; and c) how did the involved teams affect the

development of this configuration? The innovation context is particularly interesting because it concerns a business activity that is becoming increasingly strategic as it's moving itself next to more traditional functions as R&D, marketing, sales, and manufacturing. I expected the importance of innovation as a strategic activity as a selection criterion to lead to firms with explicit designs for organising for innovation and consequently, with a purposeful task interdependence configuration. However, considering the complexity and ambiguity in managing innovation I also expected different views and interpretations of how innovation should be managed among teams (Cyert & March, 1963); an intriguing setting considering the central research question. This setting is further explicated in the following paragraph.

Table 3: description of sample firms and case data

Attribute	Softy	PCtech	Reaction	Plastica
Research setting	The sales, operations, and R&D offices of a global mobile telecommunications and software provider.	The global business and technology services division of an I.T. developer and manufacturer.	The innovation division, R&D centres, marketing function, innovation project park, and three business divisions of a global chemical and material sciences firm.	The innovation division, R&D operations, and five business divisions of a global manufacturer of chemicals and materials.
Organisation design for innovation activities	Functional organisation: highly entrepreneurial and idea driven. Design, R&D and engineering geographically and functionally separated from marketing, business development, and sales.	Cellular organisation: decentralised, autonomous business units focusing on a corporate client.	Matrix organisation: innovation projects are selected from different divisions; a top 50 is selected each year which follows a stage gate process.	M-form: innovation activities are structurally separated from autonomous business divisions. R&D operations are separated from but work in close cooperation with divisions.
Task interdependence	Serial interdependence	Pooled interdependence	Pooled interdependence	Reciprocal interdependence
Corporate innovation goal	Be the most innovative firm in the industry in terms of technology	Be an innovation leader through client focused innovation	Become an innovation leader in the industry through open innovation	Support the mainstream divisions to be more innovative
Innovation management team (name, size, task description)	The “product team”: manages the innovation process for software and sales operations. Five members.	The “corporate innovation team”: supports innovation in service operations. Six members.	The “innovation program office”: supports innovation project teams. Six members.	The “technology group”: supports R&D teams. Eight members.
Data collection	Interviews (n=42), Archival documents, Observations (n=2)	Interviews (n=19), Archival documents	Interviews (n=20), Archival documents	Interviews (n=41), Archival documents, Observations (n=4)
Retrospective research	2002-2010	2005-2010	2007-2010	2006-2010
Real-time research	2010-2012			

3.4.2. Research setting

Research focused on four companies in two industries: the information technology industry (two cases) and the chemicals industry (two cases). This setting is appealing for numerous reasons. First, whereas innovation plays an obvious central role in information technology (Turban et al., 2008), the chemicals industry is also known for its consistent orientation toward technological innovation (Ahuja, 2000). Ergo, companies in these technology led industries will have purposefully defined an organisational structure to manage their innovation activities which provides possibilities for studying interdependence between innovation teams. Second, having two cases per industry provided an opportunity to select pairs of cases (i.e. same industry) and then to analyse the similarities and differences between each pair. The juxtaposition of seemingly similar cases for the purpose of finding differences is an effective tactic for crystallizing initial categories (Eisenhardt, 1989). Third, this multi-industry setting allows the investigation of different approaches to organisation design for managing innovation which I expected to benefit the external validity of my findings.

All four cases emphasised innovation as part of their corporate strategy and identity, but in different ways, and by setting different innovation goals. One important commonality however is that they all created a distinct type of linking team: “innovation management teams” (IMT) responsible for supporting other teams in managing their innovation activities. The IMT is central to this study as it proved to take a prominent position in the data. The analysis therefore focuses on the interdependence between the IMT and other teams in each case, how this interdependence changed over time, and the role of the IMT’s with respect to this change.

The typical composition of an IMT is one or two heads or managers, with a small team of five or six consultants. IMT's became an important cornerstone of this study because they represented the novelty and importance of innovation as a strategic activity to organisations. More specifically, because innovation as a firm level priority is still a nascent organisational discipline, the firms in our sample created IMT's to support the rest of the organisation in managing innovation. I will refer to the "rest of the organisation" as "business teams" because these teams are actually operationally involved in developing new products, services, and technologies whereas the IMT's support them in doing so. Examples of "business teams" in this study are: R&D units, product development units, software development units, sales units, and operational, client-centric units responsible for service delivery large corporate customers. In simple descriptions: "business teams" actually *do* innovation while IMT's *support* innovation. The cases varied in terms of the interdependencies between IMT's and business teams. In Figure 3.2 an overview is provided of the task interdependence configurations of the IMT's for each case vis-à-vis the business teams they support.

Figure 4: task interdependence configuration per case

	<p><u>Task interdependence SOFTY</u></p> <p>IMT –business teams = reciprocal</p> <p>Business team – business team = serial</p>
	<p><u>Task interdependence PCTECH</u></p> <p>IMT –business teams = dependence</p> <p>Business team – business team = pooled</p> <p>A = account</p>
	<p><u>Task interdependence REACTION</u></p> <p>IMT –business teams = dependence</p> <p>Business team – business team = pooled</p> <p>P = project team</p>
	<p><u>Task interdependence PLASTICA</u></p> <p>IMT –business teams = dependence</p> <p>Business team – business team = reciprocal</p>

Particularly useful to my empirical field research was the evolution of the initial configuration of task interdependence due to the efforts of IMT's, their interactions with top management (TMT), and with the business teams they had to support. This evolution provided the longitudinality needed to answer my research question. Moreover, each firm has a distinct organisational form which provided variety in the type of business teams that were supported. PCtech – a leading IT firm - for example has a cellular organisational structure with highly autonomous client-centric business units. Their IMT supported thousands of business teams in their innovation services to clients. Softy uses the functional form with five interdependent groups. Softy's IMT is particularly involved in coordinating the innovation process between software developers and sales managers. Matter designed their innovation activities in a matrix organisation structure in which their IMT has to support innovation projects. Finally, Plastica has the M-form (Chandler, 1962) in which large divisions define their innovation projects in conjunction with dedicated R&D centres. Here, the IMT assists the R&D centres in managing projects more efficiently with the help of a set of tools and process support. Furthermore, the four studied companies also varied in age, with founding dates extending from 1902 to 2002. The combination of different industries, varying organisational forms and ages is likely to enhance the robustness and generalisability of my results (Eisenhardt & Graebner, 2007).

Within each firm I investigated the organisation design for innovation, the teams involved in innovation, and inter-team interaction patterns. Subsequent to the pre-study, I commenced with an in-depth study of how innovation was organised in terms of goals and tasks; fundamental building blocks when studying task interdependence (Victor & Blackburn, 1987). This preliminary stage was primarily informed by interviews with executives because I expected them to be strongly aware of what, how, and why

decisions regarding the given design were made. Subsequently, I focused on innovation teams in terms of their structure, role, and positioning in the organisation. After the identification of the teams and individuals involved in innovation I examined inter-team interaction patterns by asking informants questions about a) inter-team perceptions in terms of importance and relevance to innovation; and b) how they interacted with members from other teams and how they perceived this interaction. Interaction is defined as “teams’ simultaneous or sequential actions that affect the immediate and future outcomes of the respective teams involved in a particular situation” (Johnson & Johnson, 2005). This led me to identify three interaction patterns: cooperative patterns, competitive pattern, and influence tactics. The longitudinal design of this research further enabled me to follow the development of these interactions patterns and how they related to the transition of the initial task interdependence configuration into an evolved state with differences across a set of dimensions which I will elaborate in the findings chapter.

To sum up, the four selected cases are active in the technology led I.T. and chemicals industries. All four pursue innovation as a strategic priority. Innovation management teams (IMT) are a central and common feature of the sample firms’ organisation design for innovation. IMT’s are small teams, created to support operational teams (“business teams”) in managing their innovation activities. The interdependencies between IMT’s and business teams differ across cases as represented by figure 3.2. The means and processes by which I collected data from the sample firms are given next.

3.4.3. Research ethics

Before starting data collection this study went through a research ethics assessment conducted by the University of Leeds Ethics Committee. My application to conduct field research was approved by this committee in June 2011. In the preceding assessment a number of elements of the empirical stage of this study were evaluated. First, attention was paid to how informants were approached. The ethics protocol required participants to be given some information about the research to help them decide whether they want to take part. Also, before each interview informants were told that they could ask questions before and during the interview and they were told that they were allowed to leave the interview at any point in time over the course of the interview. Second, the integrity of informants was protected during this study by concealing their identity, especially when using ‘sensitive’ quotes; i.e. statements that could be harmful to a given informant when made public. Third, data had to be stored on a device other than a mobile device (e.g. laptop, tablet, mobile phone) and access had to be secured to prevent data loss. Fourth, any manuscript intended for publication had to be approved by lead informants who were assigned responsibility by their employers for managing the research done in their companies. Finally, I followed an ‘academic integrity’ course given by the University of Leeds ‘Staff and Departmental Development Unit’ to learn about academic authorship, practices of referencing, and issues pertaining to plagiarism.

3.4.4. Data Collection

For the purpose of data collection I drew upon the following set of data sources: in-person interviews, telephone conversations, e-mails, archival data, internal documents

(press releases, websites, news articles), and observations. The variety of data sources enabled triangulation for the purpose of reducing interviewee bias, increasing the validity of findings, and enhancing the robustness of emerging theory (Jick, 1979). Yin (1994) argues that the convergent use of multiple data sources is essential to case studies because researchers have to cope with the technically distinctive situation in which there are more variables of interest than data points.

My primary data source was semistructured interviews because a fundamental part of this research pertains to interaction patterns which can rarely be found in any official document. I was able to conduct 122 interviews with 101 individuals over a period of 24 months. As depicted by figure 3, in addition to my multiple case study, I conducted another study in the early stages of this research project during which I interviewed seven executives and managers from a set of companies which emphasised the importance of innovation on their websites. From the approximately fifteen individuals I contacted, seven agreed to participate in an interview. This study was important because it allowed me to explore my existing theoretical interests with innovation practitioners and which would increase the potential relevance of my study. Table 4 below shows the companies, the departments to which informants belonged, and the number of interviews.

These executives confirmed the importance of having an appropriate organisation design for managing innovation activities. They also revealed variance in how their firms organised for innovation and how different teams were created to build this “innovation organisation”. Moreover, the challenges of managing interdependence between innovation teams and mainstream business teams was an issue expressed by interviewees from Alcatel-Lucent, Philips, Royal DSM, Fujifilm and Air Liquide. The themes of organisation design, innovation teams, and interdependence increased my

confidence in examining these issues in more detail in the four central cases of this study. I selected the four central cases using theoretical sampling (Eisenhardt, 1989) because the aim of this study is to build theory based on a broad, significant research question. The gathering of “objects of study” for multiple case study research does not represent a sample in the statistical sense of the word even if it concerns a large sample.

Table 4: departments and companies in “executive study”

Department	Company	No. of interviews
Bell Labs	Alcatel-Lucent	2
Business development	Chemelot Innovation Park	1
Research	IBM	1
Innovation Centre	Royal DSM	1
Group Innovation	Philips	1
New Business Development	Fujifilm	1
International Development	Air Liquide France	1
	Total	8

3.4.5 Unit of analysis

Following the theoretical argumentation given in the previous two chapters, the unit of analysis in this study is ‘inter-team’; i.e. task interdependence, social interdependence, and interaction patterns are studied as an inter-team phenomena within a given firm-level organisation design as the context within which these phenomena manifest (Eisenhardt and Graebner, 2007). Contemporary organisation designs consist of dynamic and heterogeneous communities characterised by team-based structures (Miles et al., 1997; Baer et al., 2010). These teams are highly specialised, have distinctive professional identities (Hogg & Terry, 2000; Huy, 2011; Weick and Roberts, 1993), and possess a collective agency beyond the simple conceptualisation of ‘teams are created to

execute tasks'. Deriving from these studies I infer that a team acts and interacts with other teams as a collective whole and I therefore argue that the phenomena studied in this research should be studied as inter-team level phenomena.

Having adopted this theoretical lens I approached data collection by focusing on informants' team membership and their position, tasks, and objectives relative to other teams. Examples of questions asked are:

- Are you dependent on other teams for performing your tasks? If yes: which teams?
- How do you as a team member reflect on the organisational structure?
- Has this structure changed or will it change and why?
- How did it change and which teams were involved? Why were they involved?

After having established the position of the team in the organisation design and the configuration of task interdependence I then probed into social interdependence and interaction patterns by asking questions as:

- With which teams do you usually interact, why, and how?
- What is the nature of this interaction and why?

The data retrieved from this was analysed accordingly, i.e. I categorised informants into teams and analysed their feedback as the feedback of the team to which they belonged. I also used organisation charts from the cases to study how inter-team task interdependence was designed, how it subsequently played out in how different teams interacted, and how it evolved. Thus, the inter-team level perspective was consistently adhered to throughout data collection and analysis.

A sample as used within multiple case study research is composed based on theoretical rationale with the purpose of producing theoretical statements instead of

generalisations to populations or universes (Yin, 2003). The sample firms of the present study had to meet the following theory driven criteria:

- (i) Innovation is a core capability and priority in corporate strategy.
- (ii) There is a purposeful organisation design for managing innovation.
- (iii) There should be variety in organisation designs and the teams they accommodate among the cases selected.

After the selection of the four organisations given in table 3, I identified numerous knowledgeable informants who addressed and experienced the focal phenomena from diverse perspectives (Eisenhardt and Graebner, 2007). Adhering to the purposive sampling strategy (Patton, 1990) I commenced with top management to retrieve data on their organisational design for managing innovation. After I discovered which teams were involved in innovation I started interviewing individuals from the IMT's and some of the business teams they supported; both the head of each team and the members. Subsequently I turned to snowball sampling (Patton, 2002), relying therewith on suggestions by interviewees regarding other individuals or teams I should speak to considering my research interest. These suggestions were implicit at times when interviewees explained they were on less positive terms with other teams which of course motivated me to incorporate "the other side's" accounts for a more complete and valid story. For the interviews I followed a protocol with a minimal set of theoretically relevant questions to structure dialogue and enhance the comparability between interviews (Dutton and Dukerich, 1991). A concise version of the interview protocol is given in table 5.

Table 5: interview protocol

THEMES	ILLUSTRATIVE QUESTIONS
Importance of innovation	<ul style="list-style-type: none"> • How central is innovation in your company? • What is your innovation strategy and related goals?
Organisational design for managing innovation	<ul style="list-style-type: none"> • Please explain your organisational structure for innovation. • Has this structure changed or will it change and why? • Which teams are involved in innovation and what are their roles?
Interdependence	<ul style="list-style-type: none"> • Are you dependent on other teams for performing your tasks? If yes: which teams? • How do you as an innovation team member reflect on the organisational structure? • Has this structure changed or will it change and why? • How did it change and which teams were involved? Why were they involved?
Interaction	<ul style="list-style-type: none"> • With which teams do you usually interact, why, and how? • What is the nature of this interaction, why? (positive, negative)

Due to the theoretical distinction between different hierarchical layers and their respective roles in the design and development of task interdependence, I commenced interviewing executives by asking them questions around the importance of innovation; their respective role in innovation; and how they translated this into an organisational design. These conversations offered insights in both the TMT involvement and the task interdependence configuration underlying their organisation design. Data collection then transited to the teams performing innovation tasks. I discussed with individuals in these teams their role in innovation, the exact activities they performed, what their perception was of the chosen organisational design for innovation, and how they interacted with other teams.

In addition, I asked whether and how the current structure had evolved from the previous configuration and whether they had any part in this development to provide chronology to the data, an essential question considering my interest in the evolution of task interdependence. Interviews lasted between 45 minutes and two and a half hours and were all but two, tape recorded and transcribed because of objections by those two interviewees against the recording of their feedback. An example of an interview transcription is given in the appendix.

To mitigate the risk of potentially biased accounts I followed a data collection protocol. First, I interviewed individuals on different hierarchical layers and from different parts of the firm (Golden, 1992; Miller et al., 1997). Second, I also spoke with 3rd parties (innovation partners, technology providers) to ask them whether they perceived things in a similar way as internal informants. Third, I confronted my informants with factual events found in internal and external archival data. Thus, my epistemological approach was to understand the perceptions and conceptualisations of informants, while making sure that those interpretations had substantively informed behaviours and were not just a product of retrospective impression management. Informants usually agreed about the facts and events. But they often also disclosed complementary or even contradictory information; the latter was occasionally preceded by asking me whether I signed a non-disclosure agreement. Fourth, anonymity was requested and provided to informants to allow them to speak freely about any sensitive issues regarding for example their disagreement with TMT decisions, the disclosure of contradictory information vis-à-vis archival data, or their disliking of having to work with a given team. Fifth, I probed during interviews for specific instances or projects in which factual events occurred which illustrated the informant's feedback. Sixth, archival data provided by the informants was used to study formal innovation structures,

processes, and modes of communication to compare these with the interview accounts. Admittedly (but expectedly), archival data were not highly informative regarding the inter-team interaction patterns but they did however elucidate valuable content on the innovation strategy and the organisation design for managing innovation.

Finally, I made use of observations to compare these interview data to increase internal validity. My observation tactic was to focus on how each case's organisational design was understood by organisational actors and this understanding led to distinct patterns of interaction between members IMT's, business teams, and executives. The opportunity to observe provided useful means to triangulation. For example, at Plastica I was invited to an innovation event where early stage ideas were pitched to executives to secure funding for the next reporting period. At this event representatives from different divisions were present who commented on a sequence of presentations and pitches. During these interactions I observed the tension between Plastica's IMT and some of the divisional representatives who were cynical regarding the proposed framework for managing innovation; which also became apparent through the interviews. I also received a desk to work from, from Plastica's "innovation office" in the Netherlands where I was able to observe and interview employees from Plastica's IMT, R&D units, and employees of several divisions. This was particularly useful because this desk remained available to me for a period of three months during which I had a series of discussions with the IMT's head. It also provided the opportunity to follow a series of conversations between him and the Executive Vice President of the entire technology and R&D operations during which the IMT's head attempted to change and sustain parts of the organisation design in favour of his team.

A second example is Softy. Softy allowed me to attend a workshop organised for the introduction of a new product which was attended by staff from software development

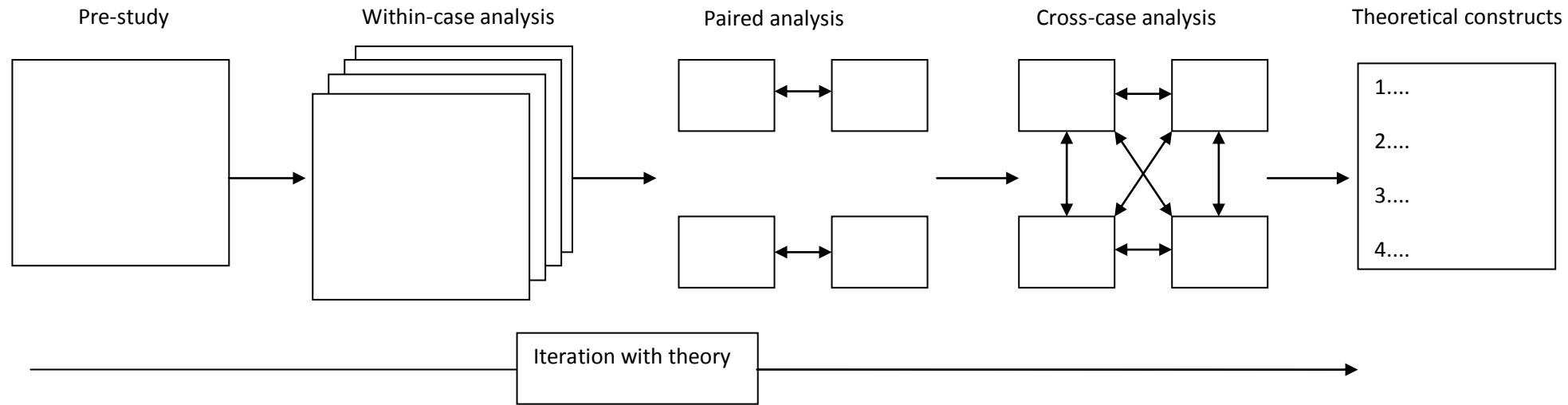
and sales, and two executives. Moreover, I spent two weeks working from two of the company's offices which allowed me to study day-to-day interaction and practices. This visit confirmed the tensions between Softy's IMT, the software teams, and sales teams. Last, I attended product demonstrations in which software engineers explained the specifications of a new design, how it was utilised to win a competitive bid, and how it was implemented in a current project. The observations at Softy confirmed how different teams were competing where they should cooperate. They also revealed how the IMT struggled with managing one particular group of three teams; the software engineers, who kept operating autonomously despite the instructions of the IMT.

3.4.6. Data analysis

Data analysis enveloped five distinct stages as illustrated by figure 3.3. In following prescriptions for inductive theory building by means of multiple cases I had no a priori hypotheses (Strauss & Corbin, 1990; Eisenhardt & Graebner, 2007). In adhering to an iterative process I included data analysis early on in the data collection stage by recording interviews of contact summary forms directly after each interview (Miles & Huberman, 1984). The contact summary form structure is available in the appendix. These forms facilitated early analysis and guided the data collection process. Each contact summary form included the following post-interview questions:

- a) Are there specific things that you would like to learn at this contact?
- b) Who were the actors present at the contact?
- c) What were the main issues or themes that struck you in this contact?
- d) Were there specific issues that you picked up from your observations that you might want to explore further at next contact?

Shortly after each interview the recording was transcribed into a Microsoft Word document. These documents, together with the contact summary forms, were loaded into Nvivo8, a software package for supporting qualitative data analysis. Nvivo8 allowed a structured and systematic data entry, data query, and data analysis process. I used tree nodes as 3rd order codes, with underlying codes as second and first order. While some of the codes ended up in the theoretical model I inductively generated, other codes served to inform the context or background of each case. Screen captures of the Nvivo8 node structure are given in appendix C. Furthermore, a more detailed description of the coding process including examples is given in appendix D.

Figure 5: the data analysis process

After data 24 months of data collection I continued analysis with an in-depth examination of each individual case by triangulating data and using the research question as a navigation instrument (Jick, 1979). This stage resulted in high level themes which were evaluated and discussed against earlier categories to stimulate objective, independent views of the “constructs, relationships, and longitudinal patterns within each case and with respect to my research question” (Santos & Eisenhardt, 2009). “Structure of innovation tasks” is an example of an initial theme which later developed into the aggregate construct of “design decisions”.

I then grouped the cases per industry to look for differences beyond these initial impressions. From this juxtaposition of same-industry cases I derived categories in which they were either similar or different (Eisenhardt, 1989). Next, these categories were used for cross-industry, cross-case analysis to replicate and elaborate categories using each firm as a case. This way I was able to build an overarching theoretical frame comprised of aggregate constructs with each part of the theory being demonstrated by evidence from at least some of the cases. “Interaction patterns” for example emerged as a category in this phase of analysis which also drove the continuing literature review in the direction of social interdependence theory. The addition of more cases and variation among pairs was done for the purpose of more robust theoretical concepts and causal relations. Any irregularities, contrast, contradictions, or replication in emergent theory was recorded and examined in more depth by going back to the data to probe for alternative explanations that better fit data than the initial themes. Furthermore, tables and figures were effective data display tools in serving the purpose of refinement and elaboration (Miles & Huberman, 1994). I present these tables and figures in the findings chapter. Finally, I maintained a process of interweaving theory generation, data analysis, and literature review to further detail my findings and validate my

contribution. This ultimately resulted in a theoretical model of how teams influence the evolution of task interdependence.

