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The Quadruple Helix as an approach to strengthen Bahrain's innovation agenda: the financial services sector ecosystem

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Abstract

Bahrain has adopted a number of government action plans and policies to support innovation, and a number of collaborative frameworks in support of wider community inclusion. The Quadruple Helix innovation model was introduced as a way to strengthen Bahrain's innovation ecosystem, but much remains unknown about how this model can be effectively applied in practice.

This research adopts an 'exploratory' and 'explanatory' approach to investigate how the fourth helix – public/civil society – is perceived and integrated into existing trilateral innovative networks between academia, regulator and industry, as well as the implications of such integration. Further, this study investigates how gaps in relation to the insufficient capacity to incorporate the fourth helix, and the tensions that arise from their incorporation, are managed by innovation intermediaries.

In keeping with the exploratory nature of this study, a qualitative methodological approach was adopted. Semi-structured interviews with key participants and document analysis were selected as data collection tools to explore participants' perceptions of their collaboration and diverse experiences. The 'Clarkeian version' of grounded theory was adopted as an analytical approach based on its three mapping strategies: 'situational maps'; 'social world/arenas maps'; and 'positional maps'. Situational analysis was chosen to investigate the 'patterns of collective commitment' and what discourses are evoked in order to co-design and co-develop innovative financial solutions. Situation analysis further helped uncover the complexity of collaboration, to develop a deeper interpretation and analysis of the power relations involved, and help elucidate marginalised perspectives in relation to the inquiry, by revealing actors who had lost part of their capacity to perform and shape action.

The data analysis revealed three key theoretical constructs, which were then replicated in the integrative framework. The framework aggregated the findings representing first the *gaps*

identified in relation to the insufficient capabilities of academia, regulator, and industry to involve public/civil society members in collaborative and trans-disciplinary innovation processes. Second, the extension of the trilateral interactions to incorporate other actors via the participation of public/civil society resulted in new opportunities as well as new *tensions* that transcended the innovation process. These involved tensions associated with conflicting interests, incongruent collaboration motives, divergent perceptions of collaborative value, and power dynamics and asymmetries. Interestingly, some of these tensions were paradoxical in nature, as they exposed conflicting but interdependent poles that reproduced themselves, and thus persisted over time. Finally, *intermediary* roles were investigated, and the analysis evolved into exploring who the intermediaries were, what roles they played, what challenges they faced, and how these challenges were managed. Although the findings emphasised the important role that innovation intermediaries played in a Quadruple Helix configuration, in relation to facilitating innovation processes they also revealed that intermediaries may create miscommunication, impede matchmaking between the different Quadruple Helix actors, and increase power imbalances among them.

This thesis adds to the growing body of literature on the Quadruple Helix model in two ways. First, it uncovers the gaps and tensions that underpin interactions in the helices and in correspondence to the collaborative and co-creational activities in the FinTech ecosystem by showing their interrelations. This study explores the nature of these gaps and tensions, the reasons why they arise, and the strategies employed by the innovation intermediaries to address them. Secondly, this study extends previous research which found that tensions were both inherited and unavoidable in helix contexts by demonstrating that, beyond that, tensions are constitutive of the Quadruple Helix environment and shape its interactions. This thesis also adds to the body of knowledge on innovation intermediaries by suggesting that although

intermediaries were proposed as a means to bridge gaps and tensions, however, in many instances, they merely exacerbated them.

Finally, in terms of practical implications, a number of recommendations are made on how to uncover the synergistic potential of tensions in order to facilitate collaboration and knowledge transfer among the Quadruple Helix's key actors.

Declaration

I, the author, confirm that the Thesis is my own work. I am aware of the University's Guidance on the Use of Unfair Means (www.sheffield.ac.uk/ssid/unfair-means). This work has not been previously been presented for an award at this, or any other, university.

List of Publications

Hafedh, H. A., & Vasconcelos, A. C. (2020). Knowledge transfer from a perspective of quadruple helix: Initial findings from the financial services sector in Bahrain. iConference 2020 Proceedings.