4. FINDINGS

The present chapter reports the findings of the four cases of this study. While in single case studies the story behind the data is emphasised, in a multiple case study the conceptual structure is used as a guiding frame for the overall purpose of theory building to prevent the theory from going lost and the text from ballooning (Eisenhardt and Graebner, 2007). This chapter is therefore divided in sections representing this structure with three major constructs: task design decisions, social interdependence, and interaction patterns. It is through the relationships within and between these constructs that the overarching research question is answered – i.e. how and why do teams shape the development of task interdependence?

Each theoretical construct is supported with evidence from at least some of the cases. Cases are sequentially reported and juxtaposed to highlight similarities or present contrasting evidence relevant for the emerging theory. Relevant evidence is brought forward to support theoretical inferences throughout the text as the process of task interdependence development is described. Furthermore, at the end of each section in this chapter a concise theoretical summary is provided to shed light on the events and relationships previously discussed in that particular section. A more detailed discussion follows in the next chapter.

Finally, this chapter contains a set of tables which summarise the evidence for each theoretical construct; present the definition of constructs; and describe how they manifested in each case. More specifically the tables in this chapter show the initial task interdependence and the configuration of the IMT's (tables 6 and 7); the consequences of this configuration for social interdependence between teams in each case (tables 8

and 9); how the IMT's responded to task and social interdependence (tables 10 and 11); and the consequences of these responses on task interdependence and the configuration of the IMT's (tables 12 and 13). Admittedly, organising the findings around the theory and summarising evidence in tables could be disappointing to readers expecting rich and detailed stories but the objective of this multiple case study is indeed theory development and therefore, the format of this study coheres with studies adopting a similar research design (e.g. Galunic and Eisenhardt, 2001; Martin and Eisenhardt, 2010; Santos and Eisenhardt, 2009).

Next, a summary of the findings is provided. Subsequently, I report the evidence around the design features of the IMT's and the consequent task interdependence between them and other teams. This is followed by the sections showing and explaining the implications of the initial design on the social interdependence between the IMT's and other teams. The final section of this chapter reveals the implications of social interdependence on how IMT's interacted with other teams. Furthermore, this section also shows how some IMT's influenced other teams to shape task and social interdependence.

4.1. Overview

My data suggest that task interdependence develops through the perceptions of and interactions between teams on different levels in the organization. Whereas companies' top management teams (TMT) establish a purposeful design for managing and structuring a specific strategic activity such as innovation, I find this configuration is not maintained for a longer period of time. Data shows namely that teams harbour perceptions of what the configuration of interdependence (design) should be and based

on either consonance or dissonance between their desired and the actual configuration, different perceptions arise of the latter. Positive perceptions take form when teams perceive a given task design to suggest the goals between teams to be mutually related; negative perceptions emerge when teams perceive their goals to be incompatible; and ‘individualistic’ perceptions arise when teams perceive their goals to be unrelated.

Inter-team perceptions of goal structures shape the ways in which teams interact. Positive perceptions lead of task interdependence lead to cooperative interaction patterns, negative perceptions to competitive interaction patterns or influence tactics; and individualistic perceptions lead to avoiding interaction and influence tactics. I observed that over time, these interaction patterns can lead to subtle changes in the initial task design. That is, task interdependence unfolds as both an “architectural” – i.e. by top-down design - and an interactive – i.e. by inter-team perception - process.

Data indicate that task interdependence develops through three main drivers: design decisions; perceived interdependence; and interaction patterns between teams. First, design decisions made by the TMT regarding the division of tasks and the creation of teams to fulfil these tasks give shape to an innovation organization. A central common feature across cases was the establishment of an “Innovation Management Team” (IMT) responsible for supporting “business teams” in developing new products, services, and technologies. These teams function as linking teams in innovation systems to support and coordinate innovation activities across other teams, which links to structural linking and integration. The second driver includes the subsequent *perceived* social interdependence as experienced between the IMT and business teams. More specifically, teams perceived the suggested task interdependence to be either *positive* when a positive correlation among teams’ goal attainments was perceived; *negative* when a negative correlation was perceived; or *individualistic* when teams perceived

their goals to be unrelated to each other. Third, teams engaged in patterns of interaction based on their perceptions of interdependence. We find that positive perceptions lead to cooperative patterns; negative perceptions to competitive patterns and influence tactics; and perceived individualistic interdependence to lead to influence tactics.

Underlying these processes, data reveal remarkable attention to the role of social identity in driving task interdependence. Several teams in all our cases attempted to maintain positive social identity. This profound social stimulator manipulated how teams perceived their task environment and the teams associated with it. Examples and more detailed descriptions of all of the above are given in the next paragraphs.

4.2 Task Design Decisions

“Innovation is a team sport, it’s not done by the management; it’s done by the team.”

[PCtech account manager]

In order to manage and structure innovation as a strategic task, TMT’s decide on a specific task design. This can take on a considerable level of complexity because innovation capability consists of a set of sub-capabilities, inter alia: R&D, technology commercialisation, product design, manufacturing which are represented by a range of “business teams”. To deal with this complexity of managing innovation TMT’s create “innovation management teams” (IMT); initially to support the different business teams but as I will demonstrate in later section; to manage the innovation process for and with them. The IMT’s are configured in different ways across the cases but they can be characterised as small teams with five to ten team members. Team members are usually (internal) management consultants who operate between top management and the rest of

the innovation organisation, attempting to promote methodologies, software based tools, and corporate frameworks for creating and managing innovation portfolios and projects. They often refer to themselves as “innovation enablers” i.e. they enable business teams to innovate.

Sample firms varied in the ways they designed IMT’s in terms of a number of dimensions. From the data I inductively arrived at three dimensions which characterize IMT’s; namely: *task*, *scope*, and *authority*. Table 6 provides an overview of these dimensions per case as they were designed at the *formation phase*.

Table 6: innovation management team design attributes at the formation phase

Firm	IMT name	Task		Scope			Authority	
		Support	Manage	Peripheral	Divisional	Corporate	Optional	Enforced
Softy	Product Group		•			•		•
PCtech	Corporate Innovation	•			•		•	
Reaction	Innovation Program Office	•			•		•	
Plastica Group	Technology Group	•		•			•	

‘Task’ is defined as whether the IMT had to *support* or *manage* innovation in business teams. First, support consisted of knowledge, networks, and resources but did not directly impose a hierarchical structure between the IMT’s and business teams, mainly because support was optional as will be explicated shortly. However, Softy’s IMT which was given the task to manage the innovation process in business teams implied a hierarchical structure in which the IMT determined aspects of how innovation tasks are carried out. Second, ‘scope’ relates to the reach of the IMT’s activities; i.e. whether they operate on *peripheral* (i.e. local; e.g. departmental or project level), *divisional*, or

corporate level in the organization. Finally, ‘authority’ indicates whether business teams are *enforced* by the TMT to accept the support offered by the IMT or whether this support is *optional*. ‘Optional’ relates to whether teams have a choice of cooperating with an IMT or whether this is made compulsory by design with for example top management backing. In Figure 3.2 of the previous chapter an overview is provided of the task interdependence configurations of the IMT’s of each case vis-à-vis the business teams they support. Next, I present examples of design decisions in several case firms.

PCtech is a first example. PCtech is the service division of a global information technology hardware and software firm, one of the pioneers in the I.T. industry. The service division was acquired in 2005 and the IMT originates from the acquired firm. PCtech’s top management team (TMT) saw potential in the IMT and decided to keep it post acquisition in the new organisation. PCtech’s IMT is named the “corporate innovation team” whose task is to support the innovation process in the business “accounts” of their highly decentralised cellular organisational form; an organic structure (Burns and Stalker, 1961). Accounts are thousands of autonomous business units organised around a single client (business or government). For example PCtech’s Microsoft account consists of approximately 100 people who work closely with Microsoft around cloud technology services. All of the innovation carried out in this account is open to management support by PCtech’s IMT.

Initially, the offered support by the IMT revolved around process support or access to companywide resources. Examples of support are innovation management tools (software based, process templates for managing parts of the innovation process) or assisting accounts get in touch with specific R&D expertise for a particular problem:

“Our proposition is a set of packaged innovation solutions, processes, tools and resources modelled on, and complimentary, to PCtech’s Enterprise Innovation approach, and is designed to enable enterprise customers [accounts] to achieve their strategic intent by exploiting their innovation potential.” (Taken from an internal PowerPoint presentation by the IMT’s head)

In 2005, PCtech’s IMT started with four individuals, all of which were consultants coming from different professional backgrounds in the domain of information technology. The team later recruited two software engineers in May 2007 to develop innovation tools without going through the time-consuming formal corporate process for developing new corporate software. The team is led by a director positioned at middle management level and he and the four consultants directly engage with the accounts. Initially, the IMT’s scope was one particular division of PCtech’s operations: Europe, Middle-East, and Asia (EMEA). Within this division they targeted more than 500 accounts and were given the formal goal of maximising the number of supported accounts. This implied the IMT depended on cooperation with the accounts to achieve this goal. Moreover, the IMT attempted to develop itself and gain exposure in the new organisation as explained by the IMT’s head:

“The thing is, effectively what we have now is an unequalled view from an intelligent organisational perspective. What we sort of need to do from an innovation perspective: if you think about it, thousands of accounts within client engagement, strategic initiatives with money behind it. On one level, it’s just like a normal program but on another level, what it could be is freaking huge, enormous. If we’re empowered to do more with it, it’s going to be pretty big.”

The last part of the quote contains the word “empowered” which implies that the IMT cannot independently enhance its position without the support of top management as will become apparent in a later paragraph. Authority wise, the IMT was an optional source of support for accounts; i.e. although the IMT needed the accounts to perform its tasks and fulfil its goal, this was not vice versa. Thus, albeit the IMT had a formal goal to maximise the number of supported accounts; the accounts did not have to work with them as one of the IMT consultants explained: “It was really difficult. Sometimes we would have people tell us “well, who are you to tell me what’s the best way to do this?”” This meant the IMT had to put in considerable effort to prove the value of the support they offered because although PCtech’s executives had created the IMT in their organisation design for innovation, they did not go all the way to enforce its authority to accounts. Moreover, dealing with large accounts sometimes reaching to multiple billion dollars of revenues is not an easy task for a relatively small team operating at middle management level. Ergo, PCtech’s IMT had to creatively deal with this challenge as I will elaborate in the paragraph on interaction patterns.

Reaction, another sample firm, is a second example. Reaction’s IMT operates in a matrix organisation where cross-functional innovation projects run through eight large divisions. Innovation is a strategic priority for Reaction’s top management team as a member of the management board explained:

“Innovation is high on the agenda of the management board. We review regularly the sales created by our innovation programs and the progress of the BGs [divisions] as they appear in the innovation reports. We focus on specific innovation projects in our

quarterly meetings with BG directors. We also sit on the board of our corporate venturing units.” [Member of the Management Board]

Albeit innovation was under the management attention of the top management team it remained a challenge to stimulate innovation in Reaction’s organisation consisting of eight powerful divisions (“business groups”). In order to facilitate and support innovation in the divisions the top management team formed an innovation management team called the “Innovation Program Office”. One of Reaction’s executives commented on the creation of their IMT: “We appointed a small group of people to do innovation excellence; a sort of operational excellence or manufacturing excellence but then for innovation.” Another executive referred to the IMT as a “group of high quality consultants”. The IMT was led by an experienced business manager and was given multiple goals by the Chief Innovation Officer (CIO): (1) help the CIO monitor innovation, (2) collect and disseminate best practices, (3) launch improvement programs, (4) support the business groups’ innovation initiatives, (5) assist the business groups in addressing and planning their innovation growth targets and (6) support the organisation to make people available to work on innovation projects.

Reaction’s executives formed a steering organization called “the innovation board” where top managers from each division sit. On a yearly basis this committee selects the top 50 innovation projects in Reaction’s European operations from a population of hundreds of projects. It is these top 50 projects that are eligible for support; i.e. the scope of Reaction’s IMT. During my field study I observed that the assistance mainly included management support to accelerate projects through the innovation project lifecycle: e.g. innovation management tools; business model generation workshops; and possibilities to connect project teams with different kinds of expertise in Reaction’s

large organisation. One of the IMT team members commented on their general objective as: “We support the divisions to innovate in every way you could possibly think. We work to directly help accelerate the 50 innovation projects that have been identified.” [IMT consultant]

Reaction’s IMT consists of six individuals; four consultants, a manager, and a director. Their performance is assessed based on two targets: a) maximise the number of supported innovation projects and b) to have an average customer – i.e. project team - satisfaction score of at least 4. The supported project teams fill out questionnaires after workshops to rate the quality of the workshop. Executives decided that the score should be at least an average of 4 on a scale of 5. Hence, similarly to PCtech, the IMT *depends* on the project teams for attainment of its goals. Although the top 50 eligible innovation projects were assigned to the IMT on a yearly basis, the IMT’s authority was not enforced; hence efforts had to be made to convince project teams of the benefits of working with them. This proved similarly challenging as illustrated by this IMT manager:

“We got a cartoon, very funny. It shows the Middle Ages and you see a whole army of knights, a lot of knights. On the other side you see three small knights, those are the good guys. Next to them you see two men, one of which is tapping one of the good guy knights on the shoulder whilst making him aware that he’s got a machine gun. The knight who’s being tapped on the shoulder says: “Not now!” This is how we often feel.”

Although all sample firms created IMT’s, there is variance in how top management design decisions determined the IMT’s structure. Softy is an example. Softy is a

producer of information technology in the telecommunications industry. Innovation is the primary source of Softy's competitive advantage and their CEO kept emphasising the importance of innovation to maintain their industry leader position:

“We're always listening because that's part of our daily bread and butter, but we have our own view of how we will continue to set the agenda for our marketplace. But you're right, we need to listen and say, have they suddenly come up with a new cherry that we haven't thought of? So, we are listening, but we have not heard it so far. The thing that we've heard and it's exactly the same about pricing, we have beaten our competitors to the point to where they are pricing at ridiculous levels.” [CEO Softy]

Softy operates in the telecommunications sector where technological innovation is key to survival and success (Porter & Stern, 2001). “To say that an organisation has a capability means only that it has reached some minimum level of functionality that permits repeated, reliable performance of a capability” (Helfat and Peteraf, 2003: 999). The repeated development of breakthrough technology enabled Softy to win competitive bids over time against other corporations such as Nokia-Siemens and Cisco. Significant patent awarded technological innovations were developed to gain entrance to the transportation sector where the company could apply its technology. Thenceforth, the firm developed its technology into additional fields within the transportation sector such as media services, technological infrastructure, on-board equipment, and data management. Despite a pivotal role given to innovation, the company did not assign ownership of innovation to a formal unit. Softy has a lot of entrepreneurial initiatives and innovation activities in different teams were not always aligned. The innovation teams aggregated into two main groups; one group focusing on the technical aspects of

software development (R&D; I.P. development) and another group focusing on the commercial aspects of innovation (commercialisation; business & product development; technology scouting/sourcing). Because of the lack of alignment between innovation activities it occasionally occurred that two similar ideas were initiated simultaneously in different parts of the organization without anyone being aware of it until much later in the project lifecycle. This created a need within the firm for a more central corporate approach to managing innovation. Therefore, Softy's 5-member IMT was formed by top management to manage the innovation process for all global business teams involved in innovation activities.

Softy's IMT the "Product Group" was created to streamline activities into a new innovation process which was enforced by design. This implied that in the technical group software engineers were no longer allowed to innovate in areas they deemed right for the company because the IMT became responsible for defining product innovation areas. Furthermore, business staff was only allowed to sell new products if they originated from any of these product innovation areas whereas in the past they were free to develop and sell any innovative concept. A reference to the design behind the IMT from the Chief Commercial Officer:

"The product area is defined, it should be saying, these are the things that customers will want or do want. You R&D team go and develop them or whatever, and then once they're developed, the product group says: "Okay, right. Now I'm going to create a nice little document or book just to give the sales guy so that now, for the first time, you will actually go out and know precisely what it is we could do and what you should sell as opposed to making it up as you go along" which is what sales guys do because they want to win deals - they're creative and they're very innovative."

The IMT received three goals from its top management: a) create and devise a central innovation methodology which business teams must adhere to; b) develop product innovation requirements which can be investigated and developed by the technical teams and; c) integrate innovation initiatives into a product innovation portfolio and codify this into a document which the business teams can use to win contracts with either existing or new customers. The overarching task connecting these goals is coordination. This is an important difference with the IMT's in the other cases which were given the task to support business teams. Furthermore, Softy's IMT was enforced by design whereas the other IMT's services were optional to use for business teams. IMT also differed in terms of scope. Plastica is a useful example to illustrate this.

Plastica is a multinational corporation in the materials and chemicals industry. It consists of six divisions, each headed by an Executive Vice President. These six divisions produce a range of products which can be categorised into four product lines: Chemicals, Plastics, Fertilizers, and Materials. Each division has its dedicated R&D centre which facilitates the technological innovation process for a given division. Albeit the R&D centres are not part of the division in the formal organisational architecture, their services are subject to the innovation strategy of the divisions. Hence, the R&D centres implement the innovation strategy of the divisions and investigate and apply technologies based on the roadmap of the division which is a reciprocal task interdependence configuration as depicted in figure 3.2. The General Manager of Technology Operations (all R&D centres) explained their role as follows:

“It's actually managing current technologies. Wherever the corporation demands innovation, so they define the innovation together with Corporate Innovation or

Corporate Programs or even with a business that wants innovation. So defining what that is and how we will implement it. So we will not [ourselves] define what that new expertise or new capability is.”

However, Plastica’s divisions complained regarding the speed of innovation projects. The task design decision to couple an R&D centre to a division created a misalignment in expectations and goals. Whereas the R&D centres worked to long term research agenda’s and technology exploration in projects with high levels of uncertainty, the divisions expected short term exploitation of existing technologies. One of the managers in a Materials division commented as follows regarding this issue of misalignment:

“The R&D centres, they are doing a great job, no doubt about it and they have all the will to support and go with us wherever we would like. But we don’t have enough speed to deal with things maybe because of the number of members, or maybe manpower. Their research may take three months or four months or five months. It’s okay; they don’t see the urgency to put this product on the market. So usually the problem is that they are little bit slow.”

To deal with this issue Plastica’s top management team created an IMT named the “Technology Group”. This IMT consisted of four members but grew to eight in 2012 as I will describe in a later paragraph. This team consisted of four individuals with a technical background in analytical chemistry, who professionally grew into project management roles. Two team members who joined later were experienced consultants hired from third party Accenture. The Technology Group’s task initially was to support the R&D team of one of Plastica’s high growth divisions: “High Performance Plastics”

(HPP). The IMT's tasks revolved around managing the R&D centre gaining more efficiency while demonstrating more transparency in performance and project progress to the HPP division. For these purposes, software based tools were introduced with which R&D projects could log project events which then became visible for projects owners in the HPP division to observe. But these tools and the underlying support were not compulsory for HPP's R&D staff to use which caused a task dependence configuration between the IMT and the R&D centre; meaning the IMT needed the R&D centre to use and accept its support but the R&D centre was not obliged to interact with the IMT.

The following table 7 presents the number of interviews in which each task design decision was mentioned.

Table 7: frequencies on task design decisions

	Statements	Frequency*
Task	The IMT is here to support other teams with their innovation activities	42
	The IMT is here to manage other teams with their innovation activities	4
Scope	The IMT has a peripheral scope	3
	The IMT has a divisional scope	19
	The IMT has a corporate scope	7
Authority	The IMT has an optional authority	11
	The IMT has an enforced authority	4

* Number of interviews in which statements were mentioned.

Regarding task, this table shows that most informants explain the IMT was established to support other teams with 4 Softy informants referring to actual management of the innovation process. Furthermore, most informants referred to the IMT as operating on a divisional level (PCtech and Reaction) while Softy's and Plastica's activities seemed to have a peripheral and corporate scope respectively. Finally, these numbers indicate that most informants describe the IMT as having

optional authority; i.e. the IMT support was not seen as being a compulsory element of the innovation process.

Overall, data show much variation in the design of innovation management teams and the task interdependence configuration of intraorganisational innovation systems. More significantly, firms that have innovation as a strategic priority use innovation management teams to support business teams in managing their innovation activities. However, the impact of such teams depends on a set of design dimensions.

I have found the organisation design of IMT's to differ across the following set of dimensions: task, scope, and authority. The earlier provided table 6 contains an overview of the configuration of these dimensions per team. These design dimensions affect task interdependence between IMT's and the business teams they support. In keeping with current literature I have discovered pooled, serial, and reciprocal interdependence to exist in innovation systems. The way the IMT is structured and where it is positioned in an organisation affects whether it operates in any of these three task interdependence configurations. But I also contribute the insight that based on the task design a team can experience task *dependence* if it requires input from other teams to fulfil its task but not vice versa. For IMT's that required the cooperation of business teams in order to perform their support activities whilst having an optional authority toward those teams it meant that business teams could opt whether to accept support or not and therefore the IMT experienced dependence. Whether business teams actually accepted the presented support or not depended on their perception of the IMT and the interdependence that it presented. In the next section I report these perceptions between IMT's and business teams.

4.3. Social interdependence

Although organisation design is central in shaping task interdependence configurations, based on my data I find that social interdependence is also imperative. In essence, a design for task interdependence does not reveal anything about how this interdependence is perceived by the involved teams which is referred to in the literature as social interdependence. Anyone familiar with organisational life can imagine a firm having teams that have to work with each other by design but who would rather not interact for various reasons. Elaborating these reasons, based on my data I identify three types of perceived social interdependence coherent with extant literature, namely: *positive, negative, or individualistic*. First, positive social interdependence exists when a team perceives the tasks of the other team(s) to promote the achievement of joint goals. Second, negative social interdependence is experienced when the tasks of teams obstruct the achievement of each other's goals. Last, individualistic social interdependence is perceived when the tasks of teams are perceived to be unrelated to the achievement of each other's goals.

Reaction is a useful example. As noted earlier, Reaction's IMT was created to support innovation project teams. Figure 3.2 shows that the task interdependence between this IMT and the project teams was task *dependence*, and between the project teams: *pooled* interdependence. Pooled, because all of the innovation projects combined had to deliver the objectives of Reaction's corporate innovation program, hence it is governed by a summative composition rule which means that the whole is a pooled outcome of its parts (Cheng, 1989). Innovation projects at Reaction were allocated resources based on their progress through a set of milestones; for example when a technology concept was developed into a prototype. This meant the faster a milestone was reached the quicker

additional resources could be accessed, the quicker a project would progress to commercialisation. Reaction's IMT supported project teams by offering management tools that structured the process of innovation to accelerate progress as stated by an IMT member: "We work to directly help accelerate the 50 innovation projects that have been identified." Thus, this created a positively perceived social interdependence for many project teams because both the IMT and the project teams shared the goal of accelerated project development because: a) the project team benefited from a new round of resource allocation, and b) the IMT benefited from contributing to its goal of maximising the number of supported teams. Nonetheless, for some project teams there seemed to be a negative perception of interdependence. One of Reaction's business project managers who seemed suspicious and sceptical toward the IMT stated: "such an innovation group is seen as a corporate staff department who come to interfere with your business." Some of the project teams seemed to perceive the IMT as representatives of top management, as if they were spying on them. When asked about this, an IMT member elaborated as follows:

"We now try to offer our services, and that's got to do with culture at Reaction, when you accept our services, you actually accept you couldn't do it yourself and perhaps you're a weakling."