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1. Introduction

1.1 Research background

In recent years, innovation has become one of the typical features of the financial services sector (Fáykiss et al., 2018). Partly as a result, the sector has found itself within a paradigm shift (Fonseca & Meneses, 2019), due to the convergence of pervasive digital technology and FinTechs (Laldin & Furqani, 2019). FinTechs has emerged as a result of the increased support for "multi-actor collaborative innovation" (Schütz et al., 2018, p.47). Platforms like FinTechs result from "the combination of two concepts: finance and technology" (Fonseca & Meneses, 2019, p.417). This concept designates start-ups that develop technological innovations, with application to the financial sector (Fonseca & Meneses, 2019). This has given the opportunity to new players to enter the industry, as a result, the heterogeneity of the actors involved increased (Carayannis & Campbell, 2011). This further necessitated dynamic balancing and knowledge resource integration in order to progress digital innovation (Holotiuk et al., 2018).

FinTechs were further found to be compatible with entrepreneurial ecosystems (Mason & Brown, 2014; Stam & Van de Ven, 2019), and the collaborating dynamics, mutualistic interdependence, and inclusiveness of the Quadruple Helix model (Lindberg et al., 2014; Schütz et al., 2018; Sverige, 2015). Theoretically, the Quadruple Helix model or ecosystem refers to configurations where diverse actors such as academia, industry, regulator and public or civil society, tend to be classified as "fluid and heterogeneous innovation networks" (Carayannis & Campbell, 2011, p. 342). Under these configurations, innovation is often driven and increasingly stimulated by dynamic processes of knowledge creation among the actors (Carayannis & Campbell, 2009).

Until recently, theoretical models of the Quadruple Helix have adopted a 'macro perspective', focused mostly on the context of the regional innovation networks, territories,

and aggregates of actors (Caetano, 2017; Cavallini, Soldi, Friedl & Volpe, 2016; Ivanova, 2014; MacGregor, Marques-Gou & Simon-Villar, 2010). Scholars have argued that the macro-analytical focus on identities and titles, as well as the stakeholders' sectors of origin (McAdam & Debackere, 2018), should be supplemented by the micro-analytical focus on "dynamic relationships, synergies, collaborations, coordinated environments, and value-creating activities" (Hasche et al., 2020, p.2). They are considered as key constructs that aid in explaining the Quadruple Helix effectiveness (Hasche et al., 2020; Scuotto et al., 2020). However, few studies have attempted to provide an understanding of the Quadruple Helix configurations as a process (Björk, 2014; Lindberg et al., 2014; García-Terán & Skoglund, 2019), as well as the roles in the formation of innovation networks from a 'micro perspective'.

The Quadruple Helix proposes the fourth helix as an inclusive framework to overcome the excluding structures of previous interaction models for innovation and growth (Carayannis & Campbell, 2009; Carayannis & Campbell, 2010; Lindberg et al., 2014). However, little is known about the fourth helix's participation in the wider innovation processes (Grundel & Dahlström, 2016). As a result, interactions have only been examined on a superficial level (García-Terán & Skoglund, 2019). To determine how processes unfold in the Quadruple Helix configuration, this study focuses on Quadruple Helix participants micro-level interactions (Höglund & Linton, 2018; McAdam et al., 2018) and the output of these interactions, where introducing the fourth helix one step at a time is crucial (Carayannis & Campbell, 2011). By concentrating on the financial services interactions arena in Bahrain, the study extends existing conceptualisations of possible Quadruple Helix arrangements.

The Quadruple Helix innovation model is used as a theoretical concept in the thesis, as well as an attempt to investigate how the model works in the financial services interactions arena in Bahrain. The model can also identify possibilities for diverse stakeholders to participate in innovative development. The Quadruple Helix engagement process is essentially an iterative

alignment process in which all aspects of the cross-sectoral and inter-disciplinary innovation processes must dynamically adjust to accommodate Quadruple Helix requirements. The focus is thus on the processes and interactions. Their functions are to co-design and co-develop innovative financial solutions between regulatory representatives, academics, industry and explain the implications of involving public partners in Quadruple Helix co-development and co-design processes.

The financial services interactions arena is therefore evaluated against the theoretical assumptions underpinning the Quadruple Helix model of innovation. In this research, Quadruple Helix conceptualisation are based on how a fourth group of actors have been central in the formation of joint action networks. These include the financial services sector in Bahrain, amid recent recognition of the importance of developing systematic innovation policies in line with public preferences. The exploration of the Quadruple Helix model is thus based on a critique of innovation policy models that tend to neglect civil society participants.

The theoretical discussion in this study builds on the assumption that the Quadruple Helix concept (Carayannis & Campbell, 2009) is consistent with Bahrain's post-2000 development agenda and policy initiatives advocating for increased and differentiated participation (Nordberg, 2015) in societal development in general. The FinTech innovation and entrepreneurial ecosystems is not limited to the three helices primarily addressed in the Triple Helix model (Etzkowitz, 2003), such as governments, businesses, and financial institutions. Significantly it also includes civil society. The ecosystems therefore seemed particularly well suited to use for an investigation of how the Quadruple Helix model is implemented. This thesis utilises and refers to the Quadruple Helix model as it is particularly appropriate and relevant to Bahrain's financial services sector ecosystem and its emphasis on broader community inclusion. The use of the Quadruple Helix is also justifiable as Bahrain has been at the forefront of implementing economic reforms. These have been largely determined by a comprehensive

economic agenda (Bahrain Vision 2030) (Bahrain Government, 2009), which clearly states the desire to expand into knowledge-based sectors and the basic premise of helix models (Etzkowitz & Klofsten, 2005). Thereby, the innovation processes in the financial services sector of Bahrain exhibits characteristics of the Quadruple Helix model.

A valid theoretical framework is formulated for this study, consisting of the concept of the Quadruple Helix in order to investigate the co-evolution of the different systems, namely: the economic, the political, the knowledge and the public systems. This framework also aims to describe how Quadruple Helix constellations may be used in practice, as well as the specific challenges associated with enhancing inclusive partnerships. By proposing a new framework relying on the Quadruple Helix, this research can contribute to theory development by testing the Quadruple Helix model in a new context (i.e., the financial services sectors interactions arena). This framework should further serve as a starting point to additional research on Quadruple Helix in other service industries.

Furthermore, innovation intermediaries were proposed as part of adopting a micro perspective and to be what the micro level entails. Social interactions, particularly with the recent need for civil society inclusion in innovation systems, were found to have the potential to optimise an entity acting as an agent to assist in the facilitation the innovation process (Johnson, 2008; Lindkvist et al., 2019; Munkongsujarit & Srivannaboon, 2011), what Howells (2006) termed an 'Innovation Intermediary'. Cunningham and O'Reilly (2018) posit that future studies of the Quadruple Helix must broaden the micro-level unit of analysis to include innovation intermediaries. The theory argues that innovation intermediaries are essential in bringing partners with different knowledge bases together. However, research in the field of Quadruple Helix remains emergent (Miller et al., 2016). This study broadens the scope of the investigation to help understand how the intervention of an innovation intermediary can aid the integration of the fourth helix and whether they can more effectively facilitate interactions.

1.2 Research aim and questions

The aim of this study is to gain a thorough understanding of how collaborations are structured, coordinated and managed in Quadruple Helix innovation networks and the emerging FinTech sector of Bahrain, where multiple diverse stakeholders are interacting. The research questions have been informed by the review of the literature and the identification of knowledge gaps. Accordingly, the research formulated the following research questions:

1. How is the fourth helix perceived in the existing entrepreneurial and innovative networks of the FinTech ecosystems?
2. How is it integrated?
3. What are the implications of their integration?
4. What is the role played by intermediaries to manage this integration?