The same informant then continued to further explain the emergence of either positive or negative perceptions from project teams:

"And there a few, the weaker ones, they have this idea: they deliberately don't hire us because their boss could think: "You can't do it yourself." The strong ones think:

“I’m mad if I don’t use him, that guy is a free resource, at least I’ve got an extra pair of hands on board. Come on in!””

This demonstrates that formal task interdependence alone does not explain how and why perceived interdependence emerges; other values seem to be important here. According to these accounts which in reality represent the perspectives of IMT members and therefore could be biased, some business teams seemed to struggle because of low performance and believed their weakness would be exposed and their position as team could be aggravated by cooperating with the IMT. From the social psychology literature (e.g. Haslam, 2001; Hogg & Terry, 2000) it is known that teams want to maintain positive social identity. When a team experiences low performance then that is an obvious threat to “maintaining positive social identity”. However, when this team would additionally accept support from an IMT as is apparent in Reaction then this threat is perceived to increase because a) the alleged weak performance will be exposed to the rest of the organisation b) the idea of receiving support further amplifies the threat to positive social identity because such a team may think that it indeed is weak and therefore needs support. Interestingly though, teams with higher performance did not experience the support as a threat because they were not experiencing a threat to maintaining positive social identity beforehand. Because of this, the support was interpreted as a welcome contribution of resources in lieu of an additional threat and risk to be exposed as a weak team. Again, these findings are tentative because the informants did not want to reveal the identity of these ‘weak teams’ and admittedly, I did not ask the representatives of business teams whether they belonged to a weak team whereas the strong teams would readily mention and repeat their strong innovation performance.

Softy is a second example. Softy produces telecommunications software and services but its core product is a software based product that enables trains, ferries, and buses to have seamless internet connectivity across networks and country borders. This connectivity is subsequently used to offer onboard access to internet, information management services regarding scheduling and communication, and telemetry services; i.e. remote control and maintenance of vehicles. It has two central groups in a functionally integrated organisation design: a software group and a sales group. The innovation task interdependence between its software engineers and its sales managers is *serial*; i.e. a new technology or product is developed by the software teams and subsequently commercialised by the sales managers. Hence, the output of the software group is the input for the sales group. Softy's IMT was established in 2011 to manage the innovation process in this configuration of serial interdependence. However, ex ante the formation of the IMT, a *negative* perceived interdependence already existed between the sales team and software group. The CFO described this tension as:

“There's some lack of understanding which is probably the best way of seeing it. Our communication - there is a gap and when people don't understand all of the obligations of what the software teams have to deliver, they see them as resistant. The same as when you can't see what the sales guys are facing you don't understand the need for continuous innovation and extra resourcing available to support that.”

The interviewee referred to “obligations” because the sales team's main innovation goal was to maximise the number of new products sold: a quantitative measure. The software teams had to develop new technologies whilst complying with strict industry safety standards and they therefore went through rigorous testing procedures: a

qualitative measure. Hence, by organisation design Softy seemed to be dealing with a serial interdependence configuration in which the tasks and goals of the two teams were negatively correlated; i.e. if the software teams achieved the goal of safe and high quality products through long testing processes then this meant less new products could be developed which meant less sales output. Conversely, if the sales team would sell as many new products as possible it means the software team had to produce more products which added pressure on timelines. Because of Softy's entrepreneurial orientation, products would more often than not be sold (as a technology concept) before they were actually built and the sales group made use of this by constantly selling premature technologies which further aggravated the tense relationship with the software group. This negatively perceived social interdependence was explained by a software developer:

“And this is a real tension there, I think it's going to hit any day soon because there's the creative part of the business on the one hand and the sales guys: “Oh, I can do this. Oh, you just need one of those over there and so on.” We can't have that and go for SIL ratings, the safety ratings of these things.” [SIL ratings are industry safety standards Softy needs to comply with.]

Softy's IMT was established by their TMT to introduce structure, efficiency in the innovation process, and to reduce the tension between software and sales. For these purposes, the IMT created six product platforms which guided innovation activities. This meant that any innovation would have to fit in any of these six platforms which downsized the product portfolio to more manageable proportions. The interdependence between Softy's IMT and the business teams was reciprocal as shown in figure 3.2,

meaning that the output of the IMT – coordination of innovation tasks - is used as the input for the software and sales teams to manage their innovation process.

Subsequently, the output of the software and sales groups served as input for the six product platforms that Softy's IMT managed. The establishment of the IMT and the underlying task interdependence was not welcomed, by either Sales or by Software.

Sales were now given the task of commercialising existing technologies only. Hence, this meant they could not chase every contract by presenting the latest advancements in communications technology. Instead, they received documentation from Softy's IMT with therein the dictated parameters within which sales activities could take place and the formal product portfolio eligible for sales. Furthermore, whereas Sales could proactively access financial resources by addressing the CFO directly, they were now placed under the resource allocation regime of the IMT which meant that all resource requests had to be approved by the IMT. All in all the introduction of the IMT brought considerable change for Sales to which it immediately had to comply because of the enforced authority of the new IMT. This caused the interdependence between Sales and the IMT to be experienced by Sales as negative because whereas Sales experienced considerably autonomy beforehand, they now had to operate according to the procedures and processes managed by the IMT. Their activities were bound by the six product platforms, hence they could not sell any technology they deemed interesting and profitable:

“This is not the culture of Softy. That's how we've always done it. It was decided not to go for a particular bid which is uncommon to Softy. Our old mantra was “win every bid””. [Sales manager about the practice of trying to win every contract]

Moreover, all resource requests by Sales had to go through the IMT; Sales could no longer contact the CFO directly. Sales regularly required financial resources for outsourcing early stage technology development to 3rd parties to enable the commercialisation of prototypes but this was now brought to a halt by the IMT. Thus, the altered task interdependence configuration driven by the establishment of the IMT had an impact beyond changes in the way formal tasks were handled because it also impacted perceived social interdependence. This was not only the case for Sales but also for Software.

The software teams felt the creation of IMT violated their identity as the “generators of intellectual property” [head of Software] because the IMT prescribes the six product areas on which Software’s innovation activities had to focus. The Software group was accustomed to being the single authority in R&D and innovation at Softy and hence it perceived the IMT as a threat to this position. Moreover, the fact that the IMT was enforced by design amplified this perception because Software was obliged to comply with the IMT’s process from the very start without any “acclimatisation” period; i.e. there was no transitional period in which the teams could accommodate to the new task interdependence configuration. The manager of one of the software teams explained:

“Well I think the change for me, and it’s one that doesn’t necessarily sit comfortably with me, is that the notion of that point of innovation is squarely being put in the court with the product group which is Mr. [head of IMT]. It’s been described to me that we almost become just subservient and what needs doing, we go and do it. It’s not a position that I’m at all comfortable with.”

Based on these negative perceptions of interdependence, the IMT therefore experienced considerable resistance from both teams as I will demonstrate in the next section.

In sum, the sample shows useful variation. Where some firms showed instances of positive and negative social interdependence, others showed more evidence of *individualistic social interdependence*. PCtech is an example. PCtech's IMT had the task to support a large number of autonomous accounts which operated as small organisations. We previously showed the task dependence of PCtech's IMT with respect to the accounts it supported. This meant that they depended on the accounts to execute their tasks and achieve their goals as a team but not the other way around. Although many accounts appreciated the IMT's support because it enabled them to increase sales through innovation, others were more sceptical. For example, one of the large accounts at PCtech commented as follows when asked whether they used any of the support offered by the IMT:

"No, because those are account innovation tools and the Innovation Diagnostic is an account device or an account business plan. And we're a strategic member of Accounts." [Innovation Diagnostic is an innovation tool offered by the IMT to the accounts]

This account felt they were a special type of strategic account because of their size and success and therefore they felt no need to receive support from the IMT, hence they perceived an individualistic social interdependence vis-à-vis the IMT which meant they have no need of the IMT. Obviously, this caused a challenging situation for the IMT because if they depended on the accounts to carry out their task and attain their goals

and some accounts did not experience any interdependence, then the IMT was unable to reach them because their authority was optional; i.e. the accounts did not have to cooperate with them. This asymmetric interdependence configuration – dependence versus independence – was ultimately resolved by the IMT in a tactical response which is described and analysed in the next paragraph on interaction patterns.

Plastica is an additional example. Plastica's IMT also operated in a task dependence configuration because it depended on the support given to R&D teams in the High Performance Plastics division but the R&D teams were not obliged to accept this support since their support was initially based on optional *authority*. An R&D project manager told us he did not believe in the type of tools offered by Plastica's IMT and therefore he perceived no social interdependence:

“You know what, I don't believe in those tools. I think if you're going to institutionalise this, then inherently the innovation is lost. Everything you try to put in boxes, to structure, loses reality.”

Based on this perception he chose not to accept any of the IMT's support. Creativity was something that should not be constrained according to his viewpoint. He therefore believed he should not have to cooperate with the IMT. The IMT's manager was aware of the “individualistic” perceptions by some R&D teams: “Regardless of which tool you offer to people, it's important whether people actually feel obliged and committed to use that tool in the right way.” The word “obliged” pertains to the authority of the IMT which was optional initially; hence R&D teams were not obliged to use the tools. Furthermore, the word “committed” relates to how the IMT's support is perceived i.e. is

it positive which will bring about commitment, or is it seen as negative or unrelated which causes less or no commitment on the end of the R&D teams?

However, there was a smaller R&D team doing research in a more distant area to Plastica's divisional strategy. This team was exploring applications of new materials in the metal and automotive industry. They perceived interdependence with the IMT to be positive because the IMT had exposure to top management and the entire division so they could help them draw more attention and consequently receive more resources. This R&D team felt like "the neglected child" as one of their members explained so the efforts of the IMT to get in touch with them and support them were welcome. Here, the IMT's tasks and objectives resonated with this smaller team's objective of enhancing its group's identity within the larger context of the division and the corporation which brought about a positive interdependence.

Table 9 shows the social interdependence and underlying driver per case. My data suggest that it is not only goal structures that drive social interdependence, but team related values as autonomy and identity. In contrast to goals, these factors are not apparent by design. In this table, I also show between which teams a given perception emerged. In cases where the tasks and goals were perceived to be mutual, and where there was no conflict or threat to team related values, between the IMT and business teams; positive interdependence perceptions emerged. By contrast, where goals were seen to be negatively correlated between IMT's and the teams they aimed to support, and where teams perceived a conflict or threat to team related values, a negative social interdependence arose. Lastly, when teams did not perceive any relationship between their goals, they experienced individualistic social interdependence. This demonstrates that task interdependence has implications for shaping social interdependence. Table 8 shows an overview of frequencies per given type of social interdependence.

Table 8: frequencies on types of social interdependence

Interdependence category	Summary of informant statements	Frequency*
Positive social interdependence	The IMT is seen as having a positive contribution to the attainment of the other teams' goals and/or as being aligned with the other teams' values.	36
Negative social interdependence	The IMT is seen as having a negative contribution to the attainment of the other teams' goals and/or as being in conflict with the other teams' values	38
Individualistic social interdependence	IMT goals are seen as having no contribution to the attainment of the other teams' goals and/or as being unrelated to the other teams' values.	4

* Number of interviews in which statements were found.

In keeping with existing theory I found that goals shape perceptions of interdependence (Victor & Blackburn, 1987; Johnson & Johnson, 2005). This literature stream explains how individuals can experience positive, negative, or no interdependence with others based on perceptions of any mutual goal attainment. Additionally though, I contribute a number of insights. First, I demonstrate that in addition to goals, team related values as autonomy and identity shape social interdependence. Thus, perceptions between teams can take shape based on both respective goal structure and perceptions around how a particular task interdependence configuration relates to their identity and autonomy. The latter two are factors which are not given by design as for example was seen in the case of PCtech where (some) high performing teams with an identity of “success” did not accept a task interdependence which implied receiving “support”. Or in the case of Softy were the IMT was seen as interfering with Software’s identity and Sales’ autonomy. Inter-team were therefore also driven by teams attempting to maintain positive social identity. Second, my data reveals

how task and social interdependence are interrelated. The way tasks are designed and divided among teams gives shape to a process of social interdependence. Thus, I argue that task interdependence as a top down process of organisation design is followed by an inter-team process of social interdependence. Ergo, I assert that a) the way teams perceive their goals to be related, b) the way task interdependence relates to team value of identity and autonomy, and c) the interaction between social identity and task interdependence, shape inter-team perceptions into a distribution of social interdependence. Finally, whereas social interdependence has mainly focused on the inter-individual level of analysis (see Johnson and Johnson, 2006 for an overview), based on the findings of this study I argue social interdependence to also exist on the inter-team level of analysis.

Table 9: social interdependence between the IMT and business teams

	Positive social interdependence		Negative social interdependence		Individualistic social interdependence	
Definition	There is a positive correlation perceived among teams' goal attainments.		There is negative correlation perceived among teams' goal attainments.		There is no correlation perceived among teams' goal attainments.	
	Teams	Goals/Values	Teams	Goals/Values	Teams	Goals/Values
Softy			IMT vs Sales IMT vs Software	Values: identity and autonomy related conflicts. Sales lose autonomy; Software lose authority.		
PCtech	IMT vs Accounts	Mutual goal: sales through innovation. "We know that innovation sells."			IMT vs large accounts "A key point is: what's the value you add? Really, what's in it for me?"	Values: Support vs identity of "already successful"
Reaction	IMT vs HP ^a project teams	Mutual goal: Acceleration of project development The IMT is an "extra resource" to HP teams	IMT vs LP project teams	Values: identity related conflict LP teams do not want to be seen as a "weakling".	IMT vs HP project teams "I don't believe in the mission of the IMT, to stimulate innovation in our groups."	Support vs identity of "success"
Plastica	IMT vs small R&D group	Mutual goal: provide support vs use support to increase exposure of R&D group in Plastica			IMT vs R&D project manager	Values: Structure vs Creativity

^a HP = high performing, LP = low performing.

4.4. Interaction Patterns

In addition to the relationship between task interdependence and social interdependence, I also observed that social interdependence shapes the way teams interact. The designed task interdependence configuration in which the IMT's operated, suggested a specific pattern of interactions between the IMT and other teams. However, the expected interaction patterns often did not match the actual interaction patterns because of (sometimes unanticipated) positive or negative social interdependence, or "individualistic" perceptions between teams. In this section I elaborate on how interaction patterns between the IMT's and business teams unfolded in each sample case based on the distribution of social interdependence. Moreover, I demonstrate how these interaction patterns affected the evolution of task interdependence; i.e. how IMT's managed to influence how and when task interdependence developed into a subsequent – more favourable - configuration.

The data indicate three distinct interaction patterns: *cooperative patterns*, *competitive patterns*, and *influence tactics*. First, cooperative interaction patterns are defined as teams engaging in actions that increase chances of each other's success based on positive social interdependence within a given task interdependence configuration. Second, competitive interaction is a pattern which is defined as teams engaging in actions that reduce the likelihood of other teams' success. Here, teams resist to cooperate because of a negatively perceived social interdependence regardless of the interactions a given task interdependence configuration may suggest. Third, the most central interaction pattern found in this study is "influence tactics". Through influence tactics teams attempt to shape the actions of other teams to alter task and social

interdependence into a more favourable configuration; findings which go well beyond the current conceptualisation of influencing in social interdependence theory. Influence tactics were particularly prevalent when IMT's depended on other teams but not vice versa; or when an IMT was confronted with negative social interdependence on the side of the teams they had to interact with by design. This study contributes two categories of influence tactics: hierarchical influence tactics aimed at top management, and lateral influence tactics aimed at business teams positioned at hierarchical levels comparable to those of the IMT's. The remainder of this paragraph illustrates the above interaction patterns from the perspective of the IMT in each case.

An example is Softy. Softy's IMT's was enforced by design in a serial task interdependence configuration with Sales and Software. Interdependence between the IMT and these teams was perceived as negative. Sales' team members experienced their role in innovation at Softy to have become inferior because their autonomy had become limited and constrained. This perception impacted interaction patterns between the IMT and them.

First, Sales contested the way resources were allocated to projects. The IMT had formalised resource allocation requests which meant that Sales could not easily develop and sell prototypes of early stage technology. The development of prototypes was often outsourced by Sales to 3rd party technology providers to avoid dealing with the Software teams' slow response time. Second, competition also arose around customer acquisition strategies; i.e. whereas Sales used to aim for each possible contract, the IMT only allowed the existing product portfolio to be offered which meant that some contracts became out of reach. In addition, the IMT stipulated minimum profit margins on features and products sold to new customers. Hence, Sales had to learn how to say "no" to potential customers but this procedure was not followed by each sales manager.

Third, the shift from a project-centered to a product-centered organization caused additional conflict and discussion over Softy's business model. Whereas Sales still championed the project-centered model which revolved around "winning every project"; the IMT tried to impose the product-centered model in which all innovation was based on six focused product platforms. Ultimately, the continued competition caused some sales team members to leave Softy or move to new jobs of the firm's U.S. or Australia divisions.

Similarly, the interaction patterns between Softy's IMT and Software were competitive because the software team perceived the IMT as a threat to their identity as "generators of intellectual property" as a software engineer mentioned. The result of the negative social interdependence was that Software resisted any attempts by the IMT to implement changes in the innovation process despite the IMT's enforced authority by design (see table 6). This led to a series of collisions between the head of Software and the Head of the IMT. The head of the IMT described: "He [Head of software] accuses me of telling him how to do stuff. Now in my view, there's a role within product group to say how to do stuff. "

On his turn, the Head of Software repeatedly expressed how he had managed Software to develop technologies that brought Software its market leading position. He viewed himself as the architect behind Softy's software based technology framework and was not ready to shift the ownership of this framework to the IMT by accepting the "six product platforms" strategy. The competition between the IMT and Software was apparent in intense disputes over the phone or over e-mail, because both teams are located in different offices. The frequency and intensity of these competitive interaction patterns even reached the CEO: "It's an interaction between those two teams. Heavy wars, that doesn't work. They need to work together." Hence, the task interdependence

configuration by design suggested cooperative interactions between the IMT and Software but the reality was different based on a negative social interdependence.

The fact that the CEO noticed these competitive interaction patterns was an opportunity for the IMT to utilize his authority to change these dynamics but instead of attempting to change the negative social interdependence, Softy's IMT persisted in the competitive patterns by just confronting Software and Sales with continued arguments and disputes. Ultimately, Softy's IMT was not able to change this situation and therefore both task interdependence configuration and social interdependence distribution between the IMT vis-à-vis Sales and Software remained intact from its establishment until the end of the field study.

PCtech's example reveals a different story. PCtech's IMT had a large number of potential accounts to support considering their regional scope but their authority was optional, hence accounts did not have to cooperate. Consequently, the IMT experienced task dependence with respect to the accounts because a) the IMT needed the accounts in order to perform its tasks and attain its objectives, and b) the accounts did not have to accept the support, in fact many accounts refused to work with the IMT. On their turn, the accounts experienced individualistic social interdependence with respect to the IMT as I have shown in the previous paragraph. The combination of task dependence and individualistic social interdependence was obviously not an optimal situation for the IMT. But the IMT did not accept the status quo; instead they attempted to change this configuration to enhance the position of their teams by influencing other teams in a number of ways.

First, PCtech's IMT engaged in hierarchical influence tactics through a process referred to as "executive legitimisation". In general terms, the IMT proactively engaged with top management to increase the legitimacy of their activities in PCtech's

innovation organisation. To achieve this legitimacy the IMT created innovation management tools to track the innovation performance of accounts and reveal their score on innovation performance indicators designed by PCtech's top management. Normally, the development of such software based tooling would take at least a year as one of the IMT members explained in an interview. However, they hired two additional members specialised in software programming who could locally build these tools in order to work around PCtech's corporate bureaucracy around formal software development. The information generated from these tools appealed to PCtech's top management team because it offered them a valuable governance instrument in a large decentralised organization. PCtech's Chief Operating Officer expressed how these tools resonated with his own beliefs about running the organisation: "I'm a big believer in processes. I'm actually freaked about KPI's." In fact, corporate management increasingly viewed the IMT as a device for controlling, if from a distance, the autonomous behaviour of PCtech's accounts. Hence, the IMT became more central in the eyes of top management team members. In addition to developing tools that revealed account performance, the IMT also demonstrated to their executive team how innovation had improved sales figures over the years 2007-2011 which was an important additional legitimisation for the IMT's support activities. Thus, the IMT was effectively influencing top management to strengthen the IMT's position in the company as two IMT members described:

"You go to that account and say "well this is a framework I think you should employ" and they say "well I've got my own finances framework, what do you know?" But if the chief financial officer turned round and says: "Well you've got to run your finances like this" you don't argue do you?"

“He [Chief Operating Officer] is effectively number two in the company and he is responsible for all global accounts. He’s an EVP, a very big sponsor.”

In addition to executive legitimisation, PCtech’s IMT also engaged in lateral influence tactics aimed at the accounts. One of the lateral influence tactics they used is referred to as “expertise legitimisation”.

When the IMT approached accounts which were subsequently reluctant to work with them, the IMT demonstrated how their support had helped other accounts – i.e. their peers - achieve successes. For example one of PCtech’s accounts was organised around serving Bank Santander. This account operated in the financial services sector where information technology is central, and hence where innovation in this area is crucial to prevent a client the size of Santander to switch to PCtech’s competitors, e.g. IBM. Because the Santander account strongly relied on innovation, it started cooperating with the IMT soon after its establishment. As a result, the Santander account had been successful in managing innovation projects and deliver new services for Santander supported by the tools of the IMT. The maturity of the Santander account in managing innovation therefore was much more advanced than other accounts, especially those that did not yet cooperate with the IMT. The IMT therefore used the Santander account “case study” to demonstrate to the “hesitant accounts” how their support could also contribute to their innovation performance, and consequently their sales figures. This lateral influencing tactic was described as follows by the head of the IMT:

“As the accounts share back with us what they are doing, we can be sharing that back out to the accounts: “This is the best practice we’re seeing. Look at the Innovation

Diagnostic [tool], one of our financial services accounts has got one of the best Innovation Diagnostics that we've seen." So we could share that with other accounts and go, "Look at this, look at all the different elements they've got in there."

As a result, many accounts which were hesitant at start became more cooperative in their stance toward the IMT because the evidence of peers successfully working with the IMT produced the "I want that too" effect and established the expertise of the IMT.

A second lateral influence tactic used by PCtech's IMT is "goal alignment". PCtech purposefully aligned the goals of their team with those of other teams. In 2011, the head of PCtech's IMT approached the Account Operations Executive and convinced him to include measurable objectives regarding innovation in the "Account Planning Scorecard"; a set of performance indicators set by corporate management. This meant that from that point in time the accounts were also assessed based on their innovation performance, including the way the innovation process was managed and the client feedback on this process. From then on, the IMT's services directly contributed to the attainment of the accounts' these innovation related objectives. This gave the IMT a powerful mechanism for convincing accounts to cooperate because their goals were now aligned; i.e. supporting the innovation process versus attaining innovation objectives in the accounts' scorecard. An IMT member explained how they framed their management tools to match the accounts' performance objectives attainment:

"We actually gave the accounts four different targets. We said, "Your account innovation diagnostic, everything you talk about in innovation, every initiative you got in place, every conversation you have must be targeting one of four things [scorecard objectives]."

In addition to using goal alignment as a lateral influence tactic, PCtech's IMT also used it as a hierarchical influence tactic directed at their top management. Because the head of the IMT had a background in business intelligence he knew how to make performance visible. Moreover, he had hired two software developers who could quickly work on the development of tools he envisaged. The head of the IMT decided to align top management by associating innovation with the key performance objectives top management had set for the coming year. For example, during the field study (2011-2013) one of the most important corporate objectives was customer retention. Top management emphasised to the accounts that they had to make an effort to keep customers with them; i.e. accounts should carefully balance between acquisition of new customers and retention of existing customers. The head of the IMT therefore built a "dashboard" (management information tool) that showed how accounts that had used the "innovation diagnostic" tool were more successful in retaining customers than accounts that did not use this tool. This was a powerful goal-alignment tactic to demonstrate that the IMT's objectives were indeed well aligned to those of PCtech's top management.

The head of the IMT explicated that the reason behind using the influence tactics was the establishment of the IMT in PCtech as a central group instead of a temporary "program" when it comes to innovation management. Remarkable was the conviction of IMT members to make an effort for the IMT as a team in lieu of individuals going after their own success. The importance of the development of the IMT was something that kept its members busy and drove them to consistently interact with top management and accounts to gain a favourable and undisputable position in PCtech's innovation

organisation. The IMT's head explained his concern with strengthening the position of his team:

“I think we are forever morphing and multiplying and dividing so as things move, we move with it and that's why I think we will evolve beyond what we are now. Hence, my annoyance with the fact we sometimes get called the innovation diagnostics team.”

By mean of these influence tactics PCtech's IMT enhanced its position in the firm because top management *redesigned* the IMT's task, scope, and authority at the end of 2011 from supporting, divisional, and optional into: *coordinating, corporate, and enforced*. In their new role the IMT had to manage the creation and use of innovation management tools in PCtech's accounts. Moreover, the implementation of the innovation diagnostic tool had become compulsory and the IMT monitored the usage of this tool across accounts. Also, the IMT stored and managed the content of innovation projects across accounts and stimulated knowledge and resource sharing through “Google-like” semantic web tools that contained information about projects, individuals, centres of expertise, resource availability, and other types of information around innovation. Additionally, the IMT constructed and published case studies in which it demonstrated how it helped specific accounts in a similar way as it had used the Santander-case to show their expertise. Finally, the IMT continued reporting innovation performance indicators to top management but because the IMT shifted from a regional to a global role it now reported directly to PCtech's corporate executive team. Altogether, the combination of PCtech's IMT's hierarchical and lateral influence tactics caused a shift from the initial task dependence into task interdependence. Moreover, the initial individualistic social interdependence perceived by accounts became positive

social interdependence. Lastly, the IMT continuously worked toward improving and strengthening its position within the firm for the sake of the team as a collective: “I think we are somewhat much more influential now than ever before.” [Head of IMT]

An additional example is Plastica. Their IMT engaged in influencing in ways similar to PCtech’s IMT because they had to deal with a negative or individualistic social interdependence between them and some of the R&D teams. First, Plastica’s IMT initiated conversations with top management to gain more legitimacy for their activities as an IMT member explained: “We need to make sure that leadership is pushing for the same message as us towards their people.” In these conversations the IMT collaborated with top management to confirm, capture and redefine the firm’s innovation objectives for the R&D teams. Subsequently, the IMT developed a reporting tool which displayed and reported the agreed upon innovation objectives and the progress made per R&D project. Plastica’s top management was impressed by this approach since it laid bare the performance of R&D teams; something which had been highly ambiguous before this development due to the complexity and length of R&D projects. An IMT member explained the importance of this step:

“We are gathering and reporting the KPIs. The KPIs themselves were designed by the top management team, and now our Executive Vice President has decided on another set of metrics he’d like to see. So we’re taking all of those inputs and collecting that information and then reporting it up, which had not been done previously.”

This hierarchical influence tactic proved effective and because of its success Plastica’s IMT was given a new scope by top management. The scope increased from *divisional* (the High Performance Plastics Division’s European Operations) to *corporate*

(all R&D teams across divisions). The number of R&D teams that had to be supported significantly increased because of this decision. Moreover, while the IMT's authority was *optional* initially, it now became *enforced*. The head of Plastica's IMT explained how influencing top management also led to a redesign of the IMT's task and authority, viz. the task changed from supporting to coordinating ("harmonising") the innovation process for all R&D teams. Furthermore, their authority became enforced since R&D teams were expected to cooperate with the IMT in the formal redesign:

"My role today, I don't know if you got this but we're going to change the organisation. And my role today as GM of the Global Technology Group is in essence to harmonise all processes globally for the entire technology [R&D] operations."

Although the redesign of the task interdependence configuration enhanced the position of the IMT in Plastica's innovation organisation, it did not however warrant the cooperation of R&D teams in a large multidivisional organisation with globally dispersed R&D activities. In fact, the IMT's corporate scope and enforced authority as mandated by top management created resistance from some of the new-in-scope R&D teams as one IMT member noted: "Well, and top down approaches work fine in Asia, they don't work at all here [Europe]. And they don't work at all in the Americas because people are bred to challenge." The sudden change for many R&D teams brought about a negative social interdependence, i.e. R&D teams perceived the IMT as negatively aligned to their local objectives. In response, in addition to hierarchical influence tactics, the IMT resorted to lateral influence tactics to move the new R&D teams into a positive social interdependence. The IMT explained how they had to influence the R&D teams to change the negatively perceived interdependence into a positive perception. An

example is a tool the IMT introduced to cancel R&D projects that were underperforming before any additional resources were wasted. The R&D teams felt this tool would hinder the innovation process and therefore objected to it. To deal with this resistance the IMT used “expertise legitimisation” as a lateral influence tactic. They explained how this approach had helped other R&D teams to successfully cancel projects in time and the amount of resources it had saved the company.

“I think it's fine to look at the best practices inside the company and certainly we want to make sure that we're doing that. So we're using the term “stop” and we want to highlight, these are the businesses that stopped projects on time instead of stopping them after all the money's been spent”. [IMT member]

This influence tactic demonstrated to the R&D teams that the IMT offered services that could benefit them. The negative perceptions gradually evolved into more positive perceptions. The head of the IMT was not naive in believing the redesign in itself would imply a cooperative interaction structure with the R&D teams. He was aware that the set of tools they offered was insufficient to get the R&D teams' cooperation; he emphasised therefore how the behaviour of R&D teams needed to be altered for any tool to be effectively used.

To realise this behaviour change the IMT used an additional lateral influence tactic: ‘goal alignment’.” IMT members purposively investigated the goals of R&D teams to find out how they could align the goals of the R&D teams with their own goals as an IMT member explained:

“As soon as you have those common goals and those common understandings then the rest kind of falls into place. When you feel like you can rely on each other I can say to either one of them, “I need you to go figure this out and I need you to do it by tomorrow afternoon,” and that would be no problem.” [IMT member on aligning goals with R&D teams and the impact on cooperative interaction]

Goal alignment was achieved through tailoring the tool and support package to the local problems of R&D teams. Although the IMT had to support 1300 individuals globally it kept making an effort to align their support to the particular problems confronting an R&D team. The goal alignment influence tactic proved an effective instrument through which Plastica’s IMT reached positive social interdependence and cooperative relations with the R&D teams.

Similar to PCtech’s IMT, Plastica’s IMT members described their concern with enhancing the importance and influence of the team within Plastica. It was the team as a collective unit which was prioritised and for which IMT members kept influencing executives and R&D teams.

“It needs to be recognised in the organisation. It’s still young and it’s starting to get its recognition. We made a strong financial proposal so the criteria to get this thing on track have been formulated. Now it’s a matter of creating recognition. Sometimes it’s a bit of promotion and sometimes it’s repeating to others what exactly our role is.” [head of IMT]

Summarising, due to hierarchical influence tactics Plastica’s IMT managed to instigate a redesign that positioned them into a configuration with enhanced their task,

scope, and authority. In addition, the lateral influence tactics toward R&D teams created a setting in which task interdependence was better aligned with positive social interdependence.

PCtech and Plastica illustrate the effect of combinations of hierarchical and lateral influence tactics on the development of task and social interdependence. Reaction is a different example. Reaction had to the task to support Europe-based innovation project teams in accelerating project progress to reduce time to market with an optional authority; i.e. the IMT experienced task dependence. Although many project teams experienced positive social interdependence there were many – specifically those struggling with performance – that refrained from cooperating because they perceived the IMT as a threat that would expose their issues. Additionally, in September 2011 the IMT introduced a tool which could monitor progress of innovation projects to measure where support to accelerate projects was needed. However, this tool made things worse with respect to the social interdependence experienced by innovation project teams because more teams started to perceive the IMT as a policing instrument deployed by top management. An IMT member described the effect of this tool:

“There are a few programs which nobody likes, at all. The diagnostics tool is one of them. We use it to measure how much you’ve advanced which is like a police-role. We parked it somewhere else for a while, we used to do it every two months. It doesn’t make you very popular.”

While the IMT “parked” this tool at the Business Control unit it became increasingly aware of the need to confront the negative social interdependence and this perception of them “policing” the innovation projects. Therefore, the IMT commenced using lateral

influence tactics to shape social interdependence from negative to positive. More specifically, the IMT resorted to “expertise legitimisation” to persuade the project teams that the IMT is not policing them but instead supporting the attainment of their goals.

An IMT member described how they used this tactic:

“Our expertise is what we put forward. We try to offer them a sort of perspective, a vision, to make them believe that we can improve their project. We often also provide hands-on support to try to influence their mindset.”

Thus, the IMT increased its involvement in both the strategy and operations of innovation project to demonstrate their possession of expertise and their operational commitment to support the innovation project teams.

An additional lateral influence tactic the IMT adopted was goal alignment. During periods of strategic change Reaction’s IMT would set new or redefine existing objectives related to innovation for the innovation teams. The most recent change was particularly onerous and the IMT utilised this by adapting its support package to help teams get ready for and meet the new innovation objectives. One of the IMT members referred to this as the ‘we are the saviours strategy’. This approach conveyed to the teams that the activities and goals of the IMT were strongly aligned with those of the project teams; i.e. the IMT supported the attainment of concrete innovation objectives while the teams tried to meet those objectives.

Although these influence tactics led to a shift in the perceptions of many project teams toward the IMT, they did not change the task design configuration. The difference between Reaction on one hand, and PCtech and Plastica on the other was that Reaction did not use hierarchical influence tactics. The consequence was they were not

able to convince top management to redesign their innovation system by reconfiguring the IMT's task, scope, and authority. The IMT therefore still operated in a task dependence configuration although their lateral influence tactics managed to increase cooperation with the project teams. The IMT's head explained why his team did not use hierarchical influence tactics:

“Reaction is not very capable in strictly enforcing things top down. Reaction is still a firm that has grown through acquisition; it has a lot of different cultures in different parts of the world so it's become a company of consensus.”

This explanation could however also have been used by the IMT's of Plastica and PCtech since these IMT's are also part of a large decentralised organisation that partly grew through acquisitions. Another remarkable piece of evidence was the ability of the head of another unit – the Manager Open Innovation – to create a stage-gate tool that forced innovation projects to meet certain criteria before each round of financing and to make it compulsory for innovation project teams. He convinced top management to introduce this tool by showing how it would manage adequate use of resources and better management practice in innovation. This shows that hierarchical influence tactics could indeed have benefited Reaction's IMT despite the reality of a large heterogeneous organisation. An innovation executive described the compulsory element of this stage-gate tool:

“We have a very clear project management philosophy of five stages, from ideation all the way to implementation and everything in between. This also means that there are stage-gate reviews involved when a project proceeds from one stage to the next. And we

are very serious about this; this is one of the things that are being managed top-down. Everyone also has to do the associated training. So this is an example. A bunch of other stuff is not top down managed but this is one of the things which we decided to manage top down.” [Vice President Innovation]

The data reveal considerable variation in inter-team interaction patterns across firms. Table 10 demonstrates the outcomes of these interaction patterns for each of the IMT’s. Competitive and cooperative interaction patterns between IMT’s and business teams have been observed which confirms extant literature on the relationship between social interdependence and interaction patterns. More significantly however, based on the data it is argued that influence tactics are the central interactional device through which IMT’s shape task and social interdependence. Influence tactics can be hierarchical which means they are aimed at top management. A specific form of a hierarchical influence tactic discovered in two cases is executive legitimisation through which IMT’s increase the legitimacy of their activities through attaining more support and authority from top management. Through hierarchical influence tactics IMT’s enhance their position in the innovation organisation across the dimensions: task, scope, and authority. By design these dimensions were configured as support, divisional, and optional. By influencing top management the IMT’s of PCtech and Plastica were redesigned to *manage* business teams with a *corporate* scope and *enforced* authority.

Moreover, to shape social interdependence IMT’s deployed lateral influence tactics aimed at business teams. These tactics were particularly used in case of negative social interdependence and competitive interaction patterns. By means of the lateral influence tactics “goal alignment” and “expertise legitimisation” IMT’s were able to alter negative social interdependence and competitive interaction patterns into positive social

interdependence and cooperative interaction patterns. Finally, IMT's which used influence tactics more vigorously by combining hierarchical and lateral influence tactics were able to both change task and social interdependence into a configuration in which both types of interdependence were aligned; i.e. task interdependence and positive social interdependence in lieu of task dependence and negative social interdependence.

Extant literature reports that organisation design influences interaction patterns because "choices about organizational structure influence who interacts with whom" (Puranam et al., 2012: 429). More specifically, design decisions through which tasks are allocated to teams determine which teams should interact to perform a given task.

Whereas pooled task interdependence configurations require less interaction, reciprocal interdependence will require more frequent interaction. However, based on the findings of this study I contribute the insight that task interdependence only partly determines interaction patterns. Perceived, social interdependence plays a crucial role as teams which perceive a goal conflict (formal or social identity related), or absence of any mutual goals are likely to engage in competitive interaction or refuse to interact with other teams. Hence, it is the combination of organisation design *and* the subsequent perception thereof that give rise to interaction patterns among teams.

In addition, whereas in prior work on task interdependence it is argued that interdependence originates from a top-down division of tasks (e.g. Nadler and Tushman, 1997) or from an "architect" (Puranam et al., 2012), I argue that teams can actually shape task interdependence by engaging in hierarchical influence tactics in which top management is persuaded to make changes to the organisation design.

Table 10: hierarchical and lateral influence tactics

Influence tactics					
	Overall Rating^a	Executive Legitimation	Expertise Legitimation	Goal Alignment	Result
Definition		Appeals to top management that increase their interest and involvement in the IMT.	Statements and actions that convey superior expertise.	Statements and actions that align own goals with the goals of other teams.	
Rationale		To increase the legitimacy and importance of own activities in the organisation.	To convince other teams of the benefits of cooperation.	To convince other teams of the benefits of cooperation.	
Softy					Sustained task interdependence. Negative social interdependence.
PCtech	+++++	++ Account performance tracking and reporting. Showing impact of innovation on sales.	++ Show role in 'Santander' case study. Publish best practice case studies which show expertise of IMT.	++ Inclusion of innovation objectives in Account Planning Scorecard. Show correlation between "diagnostic tool" and customer retention.	Enhanced task interdependence. Positive social interdependence.
Plastica	+++	+ R&D teams performance tracking and reporting.	+ Show how IMT helped save other R&D teams' resources.	+ Tailoring support to local teams' objectives.	Enhanced task interdependence. Positive social interdependence.
Reaction	++		+ Give teams an innovation "vision" and "hands-on support"	+ Position IMT as 'saviours' during times of strategic change.	Sustained task interdependence Positive social interdependence

^a To rate the use of influence tactics, each firm was assigned a score of '+' for use of a particular influence tactic. '++' was assigned if an IMT used multiple mechanisms to deploy this tactic.

Table 11 contains the number of interviews in which each respective influence tactic was mentioned.

Table 11: frequencies on influence tactics

Influence tactic	Description	Frequency*
Executive legitimisation	Appeals to top management that increase their interest and involvement in the IMT.	29
Expertise legitimisation	Statements and actions that convey superior expertise.	29
Goal alignment	Statements and actions that align own goals with the goals of other teams.	32

* Number of interviews in which statements were found.

Frequencies on influence tactics show a quite balanced distribution meaning informants perceived these tactics to be used proportionally. However, PCtech and Plastica were the only cases whose IMT's members referred to the executive legitimisation process. Remarkably, Softy's IMT members, did not mention any influence tactics used despite their intensely competitive interaction patterns with the software and sales teams. They kept repeating the difficult relations with sales and software; in illustration of this point, thirty (30) interviews were found overall in which negative interaction patterns were mentioned, 14 of these interviews came from Softy.

Hence, the development of task interdependence can come from teams other than the upper echelons of an organisation. Tables 12 and 13 show the changes in the design of IMT's as a consequence of influence tactics. Below, table 12 present the corresponding frequencies of interviews in which these changes were mentioned.

Whereas the first frequency table showed that the IMT was established to support other teams, on a divisional level, with an optional authority; this table reveals a shift

across these design decision attributes. More specifically, a clear emphasis on the IMT as managing other teams in lieu of supporting them is visible which indicates the IMT gained more responsibility and control over the innovation process than initially at set up. Also, the scope has increased overall, with more individuals disclosing the IMT's activities have increased in scope to divisional (mostly Reaction informants) and corporate. Lastly, in this second phase a shift can be observed from IMT's being described as having optional authority to having enforced authority which meant that the IMT moved into a role that was more significant and vigorous.

Table 12: frequencies on changes in design IMT

	Statements	Frequency*
Task	The IMT is here to support other teams with their innovation activities	1
	The IMT is here to manage other teams with their innovation activities	27
Scope	The IMT has a peripheral scope	
	The IMT has a divisional scope	12
	The IMT has a corporate scope	15
Authority	The IMT has an optional authority	
	The IMT has an enforced authority	9

* Number of interviews in which statements were mentioned.

Table 13: innovation management team design attributes at redesign phase

Firm	IMT name	Task	Scope			Authority		
			Support	Manage	Peripheral	Divisional	Corporate	Optional
Softy	Product Group		•			•		•
PCtech	Corporate Innovation		•			•		•
Reaction	Innovation Program Office	•			•		•	
Plastica	Technology Group		•			•		•

“Influence tactics” was a fundamental discovery in this study. It concerns an interaction pattern through which teams attempt to alter task and social interdependence. Influence tactics as an interaction pattern has implications for social interdependence theory. Social interdependence theory (Deutsch, 1949a; Johnson & Johnson, 2005) relates contrient (competitive) and promotive (cooperative) interaction to perceived goal correlations between individuals.

Based on inductive analysis of the data I propose influence tactics as an interaction pattern that a) changes goal perceptions and b) develops interaction patterns from competitive to cooperative; or from no interaction to cooperative interaction. Sic, this suggests a more dynamic conceptualisation of social interdependence in which perceptions and interaction evolve into different types as driven by the extent to and fashion in which teams use influence tactics. Also, whereas social interdependence theory conceptualises interactions as inter-individual phenomena occurring *within*

teams, based on my findings I assert that they also exist *between* teams; i.e. as inter-team phenomena.

The reasons behind influence tactics seem to go beyond responses to organisation design. The intrinsic drive of IMT members to enhance the position of their team was something that was strongly observed in PCtech and Plastica and to a lesser extent in Reaction. This could be explained by elements related to social identity in which group members strive for maintaining positive group identity (Zander, 1971). The role of social identity as a driver for IMT's to enhance their social identity as "the innovation management group" is a useful theoretical framework for explaining the efforts of IMT's in shaping task and social interdependence because one could assert that an IMT does not need to alter any form of interdependence if individual team members are satisfied with the status quo in terms of task and reward. However, the continuous collective drive of IMT members in developing the IMT into more than a "program" to increase the "recognition" proposes there are motivations and drivers involved related to social identity theory.

5. DISCUSSION

5.1. Overview

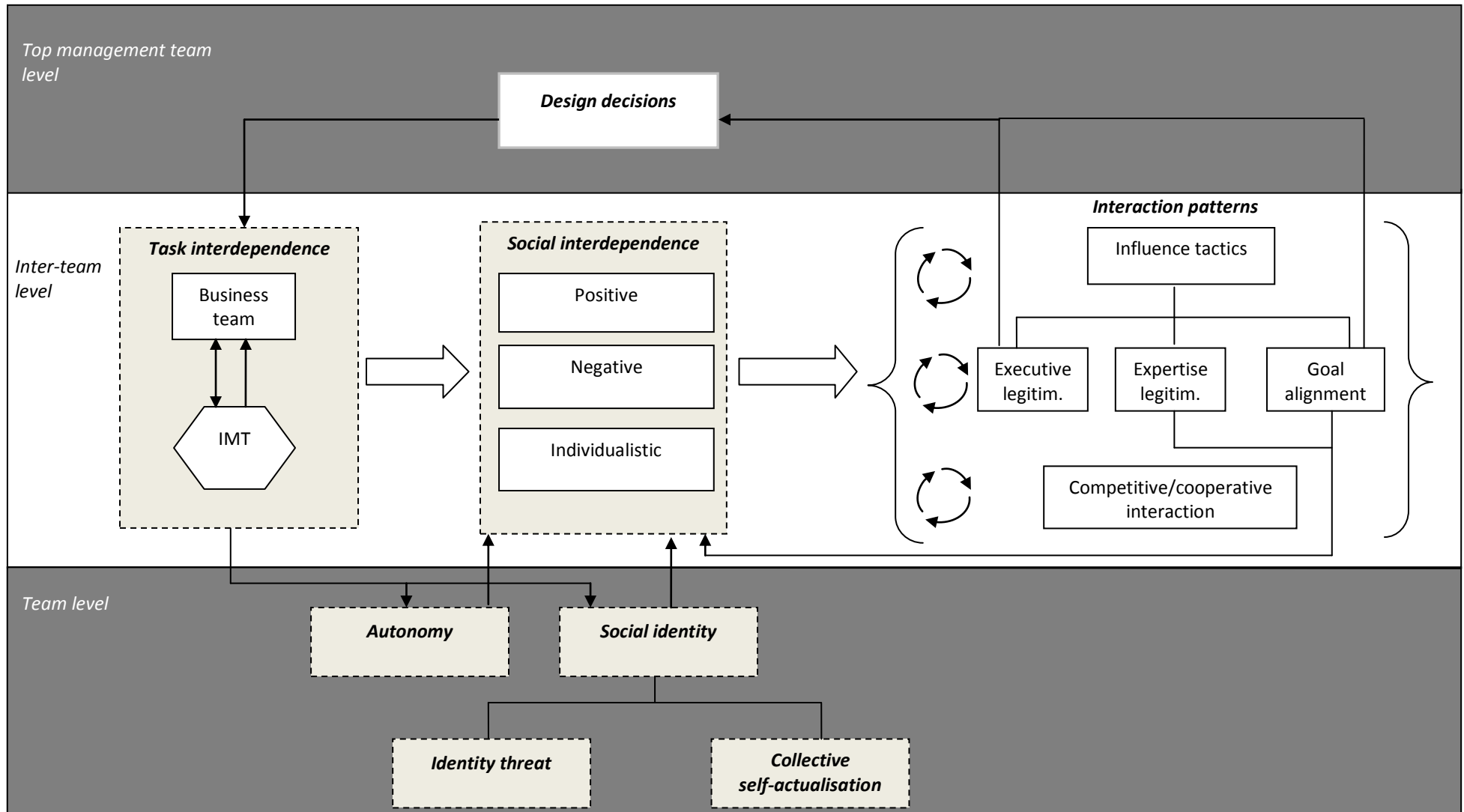
The present chapter discusses the findings in light of the contributions to theory, methodological and contextual limitations, and potential future research. Theory building from case studies is a critical exercise in which the concepts, framework, or propositions that emerge from the research process are evaluated in terms of constituting ‘good theory’ (Eisenhardt, 1989). According to best practice in organisational research (e.g. Galunic and Eisenhardt, 2001; Martin and Eisenhardt, 2010; Santos and Eisenhardt, 2009), good theory that is inductively built, should be parsimonious, testable and logically coherent. In this chapter I have tried to reconcile these academic requirements with the requirements of a PhD thesis which demand lengthier and more detailed accounts of describing the contributions of the study.