The Literature Review Chapter offers a thorough explanation of how the research questions were formulated (See Chapter 3, Section 3.5). The following are the study objectives in order to attain the research aim:

1. To investigate how a Quadruple Helix is operationalised by explaining how existing perceptions of the fourth helix under the Quadruple Helix model relate to the proper formulation of participatory processes that integrates the fourth helix into the broader innovation processes.
2. To elucidate the complexity of the Quadruple Helix model by focusing on how the micro-processes aimed at fourth helix integration affect how the different helices emerge and unfold, as well as how the interactions are shaped.
3. To examine the significance of intermediary intervention in facilitating the dynamically intertwined Quadruple Helix participatory processes and explore their function as a conduit for public integration.

1.3 Significance of the study

The objective of this research is to explain how the fourth helix is perceived and integrated into networks that join three stakeholders – academia, regulators, and industry, as well as the implications of such integration. The study further investigates how gaps in relation to the insufficient capacity to incorporate the fourth helix, and the tensions that arise from their incorporation, are managed by innovation intermediaries.

This research contributes to the existing body of knowledge on the Quadruple Helix by adopting a micro perspective (Miller et al., 2016). Further, this study is significant because it aims to go beyond rather static Quadruple Helix models by indicating how the processual viewpoint can be useful in analysing the implications of the subsequent inclusion of the fourth helix in the financial services sector interactions arena. This can be achieved by focusing on participants reported experiences, what shape the interactions take in practice, and what drives the heterogeneous relationships processually (Kriz et al., 2018; McAdam et al., 2018) to elucidate their complexity. Fundamentally, these perspectives on processes can aid the investigation of the 'how' of specific outcomes and their interrelationships and extend previous research which studied tensions in helix contexts (Fitzpatrick & Malmborg, 2018; Van Horne & Dutot, 2017).

Prior studies have also noted the significance of intermediary actors who were demonstrated as to be efficient structures for embracing Quadruple Helix structure growth in regions (Colapinto & Porlezza, 2012; Liljemark, 2004; Lindberg et al., 2014; Sverige, 2015; Van Horne & Dutot, 2017). The role of intermediaries, however, has received little attention in terms of how it can aid in the integration of public engagement in collaborations and contribute to knowledge transfer (Gagnon et al., 2019; Miller et al., 2016; Villani et al., 2017). This study contributes to the existing knowledge on innovation intermediaries (Cunningham et al., 2018; Lindberg et al., 2014; Lindkvist et al., 2019; Secundo et al., 2019), by extending the existing

conceptualisations of possible Quadruple Helix arrangements and providing examples of local configurations underpinned by intermediary agents. Moreover, this study aims to gain further insight into whether intermediaries can be proposed as a means to help bridge gaps and manage tensions between the various helices.

In terms of methodology, the study utilises Grounded Theory and Situational Analysis that contribute to both an empirical description of the fourth helix integration process (Carayannis & Campbell, 2011) and hence the processual nature of helix models is theoretically advanced (Kriz et al., 2018; McAdam et al., 2018). As a consequence of the inductive nature of Grounded Theory, the study contributes to the existing literature on Quadruple Helix by providing richer insights into the critical aspects of interaction (Clarke, 2005). It is also evident that the micro-processes can affect how the different helices emerge and unfold over time (García-Terán & Skoglund, 2019). By using situational analysis (Clarke, 2005), it is possible to fully elaborate the marginalised perspectives of the situation. This approach can explain how the dynamics may affect attempts to integrate the fourth helix by creating and stimulating a more innovative climate.

In terms of practical significance, this study provides a novel contribution in that it adopts a micro perspective (Miller et al., 2016), to uncover the collaborative tensions that underpin interactions in the helices to show their interrelations. Furthermore, it also provides a practical understanding of the gaps in terms of how much public integration is actually realised. It is also important to address the reasons why including public members is inadequate practice, as awareness of these can help narrow down these gaps. This study further helps explore the mechanisms needed in order to make the collaborations intrinsically interesting while avoiding marginalising public members. Therefore, a number of recommendations are made (See Section 7.3).