The juxtaposition of my findings and extant literature was an intensive process, since it required me to examine and integrate literatures from several disciplines. Nonetheless, it allowed me to develop contributions constituting new insights, going beyond replicating past theory because replicating theory is at best a modest contribution (Eisenhardt and Graebner, 2007). Admittedly, the sheer volume of data generated from 122 interviews, months of observations, and thousands of pages of archival documents yielded theory that was overly complex at times, or theory in which I tried to capture everything. The support from academic advisors, discussions with colleagues and practitioners, presentations at conferences, and the experience of writing and publishing my work, however, helped me focus on those points that were in scope of the research question of this study, and which had the highest potential in delivering important contributions to theory and practice. This introduction to the discussion therefore also

serves to inform the reader that, different to single case studies which emphasise the idiosyncrasies of the case in lengthy and detailed descriptions and discussions, this study adheres to the multiple case study protocol which stresses parsimony, robustness, and generalisability for the purpose of building superior theory (Eisenhardt and Graebner, 2007).

The purpose of this study has been to answer the question: “how and why do teams contribute to the development of task interdependence?” My core theoretical contribution is to emphasise the important role of teams (not just the environment, task technology, or top managers) in shaping (not just experiencing) the development of task interdependence as a process (and not a static configuration). Moreover, based on the findings of this study I argue task interdependence develops as the conjunction of task and social interdependence – which is a dynamic, cyclical process, and an inter-team level phenomenon. I found this process to be cyclical and to consist of three main steps: design decisions, social interdependence, and interaction patterns. Each step of this process has common elements across cases, but with variation in their interplay and importance. I next discuss the contributions of my research in more detail, following the structure of this process which is depicted in figure 5.1 below.

Figure 6: a process model of how teams shape the development task interdependence



5.2. Theoretical contributions

5.2.1. Organisation design and task interdependence

My findings suggest that in the first step of the process of task interdependence development observed in this study – i.e. design decisions - top managers create a specific type of cross-functional interface – innovation management teams – as a mechanism to integrate the innovation activities of other teams.

The existence, nature, and role of innovation management teams observed in this study contribute to the literature on organisation design as they form a distinct and contemporary type of cross-functional interface (Jansen et al., 2009; Nadler and Tushman, 1997) that is created for/in innovation systems. For complex organisational contexts as innovation systems, I emphasise the necessity of replacing the term cross-functional interface with a more appropriate term as the one I have suggested in previous chapters, viz.: linking teams. For innovation systems the term ‘*cross-functional interface*’ is outdated because the functional design is a traditional form from the standardisation era and hence the type of groups and teams in contemporary organisations have less to do with functions as they have with heterogeneous, specialised, and autonomous teams (Miles et al., 1999).

A number of fundamental characteristics and processes of linking teams emerge from this research. First, their features differ within a common set of dimensions which are the direct derivative of top management’s design decisions: task, scope, and authority. The ‘task’ of innovation management teams is to either support or manage the innovation activities of other teams. Most of the IMT’s (three out of four) observed in this study were given the task to initially support other teams in managing innovation.

Softy was the only case in which in the IMT in the initial phase was given a coordination task and enforced authority. It can be theorised that this is due to the given that in Softy, the top management team identified a specific organisational problem between Software and Sales in the innovation system which needed to be addressed. In the other cases, however, this particular organisational problem was not there (or not mentioned by the informants) which led the top management teams to equip their IMT's with a general supporting task and an optional authority. The second structural feature – 'scope' -pertains to whether the IMT is active on a peripheral, divisional, or corporate level. Considerable variety was observed between the cases as regards their scope. Finally, 'authority' is the third feature of IMT's which relates to whether other teams are enforced to cooperate with them or whether this cooperation is merely optional.

Second, in the organisation design literature, the cross-functional interface is most often structured as a working group with links to multiple subunits (Galbraith, 1994). They are conceptualised as teams in which each member has a competing social identity and commitment to another subunit in the organisation. Therefore, these teams are argued to lack a high degree of internal interdependence, a team-level task, and a strong team identity because they consist of "co-acting" individuals who pursue their own goals over those of the team (Donnellon, 1995; Hackman, 1987; Katzenbach & Smith, 1993). This study generates important contrasting insights because the innovation management teams observed in this research are not characterised by competing social identities but have a more homogenous internal structure with individuals who collaborate for the sake of the attainment of collective team-level goals. The IMT's observed in this study consist of management consultants with a shared social identity. Moreover, IMT's do not have obligations to other subunits; instead they have obligations to top management teams. However, it is important to note that innovation

management teams are driven by a strong degree of collective agency and are not merely marionettes to other subunits, or to top management. Admittedly, other units and top managers place constraints on the extent to which IMT's can have an impact on the management of innovation but based on my findings I argue IMT's proactively, not passively, attempt to enhance their position and increase their sphere of influence despite these constraints. The drivers, process, and consequences of these agentic processes are elaborated in a later part of the discussion.

Third, against common beliefs emphasising intra-team processes, I find inter-team processes to be important in the attainment of organisational coordination. Competition, conflict, or disparity between teams, hinder the process of coordination for innovation management teams. In such unfavourable contexts, IMT's attempt to cause shifts in the formal and informal structure of the innovation system to enhance their coordinative capacity. This extends the findings of prior studies which propose intra-team processes are an important mechanism to create organisational coordination (Ancona & Caldwell, 1987, 1990, 1992; Barker, Tjosvold, & Andrew, 1988). Based on my observations I add to this the importance of inter-team processes.

Fourth, this study sheds light on how linking teams in innovation systems support or manage the innovation activities of other teams. I suggest they do so by providing knowledge, resources and networks to other teams which are offered in structured forms such as innovation management tools prescribing a tangible, stage-based approach to how teams should manage innovation. In addition, IMT's co-create innovation objectives for other teams which were consistently monitored and reported. These processes are more characteristic for later stages in the development of IMT's and suggest that IMT's operate as a 'satellite team' for top management. This reveals the importance of IMT's in innovation systems which are known to be complex

organisation designs with a high degree of decentralisation of decision making (Rivkin and Siggelkow, 2003), differentiation and decomposability of tasks (Miller and Friesen, 1982; Zhou, 2013), and autonomy and adaptability of teams (Baer et al., 2010; Schreyogg and Schidow, 2010).

Fifth, innovation management teams and their structural features can change over time. I have not come across any study that explicitly covers the issue of evolving linking teams. The IMT's in three cases evolved in terms of their design dimensions and centrality in the innovation system. PCtech and Plastica are the best examples as their design dimensions changed considerable as is apparent in tables 12 and 13 in the findings chapter. These IMT's started with the task to support but eventually had to manage other teams. Furthermore, their scope developed from divisional to global which increased their centrality. Finally, their authority became enforced over time which anchored them in the task interdependence. The other IMT's did not change because of reasons inherent in the formal and informal structure. The subsequent (sixth) point elaborates on the formal structure while the reasons related to the informal structure are explained later in this chapter.

Sixth, IMT's can operate in different task interdependence configurations. In this study, IMT's operated in pooled, serial, and reciprocal configurations (Thompson, 1967). The task interdependence was an important context for IMT's since it strongly determined the IMT's starting point; i.e. the IMT's of PCtech, Reaction, and Plastica started somewhere 'under the radar' and slowly progressed into more central roles whereas Softy immediately interfered in an existing configuration and had to deal with the consequent structural and social complexities in coordinating inter-team processes. The IMT's which were more subtly introduced proved more successful than Softy's IMT. Although speculative, the comparison between Softy and the other cases suggests

a number of insights about the relationship between IMT's success and organisation design.

First, IMT's can be best introduced in task interdependence configurations in such a way that the status quo is not immediately disrupted. Pooled task interdependence would be most appropriate since teams do not directly cooperate with each other but instead their efforts are aggregated on the firm level according to the summative-composition rule discussed in the theory chapter. As was the case for PCtech's and Reaction's IMT, their IMT's could subtly introduce their support whilst gradually increasing the interdependence between them and other teams through several mechanisms which I will expand on later in this chapter. Softy had considerable more difficulties in coordinating the sales and software teams because they were positioned in a serial interdependence configuration which placed them right at the core of an existing innovation process. There was no gradual build up to the new setting which increased the resistance from other teams to accept the new organisation design.

However, Plastica's IMT was also installed in a serial interdependence context which also suggests high levels of interdependence and an immediate intrusion to an existing way of working between other teams. But why was Plastica's IMT the second most successful IMT despite the less favourable task interdependence configuration? The explanation for this resides in the differences within the common set of dimensions. Softy's IMT dimensions were designed from the beginning as being coordinating (task), global (scope), and enforced (authority). As a result the teams with which Softy's IMT had to cooperate refused to cooperate because of the sudden impact on their work processes. By contrast, although Plastica's IMT was placed in a similar task interdependence configuration their dimensions were configured as supporting (task), peripheral (scope), and optional (authority). Ergo, I argue that the configuration of firm-

level task interdependence and the team-level design dimensions of innovation management teams have an impact on the success of IMT's in effectively coordinating other teams.

Albeit design decisions proved important in driving task interdependence, based on my observations I propose an equally (if not, more important) role for more social aspects. The formal structure in all cases strongly affected the informal structure, the latter actually developed in response to the former as teams formed perceptions of the overall organisation design, and of each other. Literature has indeed suggested relationships between formal and informal structure (e.g. Nickerson and Zenger, 2002; Zhou, 2013) but the detailed process of how, when, and why this relationship emerges and evolves - particularly in the context of teams and innovation systems – has not been examined. This study has distinguished between different forms of interdependence because of an expected interplay. The findings of this study confirm this interplay and further elaborate its process which has profound implications for interdependence theory. The consistent maintenance of the distinction of between task (administrative form) and social (social form) interdependence has made the observation of this interplay possible, and allows the theoretical formulation of their interrelationships. Puranam et al. (2012) argue that highly influential conceptualisations of interdependence do not maintain this distinction or assume that different forms of interdependence are perfectly isomorphic. Deriving from the findings of this study, I argue that the two are not perfectly isomorphic; the theoretical implications of this are discussed in subsequent paragraphs focusing on the social elements of task interdependence development.

5.2.2. Teams, task and social interdependence

The organisation design literature addresses the consequences of designed task interdependence in terms of inter-actor processes, specifically in terms of information processing (e.g. Puranam et al., 2012; Siggelkow and Rivkin, 2003; Wageman, 1995). Overall, these studies suggest that the designed task interdependence configuration has implications for which and how actors interact to complete their task. My observations, however, suggest that the consequences of organisation design are more profound and further reaching than information processing between individual agents. Admittedly, the organisation design literature approaches the interdependence problem from a particular theoretical angle and is therefore not per se interested in the social consequences of organisation design, but the interrelationships between task and social interdependence, with an important role of teams, warrant more explicit attention for these social consequences.

Researchers have hinted at the relationship between task design and behaviour (Langfred, 2007; Wageman, 1995; Wageman and Baker, 1997), particularly *within* teams. From the 90's more research on task interdependence within the context of teams emerged because teams were taking an increasingly prominent place in organisations in the innovation era (e.g. Astley and Zajac, 1991; Wageman, 1995; Wageman and Baker, 1997; Campion et al., 1996; Van Der Vegt et al., 1998; 1999). Overall, the role of teams in task interdependence is predominantly analysed in extant literature as an intra-team phenomenon. The main findings of these studies are that team effectiveness increases with when interdependence increases (Campion et al., 1996; Wageman, 1995; Wageman and Baker, 1997); that innovation in teams benefits from interdependence

between team members (Van Der Vegt and Janssen, 2003); and that fierce competition within teams leads to reduced interaction between team members (Langfred, 2007). A fundamental contribution of the latter study is that teams autonomously change their structures – i.e. organisation design – to manage conflict and performance issues. This suggests the existence of agency within teams with respect to shaping task interdependence. The few studies focusing on task interdependence as an inter-team phenomenon demonstrate how task interdependence can be more dynamic in organisational activities with a degree of uncertainty (Adler, 1995); and how teams need to increase task interdependence to become more central (Astley and Zajac, 1991). A third stream focusing on both within and between team-task interdependence asserts that designed and perceived task interdependence are not always equal (Kumar et al., 1995; Nickerson and Zenger, 2002; Puranam et al., 2012; Ramamoorthy & Flood, 2004; Sherman & Keller, 2011). Sic, the task interdependence that is designed, and the interdependence that is experienced are not necessarily equal which can lead individuals or teams to have different perceptions about the same task interdependence configuration with implications for attitudes and interaction patterns.

I offer several contributions to the task interdependence literature by arguing an inter-team perspective i.e. I focus on task interdependence *between* teams. First, I confirm task interdependence as an inter-team phenomenon which adds to the few empirical studies adopting a similar perspective (Adler, 1995; Astley and Zajac, 1991). In the four cases of this study the task interdependence between the innovation management teams and business teams shaped the interaction patterns between them. However, the experienced task interdependence between the IMT's and business teams differed based on how the business teams perceived the IMT's. To illustrate, the task interdependence between Softy's IMT and the sales and software teams generated negative perceptions,

which led to negatively perceived task interdependence. Driving these perceptions was the interpretation of both teams that the goals of the IMT and their team goals were conflicting, based on perceived threats of the IMT to Sales' autonomy and Software's identity. For example, the software teams believed the IMT took away their authority and undermined their identity as the creators of intellectual capital because the IMT developed a new predefined structure that channelled Softy's R&D. The sales teams felt they lost their autonomy because their sales activities were constrained by a fixed product portfolio and subject to minimum profit margins. This led to competitive interaction patterns between Softy's IMT and these teams, or to the absence of any interaction. This contrasts the task interdependence which was designed by Softy's top management, which suggested that the IMT should manage the innovation process and interact frequently and productively with both teams. Hence, designed and perceived inter-team task interdependence are not necessarily equal; indeed, from this study it can be derived that perceived task interdependence is more salient than organisation design in driving interaction patterns.

Moreover, while the literature on perceived task interdependence mentions conflict, and helping behaviour in the case of negatively or positively perceived task interdependence, it does not elaborate comprehensively on the drivers, process, and consequences of these perceptions. This study shows that the drivers of this process derive from team related values and the perceived goal structure between teams; elements which are not always given by design. A useful theoretical perspective that connects the concepts of design, perceptions, and interactions is social interdependence theory (e.g. Baer et al., 2010; Chen and Tjosvold, 2006; Gong et al., 2013; Hirst et al., 2009; Johnson, 2003; Lu et al., 2010) .

Social interdependence theory posits that positive, negative, or unrelated goal structures lead to cooperative, competitive, or individualistic/absent interaction patterns. The findings of this study confirm this conceptual structure. PCtech's IMT for example established that innovation management positively contributed to the account teams' sales figures. As a result, many accounts perceived the goal structure between their teams and PCtech's IMT as positively related. This led to a high degree of willingness of these teams to accept the support of the IMT. Similarly, in Reaction, the IMT's goal was to support the project teams to accelerate their innovation projects, the successful project teams welcomed this support because they perceived the IMT as extra resources that could support the team's innovation performance. Hence, a positively related goal structure was perceived leading to collaboration between teams. Admittedly, these are modest contributions because they confirm and replicate (Eisenhardt, 1989) social interdependence theory. Some novelty is present in that these findings posit social interdependence theory as an inter-team phenomenon in lieu of an inter-individual phenomenon (Lu et al. 2010). As mentioned in the theory section, social interdependence has largely focused on relations between individuals within teams whereas I demonstrate its value as an explanatory device for inter-team behaviour. My findings therefore confirm that social interdependence theory can be conceptualised as a within- and as a between-team phenomenon.

A more profound contribution to social interdependence theory is that, based on my data, I suggest that in addition to goal structures, the role of team related values as autonomy and identity drive social interdependence. Teams in the innovation era are designed to operate autonomously to foster flexibility and rapid decision making in volatile contexts (Baer et al., 2010). This autonomy becomes modus operandi and when therefore a linking team is formed with a proposed task interdependence configuration

that reduces this autonomy, then it is likely that negative social interdependence between the linking team and the other team arises.

Softy's Sales team is a good example; the IMT formalised the commercialisation process of new technologies which used to be free for Sales to autonomously manage. Sales could no longer sell premature technology, sell to any customer, or sell for any price. Instead, the IMT developed six products areas, with finished products and predetermined margins which reduced the scope of potential customers. Sales therefore resisted the new configuration because of a negative social interdependence. Similarly, Reaction's low performing project teams allegedly perceived the IMT as a team that could expose their issues to the rest of the organisation. Thus, the threat of being exposed as an unsuccessful team by the IMT was seen as a threat to maintaining positive social identity, which led to discord with and avoidance of the IMT based on negative social interdependence. Plastica is an additional example: when the IMT offered innovation management tools to an R&D project manager he refused to work with these because they had supposedly nothing to do with creativity; a core value for him and his team. This did not lead to competitive interaction between the IMT and this team, this team simply ignored the IMT and their tool support.

Furthermore, a closer look at the data reveals nuance on the social interdependence between IMT and other teams, viz. the asymmetry in social interdependence between teams. Whereas all IMT's perceived a positive social interdependence; i.e. they had to support the business teams in managing innovation and conversely, they needed the business teams in order to be able to perform their tasks; by contrast, many business team perceived negative or individualistic social interdependence as illustrated in the above examples. Social interdependence theory overlooks the important issue of interdependence asymmetry. The findings clearly show examples of situations in which

IMT's experience positive social interdependence, while other teams experienced no interdependence. I propose that the interaction patterns that emerge due to this asymmetry are shaped by the team perceiving negative or individualistic social interdependence. Thus, in the case of asymmetric social interdependence, negative or individualistic perceptions are more salient in driving interactions than positive perceptions. However, over time, some of the IMT's - PCtech, Reaction, and Plastica – managed to shape the negative and individualistic perceptions of their counterparties into positive perceptions through influence tactics. Albeit researchers have explicated the dynamic nature of social interdependence, they have remained silent about how interactions drive this dynamism; e.g. how negative social interdependence could develop into positive social interdependence as the result of interaction. This study contributes that teams, by means of influence tactics as a form of collective agency, are important in driving the development of social interdependence. The main interest of this study is the role of teams in the process of task interdependence development. Whereas social interdependence theory provides insights on how structure shapes behaviour, it remains virtually silent on how behaviour drives formal structure. The interaction between behaviour and the formal and informal structure of an organisation is an important lacuna which was addressed by this study and which is further elaborated in the next paragraph.

5.2.3. Interaction and task interdependence development

In addition to competition and cooperation, an additional interaction pattern was discovered by means of this study with profound implications for the organisation design, task and social interdependence literatures. *Influence tactics* is an interaction

pattern through which some of the IMT's – viz. PCtech, Plastica, and Reaction – caused shifts in social and task interdependence; i.e. in the informal and formal structure of each respective case's innovation system. Influence tactics is different from social interdependence theory's notion of inducibility (Deutsch, 1949; Johnson and Johnson, 2006) in that it encompasses much more than members of the same team influencing each other in cooperative situations only.

Langfred (2007) shows how conflict is not only the product of team design, but also a determinant. The author demonstrates how teams with high levels of conflict respond with structural changes to resolve conflict. These findings illustrate how changes in task interdependence *within* teams - which were previously known to occur in response to shifts in task technology and the environment– can also occur in response to team dynamics, such as conflict between team members. Thus, within teams, individuals can change the team design to deal with issues as conflict.

In the case of innovation management teams: because linking teams are often located at a sub-corporate or less central position (Astley and Sachdeva, 1984) they typically have less task interdependence with other teams. This requires them to engage in purposive interactions to create this interdependence. The present study makes a more substantial contribution with respect to team-driven changes in organisation design because it reveals how the collective agency of linking teams (IMT's) instigates changes in social interdependence on one hand, and in the design of task interdependence on the other. This is found to occur by means of three distinctive influence tactics; which can manifest laterally (between IMT's and business teams) and hierarchically (between IMT's and top management teams).

The first influence tactic is *executive legitimisation*. This is a hierarchical influence tactic which is defined in this study as: “appeals to top management that increase their

interest and involvement in a specific team”. IMT’s used this tactic to increase the legitimacy and importance of their activities in the organisation. For example, PCtech’s IMT developed innovation performance indicators in collaboration with the Chief Operations Officer. Subsequently, the IMT developed management information tools which tracked the performance of accounts on these indicators. This appealed to top management because it increased their ability to grasp the reality of innovation activities scattered over more than 300,000 employees around the world. Similarly, Plastica’s IMT created a reporting tool which revealed the performance of R&D teams to top management. The performance indicators in this tool were also created and defined together with the top management team which welcomed this change by the IMT. Ultimately, both PCtech’s and Plastica’s IMT’s were reconfigured in an enhanced task interdependence configuration which expanded their task, increased their scope, and established their authority. The influence tactic ‘executive legitimisation’ therefore is an effective tactic which addresses changes in the formal structure, i.e. the designed task interdependence.

Second, IMT’s used *expertise legitimisation* as a lateral influence tactic to influence business teams. I define this tactic as “statements and actions that convey superior expertise to other teams to convince them of the benefits of cooperation”. Reaction is a good example. One of the tools Reaction’s IMT used was a diagnostics tool which measured project progress and which was negatively appraised by the innovation project teams because it made them feel ‘policed’ by the IMT; an obvious threat to the team related value of autonomy. To confront this negative social interdependence the IMT resorted to “expertise legitimisation” to persuade the project teams that the IMT is not policing them but instead supporting the attainment of their goals. Thus, the IMT increased its involvement in both the strategy and operations of this innovation project

team by offering them a vision and hands-on support to accentuate their possession of expertise and their commitment to support the innovation project teams. This caused the negative social interdependence to develop into positive social interdependence for many project teams but it did not change the task interdependence configuration. Hence, whilst expertise legitimisation as a lateral influence tactic is likely to affect changes in the informal structure (social interdependence), it is less likely to do so in the formal structure (designed task interdependence).

A third inter-team influence tactic is ‘goal alignment’; a tactic which is used both laterally and hierarchically. I define this tactic as ‘statements and actions that align a given team’s goals with the goals of other teams’. Plastica for example was met with negative social interdependence after it was reconfigured to operate on corporate level, dealing with R&D teams in different divisions. The standard approach to R&D project management and project monitoring was seen as a hostile intrusion in some regions (e.g. U.S.). The IMT therefore adapted its approach in these regions by moving from a standard approach to a more tailored approach which supported the local R&D objectives. This emphasised the alignment of goals between the IMT and those particular teams, and changed their perceptions from negative to social. Thus, when goal alignment is used as a lateral influence tactic it is likely to cause changes in social interdependence, the informal structure of the innovation system.

But goal alignment was also used as a hierarchical influence tactic. The head of PCtech’s IMT developed a “dashboard” (management information tool) that displayed how accounts that had used the “innovation diagnostic” tool were more successful in retaining customers than accounts that did not use this tool. Customer retention was a major corporate objective during the reporting period of 2011-2012. The creation of this tool therefore was a powerful goal-alignment tactic to demonstrate that the IMT’s

objectives were well aligned to those of PCtech's top management. This contributed to the top management's decision to reposition the IMT from a divisional scope to a corporate scope. Therefore, I argue that when goal alignment is used as a hierarchical influence tactic, it is likely to bring about shifts in the designed task interdependence or the formal structure of the innovation system.

Overall, the most successful IMT's were those of PCtech and Plastica. These IMT's used influence tactics of all three categories. Based on my findings I argue that it is the combination of hierarchical and lateral influence tactics that creates the most impact. Whereas hierarchical influence tactics shape task interdependence, lateral influence tactics shape social interdependence. Reaction's IMT for example only used lateral influence tactics of the types: expertise legitimisation and goal alignment. Therefore they managed to change social interdependence only whereas task interdependence remained intact. Softy's IMT did not engage in influence tactics but instead continued the competitive interaction with the software and sales teams and therefore failed to change the interdependence configuration, both task and social interdependence. PCtech was the most vigorous in terms of exercising their collective agency by using all three types of influence tactics, in both directions, and by utilising multiple mechanisms per influence tactic.

There hasn't been much empirical research on influence behaviour of managers or teams (Yukl and Tracey, 1992). The most significant contributions with respect to research on influence tactics have come from the organisational behaviour field (Ansari and Kapoor, 1987; Erez et al., 1986; Falbe and Yukl, 1992; Kipnis et al., 1980; Yukl and Falbe, 1990) which focuses on influencing behaviour between individuals. There was no literature identified on the topic of inter-team influence behaviour in firms. OB researchers have however investigated influencing in contexts other than firms while

subsequently extrapolating the findings to firms. The conclusions of these studies have been reported as established facts about influence tactics in organisations rather than tentative findings from a few exploratory studies (Kipnis et al., 1980; Yukl and Falbe 1990). The generalisation of studies conducted in elementary school findings to complex, large, hi-tech organisations as the ones examined in the present study seems implausible.

Nonetheless, two interpersonal influence behaviours from the OB literature were identified that relate to the inductively generated influence tactics of executive and expertise legitimisation. First, the OB literature reports ‘upward appeal’ as a process through which an individual seeks to persuade another person that higher management approves of their activities (Kipnis and Schmidt, 1988; Schilit and Locke, 1982; Yukl and Falbe, 1990). Executive legitimisation as observed in this study is different however in that it is a direct engagement with higher management in lieu of an argument that demonstrates alignment with higher management. This engagement increases the interest and involvement of top management in the IMT’s activities which subsequently adds to the legitimacy of the IMT in the wider innovation system. This study contributes the OB literature by positing upward appeal as an inter-team phenomenon, as a direct engagement with top management, and by elucidating its impact on the formal and informal structure of established organisations.

Second, OB researchers have examined ‘rational persuasion’ as influencing behaviour between individuals. Rational persuasion is defined as an individual using logical arguments and factual evidence to persuade another person that cooperative interaction will lead to the achievement of task objectives (Jensen, 2007; Kipnis et al., 1980; Yukl and Falbe 1990). This shows resemblance with the influence tactic of expertise legitimisation, a lateral influence tactic used by IMT’s to convince business teams to

cooperate through statements and actions that convey superior expertise. The difference lies in the importance of expertise; the IMT's of PCtech, Plastica, and Reaction emphasised their expertise to other teams, whilst PCtech and Plastica also used the comparative analysis technique to demonstrate how their expertise had helped other teams. Thus, rational persuasion as an inter-team phenomenon has more emphasis on team expertise. Moreover, the present study shows how expertise legitimisation shapes the informal structure (social interdependence) by changing negative or individualistic social interdependence into positive social interdependence.

Finally, there was no similar influence tactic found in the OB literature for goal alignment.

In sum, this study contributes to the OB literature in several ways. First, it contributes a new influence tactic to the OB literature, viz. goal alignment. Second, it presents upward appeal as a direct engagement with top management in lieu of only an argument that top management agrees. Third, it reconceptualises upward appeal and rational persuasion as inter-team influence tactics. Fourth, it shows how influence tactics can shape the formal and informal structure of an organisation which goes beyond simply attaining the cooperation of the counterparty. Finally, it offers an examination of influence tactics in present day corporations, contexts with more relevance to organisational researchers than settings of primary schools and university student populations.

Influencing in social interdependence theory is argued to occur only in cooperative settings, i.e. in the case of positive social interdependence (Deutsch, 1949; Frank, 1984; Johnson and Johnson, 2006). This concept is called inducibility which implies that team members are more likely to influence and being influenced by others in cooperative situations. However, based on this study I challenge these views by arguing that as an

inter-team phenomenon, influencing is likely to take place in competitive or individualistic settings. The IMT's of PCtech, Plastica, and Reaction used expertise legitimisation as a lateral influence tactic aimed at business teams which ignored or contested their support attempts. Through this influence tactic the IMT's convinced the business of the merits of cooperating with them. Hence, the competitive or individualistic settings evolved into cooperative settings through influencing. These findings add to social interdependence theory the importance of influencing between teams in situations of negative or individualistic social interdependence. Overall, the collective agency of teams is a driving force in the development of both task and social interdependence.

5.2.4. Centrality and power

The role of collective agency in enhancing task and social interdependence also has implications for the power literature. The findings of this study show how teams attain more centrality by improving their position in the task interdependence configuration. Extant literature on interdependence between teams mentions the importance of attaining centrality by teams to improve their power position and increase their sphere of influence which is particularly important to linking teams such as the innovation management teams observed in this study (Brass and Burkhardt, 1983; Astley and Sachdeva, 1984; Astley and Zajac, 1991). Social interdependence theory assumes that all participants in a social situation have equal power (Deutsch, 1949). Conversely, power theory assumes that power is distributed unequally among units in an organisation, and in order to gain power, teams should become more central through a) increasing other teams' dependence on them and b) increasing their dependence on

other teams which implies in more concise terms: increasing task interdependence. This research contributes to the power literature by elucidating the drivers (why), process (how), and consequences of team centrality attainment. I will discuss the drivers (why) in the next paragraph. The process has been discussed in the previous paragraph: this study reveals how linking teams attain centrality by means of interaction patterns, specifically influence tactics. Also, it elaborates the relationship between design and social elements of intra-organisational systems in centrality attainment. Lastly, it provides insights on the consequences of centrality attainment on organisation design as the linking teams in PCtech and Plastica were able to become more central, change their structural features, and increase the task interdependence with other teams.

5.2.5. Collective agency and the upper echelons

Conventional wisdom in the task interdependence literature attributes changes in task interdependence to demands of the environment or task technology (Cheng, 1983; McCann and Galbraith, 1981; Rivkin and Siggelkow, 2003; Siggelkow, 2002; Thompson, 1967). Interdependence between individuals can be modified by an organisation designer, typically from the upper echelons of a firm's hierarchy (Puranam et al., 2012). Coherent with these studies I find top managers form design decisions which determine task design, grouping of individuals into teams, and the allocation of tasks to different teams. In contributing to these findings, however, based on my observations I argue that the impetus for shifts in task interdependence can come from elsewhere but the upper echelons of the firm. Specifically, this study provides strong evidence for team collective agency as a driver of task interdependence development. This study demonstrates how this occurs by elucidating the influence tactics of

innovation management teams in efforts to shape the social and task interdependence configurations. Ergo, the notion of lateral and hierarchical influence tactics between teams answers the ‘how’ - component of the research question by clarifying the processes of how teams contribute to task interdependence development.

Having discussed how teams contribute to the development of task interdependence, I now turn to a discussion of the findings in light of the ‘why’ -component of the research question; i.e. why do teams contribute to the development of task interdependence? The next paragraph addresses this part of the research question by focusing on a theoretical framework that emerged during the latter stages of the field work: social identity theory.

5.2.6. Social identity and interdependence

An additional contribution of this study is the unearthing of social identity in studies on task and social interdependence. Kogut and Zander (1996) argue that “one of the most important identities in modern society is bound with the employment relationship and its location” (p. 503). Tajfel (1972: 292) defines social identity as: “The individual’s knowledge that he belongs to certain social groups together with some emotional and value significance to him of this group membership”. After a careful analysis of the data, I find that social identity provides the underlying theoretical logic for a considerable part of *why* teams form distinctive perceptions of social interdependence, and consequently engage in interaction patterns. Previous social identity research shows that individuals will primarily identify with their team in lieu of the organisation as a whole (Van Knippenberg & van Schie, 2000). When people therefore categorise themselves at a social level in terms of team membership, they will be motivated to do things that enhance their team social identity. This is referred to in the social identity literature as “collective self-actualisation” (Bagozzi, 2000; Abrams & Hogg, 1988;

Zander, 1971). The notion of collective self-actualisation is central to answering the question “why do teams contribute to the development of task interdependence?” The implications of this construct for unravelling the drivers of inter-team interaction are discussed next.

Organisation design and social identity

This study contributes the relationship between task interdependence development and social identity. The formal division and allocation of tasks in the innovation systems observed in this study interacted with the social identity of teams. More specifically, the design decision to create innovation management teams to support or manage the innovation process for/with business teams had implications for the social identity of the latter category. An illustration is provided by the Reaction case.

In Reaction the IMT was established to support the acceleration of innovation projects. This support was differently perceived by weak versus strong teams. Weak teams – i.e. teams experiencing performance difficulties – are confronted with challenges in maintaining positive social identity because weak performance does not cohere with a positive social identity (Haslam, 2004). The attempts of the IMT to support weak teams therefore created social identity conflicts for the former because they perceived accepting support from the IMT as threatening an already pressurised social identity. Whereas the performance issues posed the initial threat to these teams' social identity, the IMT's support attempts were perceived as an additional threat because they could expose to the rest of the organisation that these teams were indeed weak, because they are in need of support for managing their innovation. By contrast, strong teams perceived the IMT differently. Because of their high performance, and

consequently their ability to maintain positive social identity, these teams saw the IMT as a means to additional resources and therefore were willing to accept the support. Hence, the IMT was not perceived as a threat to these teams' social identity which is why they accepted their support.

Although this pattern of strong teams accepting the support of IMT's was not extended across cases, it is argued that the underlying theoretical logic is still consistent. In PCtech for example large successful accounts were identified which ignored the IMT because they believed their innovation performance was strong enough not to require any support from the IMT. The social identity of these large accounts corresponded with success and being self-sufficient. To maintain this positive social identity they therefore refused the IMT's support because this support conflicted with the social identity of success, autonomy, and being self-sufficient. Although this response by high performing teams is different than similar teams in Reaction, the reasons for accepting or rejecting the IMT support are explained by the same logic; i.e. maintaining positive social identity. The reason why high performing teams in PCtech did not accept the IMT's support was because they perceived the IMT as a threat to their positive social identity because receiving support could be seen as incoherent with being successful. The high performing teams in Reaction did not perceive the IMT as a threat because their success offered sufficient basis for maintaining positive social identity and any support from the IMT could not jeopardise this, instead it only offered them additional resources to generate more success. Ergo, organisation design can differentially impact inter-team dynamics based on how teams respond to structural changes in their direct social environment. Some teams experienced the IMT as a threat, whereas others perceived them as a resource. In Plastica, there was a small R&D group which readily cooperated with the IMT because they thought that the IMT would help them gain more

exposure to the rest of the organisation, a form of agency which clearly corresponds with the idea of collective self-actualisation. Simon (1947) suggested that in designing structures and tasks, an organisation should consider the effect this has on employees' values. From social identity theory it is derived that these values to a considerable extent are linked to team social identity. Therefore, when organisation design negatively affects or conflicts with an individual's social identity, they will be more likely to resist the suggested formal structure.

So far, the discussion on how structure impacts team social identity has centred on the perspective of business teams. From the perspective of IMT's, social identity and collective self-actualisation manifested as follows. Most IMT's (except Softy's) were initially positioned at divisional level, with limited task, scope, and authority. Because these IMT's were initially less central to the innovation system, they sought ways to enhance their social identity by means of the earlier discussed hierarchical and lateral influence tactics. Sic, IMT's contributed to the development of task interdependence because as a team they intended to become more important, i.e. to move toward a task interdependence configuration which is more favourable to the IMT's social identity.

Social identity and power

Social identity and collective self-actualisation have implications for the power literature on task interdependence. As previously discussed, this stream of literature posits that teams should attain more centrality in organisational systems to increase their sphere of influence and power position (Astley and Zajac, 1991; Brass and Burkhardt, 1993); a particularly relevant proposition for linking teams. The power literature argues that the driving force behind centrality attainment is the search of individuals for more power. More intriguingly, it is claimed that group membership puts constraints on

power because groups constrain individuals. The findings reported here challenge these views because the evidence suggests that teams, not individuals, collectively seek ways to enhance their power position by contributing to task and social interdependence. The driving force is collective self-actualisation, not individual power acquisition.

Moreover, team membership is found to be a source of, not a constraint on power. The IMT's in PCtech and Plastica considerably increased their centrality, enhanced their power position, because of their collective agency, not because of the individual agency of a particular team member. The IMT's revised structural features provided their team members with more power and influence than before. Hence, their membership of the IMT was a source of power in lieu of a constraint. In sum, based on my findings, I add to the power literature the importance of social identity as a driving influence for centrality attainment in task interdependence configurations.

Shared goals, social interdependence, and social identity

In the organisation design paragraph of the literature review chapter, shared goals were explained as a means to integrate the dispersed activities of complex innovation systems (Jansen et al., 2009). This importance was confirmed by the data which shows how the perception of having common goals between teams creates cooperative interaction patterns. Johnson and Johnson (2006) assert that the most salient goals define a situation as cooperative, competitive, or individualistic. Based on the findings of this research I contribute to theory by integrating social identity and social interdependence theory by elucidating the salience of the collective goal of self-actualisation and its impact on social interdependence. In all cases, the organisation design suggested a clear compatibility of goals; i.e. the IMT's were there to support business teams in managing their innovation process. However, negative or individualistic social interdependence,

and competitive or individualistic interaction patterns emerged nonetheless because of conflicts with team related values as social identity and threats to maintaining positive social identity. IMT's therefore purposively had to align their goals with business teams to convince them that their goals were actually aligned and that there was no need to perceive a threat or conflict which reduced and removed the experienced threat to social identity. This implies that initially, collective self-actualisation has higher behavioural relevance than goals given by organisation design. Hence, goals given by design only partially predict and explain collective and individual actions because of potentially more behaviourally relevant factors pertaining to social identity and the earlier discussed need for autonomy. However, formal goals can gain more relevance by means of the influence tactic 'goal alignment' as was observed in PCtech, Reaction, and Plastica, whose IMT's successfully shaped the negative or individualistic social interdependence with business teams into positive social interdependence. This suggests that the behavioural relevance of shared goals is dynamic and subject to the influence of interaction patterns, particularly influence tactics.

5.3. LIMITATIONS

I have attempted to design, execute, and report this study with great care. Inevitably, however, many methodological and practical decisions had to be made over the course of this research project. In this paragraph I discuss the limitations inherent to the decisions I made from two perspectives: methodological and contextual limitations.

5.3.1. Methodological limitations

The aim of this study was to examine how teams contribute to the development of task interdependence. To this end, I conducted a multiple case study in which I studied the evolution of task interdependence in innovation systems. Although a multiple case offers a robust strategy for studying organisational processes, it lacks the depth of a single case study which commonly yields a much richer account of how and why an organisational phenomenon manifests. A single case study would provide a more detailed outlook on the variables involved in the complex structural and social context of studying systems and interdependence configurations from the angle of inter-team dynamics. A single case study could for example have revealed other types of teams – in addition to linking teams - significantly contributing to the development of task interdependence. However, a single case study would lack the external validity compared to the present study which compares the role of teams in shaping task interdependence in multiple organisations, from two industries. Moreover, a multiple case study as compared to a single case study exchanges the lack of richness for parsimony which is a key characteristic of building robust theory (Eisenhardt and Graebner, 2007).

Furthermore, I have used the multiple case study method based on the epistemology of post-positivism, and adhering in its implementation to the common ‘Eisenhardtian’ approach to similar research designs in organisation and management studies (e.g. Bingham et al., 2007; Santos and Eisenhardt, 2009). In doing so, I have treated each case as an experiment, to confirm or disconfirm the findings of other cases to ultimately induce my data into ‘general laws’ or in other words: theory. From post-modern epistemological stances this is argued to be problematic because observations are said to be situational which makes generalising findings challenging, if not impossible. To

address this issue, an alternative approach to the multiple case study would have been the approach by Robert Stake (2006) who asserts that multiple cases should be investigated within a larger phenomenon, which he refers to as the ‘quintain’. The multiple case study should help the researcher better understand the complexities of the quintain in lieu of being series of single case studies combined to make generalisations. Stake further emphasises that multiple case study research needs to consider the situationality of the cases, which can be obscured by mere comparison. A downside of Stake’s multiple case study strategy would be the risk to be overwhelmed by the volume of data (Eisenhardt, 1989). Although I agree that the idiosyncrasy of each case is interesting, it would be challenging to include this in the overall study without compromising the focus on the central research question; both for the researcher and for the potential readers of any publications. In addition, if Stake’s approach would be followed, then the multiple case study would resemble a series of single case studies because of the reduced focus on comparative analysis. To connect the generated findings, a separate concluding study would be required to establish a theoretical framework that is comprehensive and comprehensible, all of which would add to the research effort and resources required to an already intensive research process.

5.3.2. Contextual limitations

To keep this study within the confines of what was manageable, I have restricted myself to an examination of innovation systems from two industries known for their focus on technological advancement. I have made a thorough analysis of these firms' organisation designs for innovation, the teams involved, and the changes in task interdependence over time. The advantage of these decisions, in addition to the given that they offered first and foremost a manageable option for conducting a research

project within the timeframe of the Marie Curie project, was that it enabled me to adequately focus on this set of firms and the dynamics between their teams through 122 interactions with more than 100 individuals. The trust I gained over the course of time also allowed me access to confidential archival documents and the possibility to observe day-to-day activities and interactions.

The obvious downside of the decision to confine the research to innovation systems, and to two industries is that it is now somewhat more challenging to make a reliable estimate of the external validity of the present findings. Albeit this study is expected to have more external validity than a single case study, generalising the findings should be handled with caution. I observed firms in two industries and do not know how the observed process would unfold in other industries. A quantitative study would have been more appropriate for broader generalisation. My model however emerged from different data sources; a highly differentiated interviewee sample; firms with different ages; and variety in organisational design, all of which added useful variance to this study and consolidate my confidence in the relevance of my interpretations beyond the boundaries of this particular study. I further believe that my findings are at least generalisable across firms in the chemical and information technology (and related) industries because the chosen cases are large multinational firms with operations across the world, and they are typical key players in their respective industries. Moreover, as the innovation discipline has become more central over recent years as explained in the theory section, generalising from innovation systems to broader organisational and administrative systems is less farfetched than it would have been more than two decades ago when innovation still revolved around the activities of an isolated R&D department.

An additional contextual limitation is the focus on teams and their collective agency in driving the development of task interdependence. A focus on teams might have

overlooked the influence of ‘lone wolves’; i.e. powerful agents not necessarily operating from a team but from their own interests. This would suggest a paradigmatic shift in theoretical focus from a social psychology perspective to an individual psychology perspective (Haslam, 2004). The latter is prevalent in e.g. the micro-foundations school which looks at how individual agents shape evolutionary phenomena such as dynamic capabilities (e.g. Gavetti and Levinthal, 2000; Felin and Foss, 2005; Salvato, 2009). This work attempts to unveil individual micro-foundations (Felin & Foss, 2005; Felin & Hesterly, 2007) of organisational phenomena; specifically by looking at the role of managerial cognition and emotion (Gavetti, 2005; Hodgkinson & Healey, 2011) as a foundational element of organisational capabilities. The emphasis on individual agents is also present in studies on task interdependence (e.g. Puranam et al., 2012) which conceptualise task interdependence as a phenomena occurring between individual agents in lieu of teams. I believe however that a focus on task interdependence as an inter-team construct in examining organisational systems is valuable because I took seriously the assertions from social psychology that people derive part of their identity and sense of self from the work groups to which they belong (Hogg & Vaughan, 1995; Hogg & Terry, 2000). These assertions have been strongly confirmed by the findings of this study. Nonetheless, my theoretically argued focus on teams could have rendered my observations ‘theory laden’ – i.e. ‘over-focusing’ on teams – while potentially neglecting important efforts and influences from individual agents. I find support however in other studies (e.g. Kogut and Zander, 1996) which explain that self-interested behaviour is but a single facet of human motivation. Other drivers pertaining to collective agency are argued to be at least as important in driving the actions of organisational actors.

5.4. Agenda for future research

These limitations however also present possibilities for future research. Therefore, before finishing this thesis with a list of brief concluding remarks, I will present a concise research agenda containing three potential avenues for future research. These avenues build on the research findings of the present study and may therefore be seen as logical extensions. The four future research topics I would like to propose are: (1) the development of task interdependence in stable industries; (2) the role of other types of teams in driving task interdependence; (3) the relative effect of different influence tactics in shaping task interdependence.

1. *The development of task interdependence in stable industries.* This research project has focused on firms in industries driven by technological discontinuities forcing firms to emphasise innovation. The inherent dynamism in such industries is likely to affect organisation design and task interdependence in distinct ways as the environment is one of the key determinants of task technology and interdependence (Rivkin and Siggelkow, 2003; Thompson, 1967). Similarly, in stable industries the environment is likely to shape internal organisational structures and processes differently than in more volatile industries (Volberda, 1999). The organisation design process driven by top managers is likely to bring about different types of teams, different task interdependence configurations and consequently different inter-team dynamics. Particularly, in the case of more traditional organisational systems as manufacturing, operations, or sales, the emergence of novel teams as innovation management teams is less likely because of established approaches and practices of managing these systems. The IMT's in this study were new to their firms and had to establish themselves by influencing task and social interdependence. In firms operating in stable industries, the teams involved in any given organisational system are likely to be part of the system for a longer period of

time, with a *modus operandi* that is familiar to the system. It would be interesting to see how task interdependence evolves in such settings. Do teams contribute to its development or is it to larger extent prone to the traditional drivers: task technology and environmental demands translated into a design by top management? Does team collective agency matter in organisational designs with less uncertainty and dynamism?

2. *The role of other types of teams in driving task interdependence.* In this study, I mainly focused on a specific type of team: linking teams. Innovation management teams are linking teams in innovation systems which play an important role in shaping the development of task interdependence. In the future, researchers could look at other industries, other firms, and other organisational systems to evaluate whether other types of teams could play an equally, or more important role with regards to task interdependence. Even in innovation systems other types of teams can be more dominant considering the emergence of new teams e.g. corporate venturing teams (Birkinshaw et al., 2002); incubators (Colombo and Delmastro, 2002); intrapreneuring teams (Menzel et al., 2007); product innovation teams (Moenaert, 2004); dedicated innovation units (Tushman et al., 2010); and innovation analysts (Leonardi, 2011). The heterogeneity in innovation systems could therefore present other teams as more vigorous in driving task interdependence in future studies. This study merely opens up the discussion for more emphasis on team collective agency in studies on task interdependence. Additional research is required to offer a more comprehensive overview of which teams shape interdependence, and how and why they do so? Is there any relationship between the type of team involved and the process of task interdependence? Do they all use influence tactics? If yes: which influence tactic is used and is this related to the structural features of the team?

3. The relative effect of different influence tactics in shaping task interdependence.

Although this study highlights influence tactics as effective mechanisms through which linking teams shape task and social interdependence, it does not elaborate on the relative effects of each tactic beyond distinguishing between vertical and lateral influence tactics. In the present research I have used the multiple case study method to assess how teams contribute to the development of task interdependence and have found influence tactics to be the interaction pattern through which this occurs. A cross-sectional method like survey research is probably the best choice for testing hypotheses concerning which influence tactics may be most effective while leaving space for the discovery of tactics not observed in this study.

Moreover, this research shows how linking teams become more central and powerful over time by using influence tactics. Future research could address whether the influence tactics utilised to get to this enhanced position in the task interdependence configuration remain to be used once this position is attained. Also, how do other teams respond to an increasingly powerful linking team? Will they respond with similar or other influence tactics to also gain more centrality, or reduce the centrality of the linking team? These types of questions are best addressed using methods similar to this study considering the emphasis on process and longitudinality. Ideally, a longer time interval could be considered to include more stages in the research analysis. Because I had to confine myself within the boundaries of what was manageable in this study, I could not continue data collection beyond the 24 months of field work invested in this research project. That said, I am still in touch with representatives from the case firms and hope to continue this research in the future.

6. CONCLUSION

6.1. Contribution to theory

In the present volume I have examined how teams contribute to the development of task interdependence. I thus studied teams in firms as they organised for a specific organisational task: innovation. I started by identifying the teams involved in the task interdependence configuration of four firms' innovation systems operating in two industries: the information technology, and chemicals industries. The findings reveal a number of contributions to knowledge.

First, a particular type of linking team – innovation management team – has been identified in this study which is created by firms to contribute to the coherence of innovation activities across teams. These linking teams have distinctive features in the categories of task, scope and authority and can exercise collective agency to make an impact on the development of task and social interdependence; i.e. formal and informal structure.

Second, I present the development of task interdependence as a team-driven process that unfolds in conjunction with perceived, inter-team social interdependence, a relationship between two types of interdependence rarely examined before (Chen and Tjosvold, 2008). Firms create linking teams – innovation management teams (IMT) - to support or manage the innovation process across other teams. The task interdependence between the IMT's and the teams they support or manage can give rise to positive, negative, or individualistic social interdependence based on how teams perceive their goal structure to be interrelated; and more significantly based on the impact of task interdependence on team related values of identity and autonomy. Based on the type of

social interdependence perceived, teams interact competitively, cooperatively, or resort to influence tactics.

Third, through these interaction patterns, teams play an important role in influencing the development of task interdependence in innovation systems. Specifically, innovation management teams purposively shape task interdependence by utilising influence tactics to alter task and social interdependence. Two categories of influence tactics have been identified. Hierarchical influence tactics were aimed at top management while lateral influence tactics were targeted at other teams. Moreover, while hierarchical influence tactics cause shifts in task interdependence, lateral influence tactics affect social interdependence. Furthermore, within these two categories; three types of influence tactics were observed: executive legitimisation (hierarchical); expertise legitimisation (lateral); and goal alignment (hierarchical and lateral). The combination of hierarchical and vertical influence tactics has the most impact on shaping task and social interdependence to a more favourable configuration. IMT's which use both categories are the most effective in shaping task and social interdependence and as a result will increase their centrality in the innovation system.

Finally, on a more fundamental level, I introduce social identity into research on interdependence. By means of this study I offer convincing evidence that the way teams influence the development of task interdependence originates for an important part from the social identity of their team. Social identity shapes intergroup perceptions of mutual or conflicting goal structures and interferes with the social interdependence between teams. Also, social identity drives teams to pursue the goal of 'collective self-actualisation' which is aimed at enhancing and maintaining positive social identity, a social strategy of relative positioning between teams. As linking teams, IMT's seek to improve their position vis-à-vis other teams in the organisational system to fulfil the

purpose of collective self-actualisation, particularly if initially, by organisation design, they are positioned at less central positions in the innovation system.

6.2. Contribution to methodology

Although I have used a research design which is quite established in organisational research, I will summarise some of the main learnings from using this method. I will also provide some modest contributions to the multiple case study method. I commence with the learnings.

A crucial element of multiple case study research is the art and science of practising qualitative methods. 'Qualitative methods' is a term that can mean different things to different people. Personally, I have experienced it as a means to investigate a complex phenomenon touching upon several disciplines and literature streams. Admittedly, the research process often occurred in a messy way because of the richness and volume of data, plurality of data sources, and data stemming from multiple firms. Nonetheless, I benefited greatly from a number of analytical tools such as the interview protocol, contact summary form, and the Nvivo software package. During data collection, the interview protocol provided a useful 'light' structure preventing informants from being confused and offering me a thread to guide the conversation. Furthermore, a critical tool proved to be the contact summary form which I took from Miles and Huberman (1984). This has been extremely important in directly making sense of an interview because I completed these forms immediately after an interview. Furthermore, the contact summary forms contributed to a data collection process in which interviews built on each other and during which I was able to be continuously aware of relationships between informants, themes, and categories. Finally, QSR Nvivo8 was a central device

in the analysis stage. I attended an Nvivo workshop given by the University of Leeds' Staff and Departmental Development Unit on 16 May 2011 which offered me the basics of working with Nvivo. I learned most however by actually applying it to my own data. I was sceptical of using this software at first because of the amount of preparatory work required which would potentially cost me as much time as doing the coding and analysis process manually, but having used it I would recommend it to anyone working with qualitative data. Once the data was coded I was able to efficiently perform queries on the data by looking at specific codes, combinations of codes, or highlighting codes from a particular informant or a particular case. The comparative character of doing multiple case study research required me to look at the data from different angles and continuously juxtapose and 'drill down' when a pattern seemed to emerge or when I encountered contradicting evidence. In sum, the messiness of qualitative research is a challenge but in retrospect it was manageable and feasible because I had access to a set of analytical tools and instruments.

Another characteristic of doing multiple case study research is pragmatism. The initial objective of my research project was to conduct qualitative research at one of the industry research partners of the FP7 ManETEI network. After a series of discussions this partner proved not willing to cooperate for this purpose which left me with a challenge of finding another firm willing to allow an inexperienced researcher to look at arguably their most critical strategic capability: how they manage their innovation system and innovation processes. Although the rejection from the industry partner was disappointing, it forced me to address my contacts – particularly those stemming from when I was working as a business intelligence professional in the telecom industry – to get access to firms willing to embark on a research project. The result was above expectations in that I met individuals who were genuinely interested in the research

topic and who consequently not only agreed to be interviewed, but who also proactively suggested other informants and topics I could include in my study. I learned that pragmatism and social skills are important qualities of a qualitative researcher in getting access to firms, enthusing people for research projects, and being able to make interviews a pleasant and informing experience for both the researcher and the informant. I approached my research subjects as individuals and hence I did not consider the interviews as a mere data extraction exercise. It therefore occurred that informants would start discussing a less relevant topic and I would allow them to ask me questions or to provide their views on this particular topic. An alternative option would have been to interrupt them – which I sometimes had to do when these diversions become too lengthy – but usually I would allow this sort of thing to happen to ensure that the informant left the interview in a positive state of mind.

A different element of conducting multiple case study research was the grounded approach. As mentioned a number of times in the previous chapters the research focus of this study took a number of twists and turns over the course of this project. I learned that having a grounded approach to multiple case studies means not panicking when your data tells you a different story than the one you were initially interested in. In essence, I experienced my data as a research colleague who would often hint at other interesting avenues to explore, but whom I also had to ‘control’ in order not to explore everything and find nothing.

Writing up qualitative research has been an extremely interesting learning experience. My tutors explained to me the amount of creativity and ‘art’ required to integrate all the components of a qualitative research project – especially when dealing with several cases – and present these in a convincing and attractive manner to the academic community. When I started writing conference papers in 2011 I discovered that my PhD

colleagues who were doing quantitative research experienced a much more straightforward approach in conducting and writing up their research. One of the main things I learned from writing papers based on qualitative research is coping with rejection. Working on a paper for months and then being rejected was like stepping in a bath of ice-cold water after running a long marathon. “That’s part of being an academic” was the response of my first supervisor, a reality which I had underestimated. At the other end of the spectrum is the satisfaction I felt from writing and completing several papers for leading conferences, completing two book chapters, and having a paper under review in a high impact journal.

An additional learning point from writing up qualitative research is my approach to existing studies. My first papers had quite a naive perspective on gap spotting in the literature. Researchers typically start studies with different interests and different assumptions. My responses to extant research were initially consistently formulated as: “they overlooked A, B, and C” or “they ignored the important issue of A”. One of the reviewers taught me that this type of comment is a bit unfair because of the just mentioned reasons. My language subsequently changed into “what would complement this study is..” or “a useful addition to the valuable insights these studies offer would be...”. This review therefore played an important part in shaping my writing into a more mature and more appropriate style.

Finally, as a contribution to multiple case study research according to the ‘Eisenhardtian’ approach I propose the use of ethnographic techniques. I spent time in two of the cases’ offices which offered me valuable insights into how research themes manifested in the organisational reality of the firms where my informants conducted their day-to-day jobs. A common critique of using interviews as a data source in qualitative research is that it is more of ‘retrospective sensemaking by image-conscious

informants' than actual data collection (Eisenhardt and Graebner, 2007). The opportunity I had to actually observe and corroborate data I retrieved from interviews fortified my findings and offered a more convincing argument. Hence, I believe that the use of ethnographic techniques in multiple case study research can help researchers to defend against this common critique, leaving aside whether this critique is justified or not.

6.3. Contribution to the practice of innovation management

This study would not have been possible without the cooperation of practitioners from several firms and disciplines. I am greatly indebted to the professionals who opened the doors of their firms to me – a novice researcher –and allowed me to learn from them and learn with them. Based on this research project a number of implications for practitioners can be derived which I will summarise in this section.

First, this study of task interdependence in innovation systems from the perspective of teams indicates the impact of formal structure on informal structure. Although firms may think of brilliant blueprints of how to structure and manage innovation based on principles of ambidexterity, open innovation, corporate effectuation, or intrapreneurship; the effectiveness of these designs hinges to a great extent upon how the involved teams perceive and respond to the proposed structure. The notion of goal structure between teams is a key point to consider when building innovation systems. Managers should formulate and emphasise goals in such a way that a strong impression of cooperative goal structures is experienced. Also, managers should observe and assess whether a (re)design of task interdependence has an impact on the autonomy or identity of other teams. This way, the interaction between teams is likely to be constructive and collaborative which will benefit the effectiveness and efficiency of innovation projects.

Admittedly, my message may not resonate with firms following the fad of promoting competition between innovation teams. However, based on the findings of this study I argue that teams in innovation systems incline towards cooperation instead of competition. This opposes premises originating from Social Darwinism which advocate competition as a means to approach optimal results. I instead recommend to top managers and designers to encourage cooperation when defining tasks and objectives because building on the present work I believe that cooperation creates a much more sustainable and productive environment than competition.

Second, to manage the complex and often scattered activities of innovation systems, firms can benefit from linking teams. The innovation management teams observed in this study were differently configured and positioned, and over time, achieved varying results in terms of their effectiveness and centrality. When structuring IMT's, firms should introduce them subtly in the existing innovation system to give other teams time to discover their interrelationships with these IMT's. This should reduce the potential negative impact on the autonomy and identity of teams and prevent IMT's from entering a task interdependence configuration as a bull in a china shop. In this study, the IMT's which started at less central positions, with limited authority became the most successful in enhancing their position. This development was also driven by the IMT's ability to influence top management and other teams. This implies that firms should employ individuals for linking teams who are socially and professionally capable to interact with teams from various disciplines and hierarchical levels. Therefore, it is proposed here that IMT members should be professionals with broad backgrounds similar to the 'consultants' of PCtech's and Plastica's IMT's – the most successful IMT's of this study.

Third, innovation management tools played an important role for IMT's to express their expertise and support other teams. Innovation tools can increase problem-solving capacity as well as productivity. Furthermore, innovation tools enhance the communication and interaction among teams by establishing a common language for different aspects of the innovation process which contributed to the inter-team perceptions of having common goals. When selecting existing tools or developing new tools, managers should consider how these tools benefit the objectives of the receiving end to achieve a positive social interdependence based on a mutual goal structure, and consequently cooperation in deploying and implementing tools. In addition, tools should be relevant and simple in order to lower the barrier for acceptance.

Finally, collective self-actualisation is an important driver of the action of and interaction between teams. Teams in innovation systems want to be seen as important and central, particularly linking teams which have a less tangible and straightforwardly defined social identity than other, more specialist teams. This study shows examples of how innovation management teams enhance their position in the organisation through engaging in influencing to move to a more favourable configuration of task interdependence. Moreover, examples of business teams have been given which did not want to cooperate with an innovation management team because the social identity of "success" did not match the notion of "receiving support". Simon (1948) had already explained how firms, in setting structures and tasks, should consider the effect of these decisions on the individual's values. These values are to a considerable degree related to the person's social identity and underlying objective of self-actualisation. Therefore, when an organisation design negatively conflicts with an employee's values, then dissensus and resistance are likely to emerge from this particular individual. This study elaborates and supports these thoughts. *Sic*, although organisation design matters in the

structuring of task interdependence, I find that social identity can play a critical role in shaping its subsequent development through perception and interaction. So in order to prevent *bellum omnium contra omnes*, organisations had best consider the social identity of their employees by finding a way to establish an overarching ‘innovation-identity’ which can serve as an umbrella for connecting the identities and objectives of all involved teams in the innovation system. For a more elaborate account on combining identities I refer the reader to a study by Pratt, M. G., and Foreman, P. O. (2000): “Classifying managerial responses to multiple organizational identities.” *Academy of Management Review*, 25(1), 18-42.

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Appendix A – Example of interview transcript

Interview with Mat Smith at Softy Software team

INTERVIEWER: Ok Mat, welcome. This data will be anonymised so your name will not appear in any of the material, none of the material will be shared with anyone until I have shown you the transcription and interpretation of our conversation. You can then decide for me to leave everything out or parts of it out and you are able to withdraw or allowed to withdraw from the interview at any point.

INTERVIEWEE: Ok. Hi I am Mat Smith, I am a software engineer and the main language I use is C. We produce the CCU which is, just...don't know what it actually stands for now, something central unit. It's basically a router that uses 3G to talk to a home agent and it is basically a router, so passengers on the train can browse the internet.

INTERVIEWER: And you developed the Software...you are a software engineer...what is your role in this technology?

INTERVIEWEE: I write the programs that deal with, the routing of the packets, any other software that's needed done on train. Like the web browser, we have our own bespoke programs like passenger accounting, which uses triple A. Some companies want to transfer access, others just want to know that somebody is using it so we love the fact that people are starting to use it, when they have stopped using it. The stuff that I am working on at the moment is the communications between the CCU and home agent. It basically creates a tunnel through which everybody uses the communications line. We also have programs that do telemetry, how fast the train is going, where it is. The various parameters for each of the 3G carriers like signal strength, Bandwidth. That's about what springs to mind at the moment, because that's what I am working on at the moment.

INTERVIEWER: Yes seems like an awful lot. Who are your colleagues and who do

you report to?

INTERVIEWEE: Based in the Newcastle office, there are six of us based in Newcastle. There are a couple of other people both in the UK and abroad, I report to Robert Shaw, who I think you should have been interviewing, but he is otherwise engaged. He reports to Eric and Eric reports to Steve, so I am down there.

INTERVIEWER: Well, I don't have the impression that it is very hierarchal here.

INTERVIEWEE: Yes, we just all work together; it's not strictly hierarchal, as most companies would probably be.

INTERVIEWER: That's the advantage of working for a relatively young firm. I assume you are on the brink of entering the next stage in your life cycle. Considering how...the work load of everyone and how your expanding, growing...

INTERVIEWEE: I think we are looking at two more for our department, our department alone. They are looking to get the office plan reorganised so to fit more people in. It was either that or find different premises, I mean we're already using two floors in this place.

INTERVIEWER: Yes, so the other floor as well.

INTERVIEWEE: That is where we started off, just downstairs then we moved up here, took on some more people now we are running out of space again.

INTERVIEWER: I think that will be a continuous story for them, for the next couple of years. Mat you're a software engineer, what is the role of innovation in your work? How does Softy from your point of view

innovate? I mean you're in a high-tech environment. So, I assume this must be some form of innovation.

INTERVIEWEE: Not too sure exactly what you are after.

INTERVIEWER: You're doing things in a certain way, then you have these developments software developments...technology developers outside continually, how do you stay aligned with those developments?

INTERVIEWEE: You mean sort of new products coming on...

INTERVIEWER: Yes

INTERVIEWEE: Say a new modem comes along that, we want to use. We then just stick it in a CCU and see if it works with the existing code that we have got. If not, we try and if necessary reverse engineer it. I mean Modems, in particular, we generally send them to [Inaudible] [06:05] commands to start it up and to connect. Most modems are the same, but occasionally we get different ones so different technologies. You've got 2G and 3G in this country, you have CDMA in Norway and The States, so if we need to do something using those we cannot do it in this country. So, we put it on the CCU and either States or Norway or wherever, we try and see if the existing code works with it if not we mess around with it, poke it prod it and see if we can get it to do what we need. Failing that we go back to the manufacturers and say, "how do we do this, how do we do that." We've got a problem with the Sierra Modems at the moment in that the driver that the Sierra provide, occasionally breaks, they tell us what to do. What sort of commands to send it to get some debug out, that happens then we send the debug back to Sierra , it is a two way process.

INTERVIEWER: Okay, depending on the hardware developments, you write software to match it.

INTERVIEWEE: Yes.

INTERVIEWER: And if this hardware is revolutionary, a new nature, then your job must be really hard. How do you communicate with these guys, the suppliers?

INTERVIEWEE: There are generally standard ways of talking to devices, for modems it's AT commands, for things like access points you've got protocol called SNMP. When you send it a message, gives you a message back. Very rare to have come across a device that doesn't use a standard method of communicating with it. The last one was fireside, which produced a very high speed Wi-Fi connection. They did not support SNMP; they only way we could get information out was to automatically create a Telnet session. Send it a command that way and then pass the data coming back out. Took a while to working with fireside, it actually gets the right commands to send it to get the information out that we needed. I think, we are still waiting on them to finish that. So, rarely it's the vendors themselves, that have to change something in their equipment but most of the time it's us changing our code.

INTERVIEWER: What about things like LTE, how do you prepare for that?

INTERVIEWEE: I am not involved with LTE, but again, I think it's just basically from what I have overheard, basically trying the existing drivers and tweaking them rather than starting from scratch again.

INTERVIEWER: If I am correct, in your field of work, it's more of incremental steps it's a not a...

INTERVIEWEE: Most of the time, yes it is incremental, it's building on what we have already got, rather than inventing it from scratch.

INTERVIEWER: Yes exactly, so you haven't experienced in your career so far, here at Softy that you had to fundamentally do something new.

INTERVIEWEE: I ended up having to, from scratch write the, we not only use modems, we also use what is known as, "wireless client bridges". It's basically the same thing, you have in your laptop to connect to WIFI, it's a little box, it's just the same thing but it plugs into the CCU. I had to write the driver that will use that as a connection in much the same way we use the modems.

INTERVIEWER: And how did that story occurred...someone told you, "Hey, we are going to use this..."?

INTERVIEWEE: Yes it was handed, WCB and make it work.

INTERVIEWER: Who handed it to you?

INTERVIEWEE: Steve or Eric, I am going back about two or three years now.

INTERVIEWER: Who is Eric?

INTERVIEWEE: Eric Coder.

INTERVIEWER: I have heard the name from your colleagues, but I have not met him. Is he based here in the Newcastle?

INTERVIEWEE: He is based here, but he is in The States at the moment.

INTERVIEWER: Did they explain why they wanted to use it or...?

INTERVIEWEE: More or less, yes, as I said it is basically like another Modem, it's another way of getting data off the train and back onto the train. It connects to...what they do is, they have wireless access points on the stations. So whenever the train is in a station...you've got lot more bandwidth because you're talking over that bit of WIFI.

INTERVIEWER: And the main advantage of this innovation was?

INTERVIEWEE: Speed, more bandwidth, when the train is stationary in the station.

INTERVIEWER: So Passengers on the train can have faster internet?

INTERVIEWEE: Yes.

INTERVIEWER: Was this innovation customer driven?

INTERVIEWEE: I am not sure actually, probably, it was for NSB in Norway, again...

INTERVIEWER: Is there a lot happening there in Norway, I have the idea... watching movies on the train...

INTERVIEWEE: They did actually start off having movies on the train, but it was actually based on the train, not going over the wireless to get the movies.

INTERVIEWER: Mat, my apologies, let's go back to the new Modem, they give you the box and told you to make it work and then what did you do?

INTERVIEWEE: Plugged it in, it took...the main method of communication that was SNMP. So I had to go look for the documentation for...which data I needed out of it. It was difficult to find actually, I ended up just asking it, "Give me everything that you can". And looking for some likely values and then I ended up writing the driver, which talks WSNMP to the WCB to get things like bandwidth, whether it's actually connected or not, signal strength and that sort of thing. So when the train pulled into the station, the WCB will connect to the wireless access point on the station side. I detect the fact that it is connected and then I try and open up a path to get an IP address from the far side. So we can actually use that as a link and I've brought up the link from...the CCU actually talk through that connection.

INTERVIEWER: And before, do you use whiteboard...draw up on the whiteboard or...?

INTERVIEWEE: In that particular case, no.

INTERVIEWER: To me, it sounds complex, all these steps and all these connections.

INTERVIEWEE: It's fairly standard...it's not too dissimilar from a Modem. So, I already knew how the Modems work and the processes they have to go through to bring up a connection to be able to talk through it. WCB basically is no different, it is just how you do each step that's different, but the steps themselves are very similar.

INTERVIEWER: And this was an example of someone giving you a new product to work with...so you had to...

INTERVIEWEE: Yes

INTERVIEWER: Are there any examples where you and your colleagues come up

with new ideas, “look we have to do this, otherwise...”

INTERVIEWEE: Something, I am working on at the moment, basically the connection between the CCU and the home agent is...the way it is configured is static. Each CCU knows which port number to talk to on which home agent and things like keys to encrypt the connection. What we want to try and go forward to is to be...make the CCU be able to choose, which home agent it goes to, at the moment it's just a fixed connection. If the home agent isn't there, the CCU cannot work. Going forward, we want to give the CCU say, three IP address to go and try for three different home agents and the home agents should tell the CCU...CCU brings up connections, home agents says, “can I talk to you?” home agent sends back a message saying, “yes on this IP address, on this Port”. Or “no”, and it goes off and tries a different one, or goes off and tries a different one. Going forward, that's going to be expanded to a default set of home agents. So, we can send out all the CCUs with the same configuration. CCU connects to the home agent, home agent says, “yes you can connect” and the CCU tries and gets a configuration for itself, that is not the default.

INTERVIEWER: So, you have a more optimal way of configuring these connections dynamically?

INTERVIEWEE: At the moment, it's all static and I am starting on the path to try and get it more dynamic.

INTERVIEWER: And how did this idea emerge?

INTERVIEWEE: It is something we have been wanting to do for a while, it's just that recently, we have had more impetus in trying to get it done, because of one of our projects, something like 300 trains and at the moment three home agents probably going up.

INTERVIEWER: That's a lot of static...

- INTERVIEWEE:** Yes, at the moment, it has be hand coded, we would like to go forward and be able to just sort same configuration on everything and...
- INTERVIEWER:** So, is the scale of your operations is increasing? That you have to create more efficient, innovative ways to solve these things?
- INTERVIEWEE:** Yes, because Norway started off with 16 trains, it's now forty to fifty odd trains. Virgin has about 50 again, those are about the size when we first started now going to Amtrack. We are getting into the hundreds and sort of going forward and may get a thousand or so. For a single project and that's a lot of trains to configure, whereas as if you can give the same configuration to all of them.
- INTERVIEWER:** Why do you not just copy from your competitors?
- INTERVIEWEE:** How do you mean?
- INTERVIEWER:** Look at what they're doing it and do it smarter or are you the leaders and they are copying from you?
- INTERVIEWEE:** I am not sure, I am not really involved with that side of things, I am generally told...given a brief of what needs to happen, then I go in and flash it out and write it down.
- INTERVIEWER:** This idea sounds quite...would have lots of impact. How did you come up with this idea, was it just something "o we have to do 300 trains?"
- INTERVIEWEE:** It was a couple of sentences on a report or something ,then Eric said, he fleshed it out a bit more saying, "eventually we wanted to do this, this and this". And I was told to go and implement some

of it, so I took 4 paragraphs wrote a 20 page document on how it's going to be done and that's what I am in the middle of doing at the moment, trying to implement it at the moment from my spare. So it probably initially started off as a single paragraph in a sales bid.

INTERVIEWER: It started in your team, this idea, right? This idea of making it more dynamic configuration

INTERVIEWEE: As I said, it is something we have wanted to do for a while now, a couple of years at least, but there has been no impetus to get it done because of the more pressing things to be done.

INTERVIEWER: "We" as in your team or "we" as in Softy?

INTERVIEWEE: Mainly our Team, then again when I first started with the company there was about three of us. Now, it's about 10, spread all over the place. So the design process is starting to become more formal now and I am trying to push for, write the documentation first and then do the coding. Rather than doing the coding with the intention of doing the documentation later but it never gets done, because people forget or something else just has to be done now and documentation never gets written.

INTERVIEWER: Yes. And do you feel you have enough time to creatively think about things or is the work load that high that you...it's just doing business as usual from day to day.

INTERVIEWEE: I have time to explore ideas and this home agent, this dynamic home agent thing. I have talked it through...bits of it through with three people, generally on a white board. Just to try and make it more concrete as to what actually needs to happen. Rather than saying, "a CCU has to be able to talk to one or two home agents and get its own config." I have written the technical spec that says, CCU will try for this home agent or that home agent, the home agent will then send back a message indicating what home agent it is for that particular CCU whether it's the primary one or a secondary one or say the factory default one. What I haven't done yet is how the CCU gets its own configuration, because at the

moment, we are only going half way with it and that CCU generally has a idea of what it should be, i.e. an Amtrack CCU rather than a factory new CCU. So all the CCUs will know they are AMTRAK and which home agents they should be looking to begin with.

INTERVIEWER: What I find interesting, is that you have been postponing this idea for a while, now it has become more urgent to do this.

INTERVIEWEE: As I said, if it was not a necessity for AMTRACK, it would probably not be being done now.

INTERVIEWER: So I haven't spoken to anyone who has told me ideas or innovation, regularly gets rejected or denied. It seems to me that ideas get put on the hold, if they are not very urgent and perhaps implemented at a later stage. Or have you guys been reminding the organisation that, "Look we need to do, we need to do this" throughout these years.

INTERVIEWEE: The implementation is generally driven by the needs of projects. For example: this dynamic home agent thing was needed for AMTRAK, so it's all driven by what's needed for projects. We have very little time to implement stuff on the wish list, if you like. But it is noted, there is a list somewhere of things that we would like to do, but we haven't got round to doing yet, because of everything else that does need doing.

INTERVIEWER: So the most important justification to implement an innovative project is the project need?

INTERVIEWEE: Yes

INTERVIEWER: This very interesting project, this dynamic home agent. It will change things fundamentally for you guys, regarding how you implement your projects and how you steer the communication of

all these leads. So this will enable you to become a more mature organisation, because you will be able to implement bigger transactions more efficiently. So this is a strategic leap, so I think your CEO will be happy with the implementation of this project, how many people are working on it?

INTERVIEWEE: On this particular aspect, just me at the moment.

INTERVIEWER: OK

INTERVIEWEE: But I am having to do both sides, basically we just need to talk with each other. I have to write the bit on the home agent, the bit on the home agent that accepts or denies the request and the bit on the CCU that actually makes the requests.

INTERVIEWER: How much percent of your time does this project take?

INTERVIEWEE: It's taking all my time at the moment. I would like to have 6 weeks on it but I have been given 3 weeks.

INTERVIEWER: So there are over hours involved?

INTERVIEWEE: Possibly.

INTERVIEWER: Thank you, does this project have a name?

INTERVIEWEE: I think it's just AMTRAK.

INTERVIEWER: Ok

INTERVIEWEE: AMTRAK is a company, I think we have several different projects and they probably got their own project codes, but it's only known as AMTRAK.

INTERVIEWER: You are just given the resources to solve the problem and you have 3 weeks to solve it and do you report within these 3 weeks, daily weekly, regarding your progress?

INTERVIEWEE: No. We've got a tracking system and I have created a couple of tickets for bits and pieces of the project, like to be on home agent, to be on the CCU. The documentation just to remind myself to what needs doing and I have a ticket number to book out against. Soon as I've done that bit of project like documentation I've done most of it, so that one is closed. I am in the middle of doing the bit on the home agents at the moment, then I'll work on the CCU. But there is no formal reporting of progress but there is an informal one using the ticketing system.

INTERVIEWER: Do you need to stay in touch with other departments or teams regarding compatibility of their services with this new innovation?

INTERVIEWEE: There is very little third party impact. All I am doing is, removing the static configuration out of the configurations as a whole. And putting in its place a more dynamic one, but there is very little impact on anything else that's running on the CCU.

INTERVIEWER: Ok

INTERVIEWEE: All it's doing is bringing up the communications.

INTERVIEWER: But if there were a lot of impact?

INTERVIEWEE: What I did in this particular case, when I drew up the

specifications I actually sent it round to everybody, who could be affected by it, just to read if they need to. But I think any impact, there will be a small impact on certain programs, but I will probably end up doing those changes myself, rather than other people doing it.

INTERVIEWER: Before you started working on this idea, you sent around, “Look, I am working on this, is there any impact, contact me”.

INTERVIEWEE: The difficult bit on that is getting people to actually read it.

INTERVIEWER: I am familiar with that. Tmobile was always...people are sending our project documents or project intake documents, impacts, no responses, things change. “Hey [inaudible] [0:26:37] we changed the system, why did you not tell me.” “We told you...”

INTERVIEWEE: “I did 3 months ago”.

INTERVIEWER: *[laughter]* Yes it used to happen quite often. Well, you are doing some brilliant work, thank you. I am not going to take more of your time, I promised you guys no more than half an hour. Thank you Mat. Good luck with this project in Softy.

Appendix B – Example of contact summary form from PCtech

Contact Summary Form

Contact Type (Check with X):

Visit: _____

Contact Date: __9-11-2011__

Phone: _____

Today's Date __29-11-2011__

Meeting _____ X _____

Other (Specify) _____

Written by _AE

Sites: PCtech London office

In answering each of the following questions, enumerate as needed, and write on back of sheet if not enough space.

1. Are there specific things that you would like to learn at this contact?

Role, organisation and perception of PC corporate innovation team, group dynamics, processes, tools.

2. Who were the actors present at the contact? (Provide real names or pseudonyms if necessary, affiliation, and title)

Andre Rousseau (pseudonym), Innovation Manager, team member of the PCtech corporate innovation team.

3. What were the main issues or themes that struck you in this contact?

PCtech's corporate innovation team is the formal owner of the innovation process and management at PCtech. Championed on executive level, some tools are even mandatory for accounts (e.g. Innovation Agenda).

PCtech's corporate innovation team utilises resources from different parts of the organisation to provide its services (e.g. innovation centres; transformation experience workshops)

After the acquisition PCtech's corporate innovation team had to train account executives, thousands of individuals were trained by them. Helped a great deal in institutionalising PCtech's corporate innovation team within the firm.

PCtech's corporate innovation team consists of only 6 individuals, 2 architects responsible for developing the tools, diversity of competence and skillsets,

Robert and Dan more academic, Andre more business consultant, and Randy as program manager.

4. Were there specific issues that you picked up from your observations that you might want to explore further at next contact?

Yes, dual role processing, support provider and police officer.

Role of innovation agenda, who analyses and processes this information?

PCtech's corporate innovation team reaction/responsive measures to accounts with a weak innovation agenda?

What different types of clients are there? Only accounts or also direct external contacts?

What is the function of alliances, e.g. with Intel? Who manages these and what are the expected outcomes? How do you integrate knowledge from such alliances?

Appendix C – Nvivo8 screen captures

PhD CAPTAIN.nvp - NVivo

File Edit View Go Project Tools Window Help

New

Code At

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Nodes

- Free Nodes
- Tree Nodes**
- Cases
- Relationships
- Matrices
- Search Folders
 - All Nodes

Sources

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Sets

Queries

Models

Links

Classifications

Folders

Tree Nodes

Name
SOCIAL INTERACTION PATTERNS
ROLE
PERCEIVED INTERDEPENDENCE
ORG FORM
INNOVATION PROJECTS
DESIGNED INTERDEPENDENCE
COMPANY HISTORY

Antonio D 26 October 2011_3 BA

person—this is not details that is not interesting for you but I want to explain. services client, so if the main of what we are selling to the client is a services, **this person account executive. If we are selling not only services but also other like product or PSG or IPG, it's the head GM.** This person had the responsibility client in terms of the contract—I mean, the productivity, quality of the contract the responsibility to answer to the client's needs, so it's the executive. So each have an executive. The executive has the responsibility of the contract and, not also of the growth of this contract. Growth means for us that is a lesser concept to the client's needs. --> accounts have a hierarchy

[1:05:00]

The account executive have around him several figures that he can utilise to inside the client the specific needs. **One is the innovation leader—the innovation organisation.** One other could be the portfolio expert, one other could be the expert—the responsibility of the account executive. Why? Because, internal account executive measure—so with HP measure the account executive a account, so they contract in two ways. **The first way, we measure his effort v account business innovation agenda, so corporation today know what he i inside the account and, eventually, suggest more asset if he needed to answer specific client.** Then, also, I don't know, HP have as many company internally organisation that have the responsibility to survey the client. **All the client internally a survey—two each year—so a person are going to speak with the C**

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PhD CAPTAIN.nvp - NVivo

File Edit View Go Project Links Code Format Tools Window Help

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Nodes

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Sources

- Nodes
- Sets
- Queries
- Models
- Links
- Classifications
- Folders

Tree Nodes

Look for: Search In Tree Nodes Find Now Clear Options X

- SOCIAL INTERACTION PATTERNS
 - Promotive patterns
 - None
 - Influencing
 - Conitrient patterns
- ROLE
- PERCEIVED INTERDEPENDENCE
 - Social context (research setting)
 - Perceived goal interdependence
 - Heterogeneity (research setting)
 - Group identity claims
 - Collective self-actualization
- ORG FORM
- INNOVATION PROJECTS
- DESIGNED INTERDEPENDENCE
 - TMT involvement in innovation
 - Group Structure
 - Goal structure
 - Division of activities (intended task interdependence)
 - Centrality
- COMPANY HISTORY

Marc P and Mark B 181011

Interviewee 1: Yeah, yeah it's much more targeted and it's also more outward looking, what do customer want, where it was 15 years ago,

:20:00]

it was a very internal focused.

Interviewee 2: Particularly in the money that directly, the corporate money let's say for res corporate funds directly accessible for the researchers, that's been greatly diminished over that timeframe most of the budget that now comes to Ahead for instance need to get that from the existing DSM business groups or business units.

Interviewer 1: Okay.

Interviewee 2: So for instance we worked for the business group engineering plastics, as Marc that's a substantial part that the researchers have worked for engineering plastics they every year decide on the budget, what they want to spend. REACTION Research another customer for us, but also the EBA's Biomedical and Advanced Surface R&D as a service, optional resource, lost the power to drive innovation.

Interviewer 1: I'll come back to that in a second yeah.

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PhD CAPTAIN.nvp - NVivo

File Edit View Go Project Links Code Tools Window Help

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Classifications

Look for: [Dropdown] Search In [Tree Nodes] Find Now Clear Options X

Tree Nodes

- Name
- Promotive patterns
- None
- Influencing
 - Upward appeal
 - Undefined
 - Tool creation
 - Rational persuasion
 - Peer legitimization or buy-in
 - Peer comparison
 - Corporate strategy legitimization
 - Coalition forming
 - Behavior change
 - (Corporate & group) GOAL ALIGNMENT
- Conitrient patterns
- ROLE
- PERCEIVED INTERDEPENDENCE
 - Social context (research setting)
 - Perceived goal interdependence
 - Positive
 - Negative
 - Independence - Individualistic
 - Dependence
 - Heterogeneity (research setting)

Marc P and Mark B 181011 Fabien I 070312

operations

Interviewer: Exactly. It's only those relevant stakeholders that...if this were a senior you would do something to see how you can resolve this perception something, some commercial representative, then yes, that is responsibility.

Interviewee: If he was addressing directly to me, I will not tell him, "I go to your will try to explain and then I will try him, the person, on the level that but I will not stop there in the sense that obviously there might be an organization that you also have to understand where it's coming from frankly, I do not also feel necessarily that everybody in SBU has to do what we do and how we do it.

Interviewer: Yes.

Interviewee: This is not personal; this is the reality and there you come back to example of the small company. If you are a ten people startup then more or less on the same page on everything.

Interviewer: Yes.

Interviewee: When you go to a corporation, you cannot be...

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PhD CAPTAIN.nvp - NVivo

File Edit View Go Project Tools Window Help

New [Icons]

Code At [Dropdown] ... In [Dropdown] ... [Icons]

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Sources

- Internals
 - PCtech
 - Contact summary forms
 - Interviews
 - PLASTICA
 - Contact summary forms
 - Interviews
 - REACTION
 - Contact summary forms
 - Interviews
 - SOFTY
 - Contact summary forms
 - Interviews
- Externals
- Memos
- Search Folders
 - All Sources

Internals

Name

Fabien I 070312 ASHLEY D SERVICE MANAGME

counts into place globally, making sure they run against performance indicators.

Interviewer: Okay, okay. And how important do you perceive the role Nomad. Proactive innovation is not customer or project driven searched for without direct need of a customer or project.

Interviewee: I think it is very important...

Interviewer: Why?

Interviewee: Because that's what innovates new technology and it's future doing this, we'd still be living in caves.

Interviewer: But you don't think that, wait a minute we should innovate until a customer ask first...ask for it or until there is a clear need

Interviewee: No, I think we should do both.

Interviewer: Okay. In equal proportions or one more than the other?

Interviewee: It depends on the...obviously the financial state of the business resources you have. Obviously both, even on financial, and of the day. We need to do both, probably equally. Obviously company is what will differentiate between our competitor

USER 0 Items

Appendix D – coding process

Figure 7 represents the coding process. Codes are textual fragments which can extend from a few words to a group of sentences (Locke, 2001). The inductive process I followed was based on an interpretive approach which progressed in stages from descriptive codes to theoretical categories (Eisenhardt, 1989). The emerging categories were concurrently iterated with theory to remain focussed on the theory building purpose of this study. As the study further developed, the categories were grouped into aggregate constructs (e.g. perceived social interdependence, task design decisions).

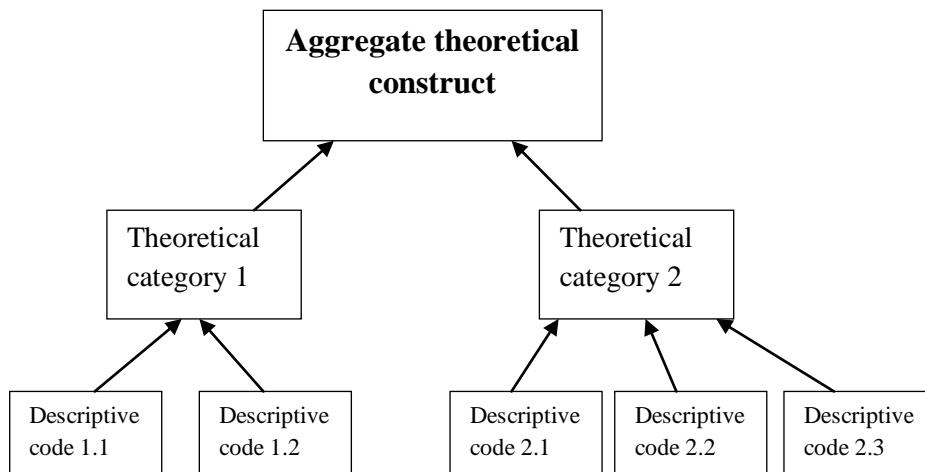


Figure 7: the inductive coding process

Figure 8 and figure 9 represent two examples of how data fragments were analysed (Kotlarsky and Oshri, 2005). It shows the descriptive codes (e.g. mutual goal structure) and the categories (e.g. positive interdependence) to which these codes were linked. In later stages of the study these codes and categories were associated with aggregate theoretical dimensions (e.g. interaction patterns) which became the core constructs of the theoretical framework (see figure 6 in discussion chapter).

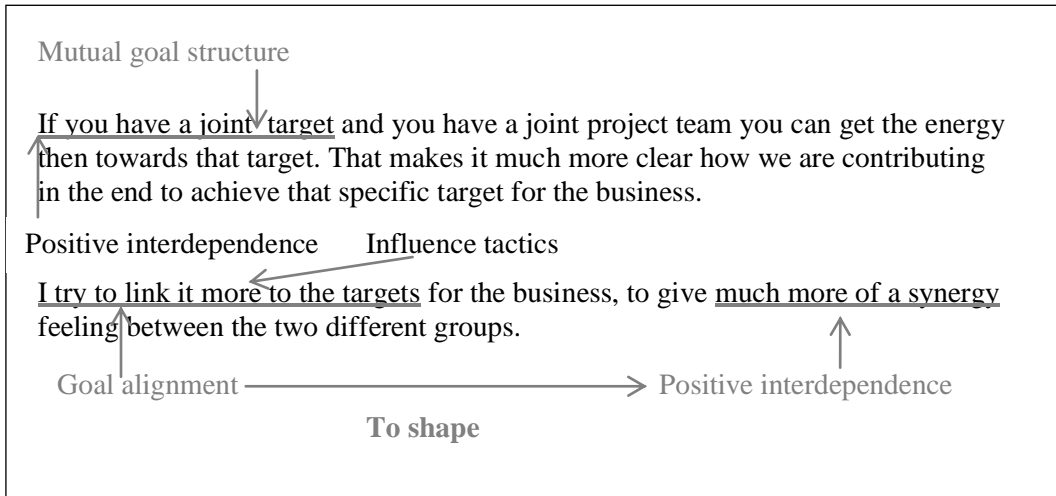


Figure 8: coding of data fragment- example A

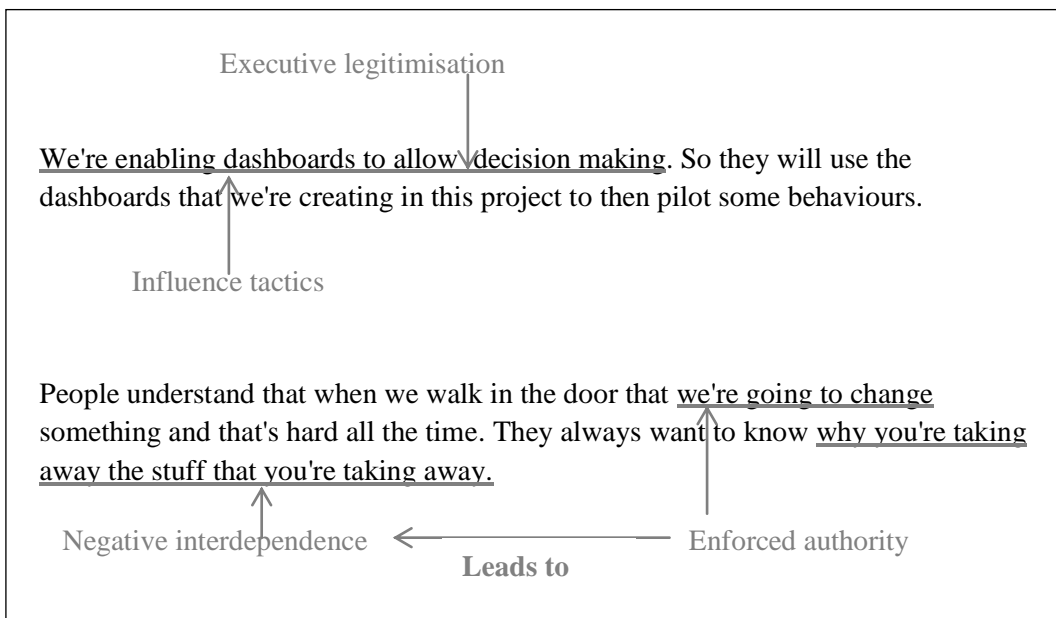


Figure 9: coding of data fragment – example B

In addition, the interrelationships between categories are given in these two figures. Figure 8 for example shows how goal alignment was deployed “to achieve” positive interdependence in the case of an innovation manager who made a deliberate effort to link his goals to those of the business teams to create “feeling” of “synergy”. Admittedly, this inductive process and approach to theorising depend on my interpretation and the perceptions of my informants. However, the multiple case study is a neat design in which any inferences can be tested in other cases in a quasi-experimental approach to examine whether these structures and inferences hold across different cases (Eisenhardt and Graebner, 2007). Moreover, multiple sources of data were used as a countervailing mechanism to deal with the alleged threat of ‘retrospective sensemaking’.