1.4 Overview of the research methodology

Grounded Theory was found suitable for this study, specifically in gaining an in-depth understanding of the complexity of interactions under a Quadruple Helix setting and how the multiplicity of actors shapes the collaborative processes as they unfold. Grounded Theory is considered an appropriate explanatory tool for understanding how the relationships are constructed with the inclusion of public actors, and the role played by intermediaries in achieving and managing this integration.

The findings were acquired by applying Grounded Theory, specifically the Clarkeian version (Clarke, 2005). Following grounded theory processes (e.g. theoretical sampling, constant comparison, diagramming and memoing) (Glaser & Strauss, 1967; Urquhart, 2012a) and utilising Clarke's (2005) analytic mapping tools, namely 'situational maps', 'social world/arenas maps', and 'positional maps', a theory emerged, which was later integrated with key elements of the literature. The mapping strategies can effectively describe a number of elements. They can analyse the various facets of the situation, embrace and elaborate its complexities, and determine how they can influence participant experience.

To collect the data, the study employed semi-structured interviews, whereby two different sets of interview guides were prepared. One was initially developed for the pilot stage of data collection (see Appendix 1). Ten interviews were carried out at this stage. Post-interview and conceptual memos (Urquhart, 2012a), as presented in Section 4.7.5, offered guidance in terms of formulating further questions. In accordance with the theoretical sampling and constant comparison principles (Glaser & Strauss, 1967), another interview guide was developed for the main stage of data collection (see Appendix 2). In total, twenty-two interviews were conducted as part of the main data collection stage. To support the interview data, this study also provided essential background and contextual information for the organisations under study.

The Methodology Chapter includes a detailed explanation of the research design and process (see Chapter 4). Following that, the core categories and the integrative diagram are presented in the Findings Chapter (See Chapter 5). The integration of emergent theory with literature is then demonstrated in the Discussion Chapter (see Chapter 6).

1.5 Thesis structure

This thesis is divided into seven chapters. First, the introductory chapter provides context for the study, as well as the research aims and questions. It also emphasises the study's expected contribution.

Chapter 2 introduces the background and context of this study. It describes the financial services sector ecosystem in Bahrain, with a focus on the different collaborative frameworks. The latter aims to encourage wider community inclusion in trans-disciplinary areas between academia, industry, and the regulators that ensure national ownership.

Chapter 3 offers a discussion of the reviewed literature. The chapter is organised into three sections: (1) The Quadruple Helix innovation model; (2) FinTech ecosystems; and (3) Innovation intermediaries. The section on the Quadruple Helix model presents an overview of the helix models, their key assumptions, critiques, and operationalisation. The section on FinTech ecosystems evaluates the innovation and entrepreneurial ecosystems and the main assumptions underpinning FinTechs as ecosystems. The section on innovation intermediaries focuses on two key areas. The first involves defining innovation intermediaries and the second analyses the multi-focused nature of their role.

Chapter 4 explains the study's methodological background and research design. The main methodology is the Clarkeian version of Grounded Theory. Section 4.6.2 provides justification for the choice. Furthermore, this chapter defines the philosophical perspectives, instruments and procedures for data collection, and situational analysis. The chapter also discusses research quality and research ethics.

Chapter 5 summarises the key findings and is organised around the data analysis categories: *Gaps*; *tensions*; and *intermediaries.* This chapter further presents the categories using an integrative diagram which details their interrelationships (Figure 5.1).

Chapter 6 discusses the theoretical contribution of this study, with respect to the findings and the literature. The chapter is based on conceptualising the role of the fourth helix: how it is integrated; what are the implications of these forms of integration; and what is the role of intermediaries in these processes. This is accomplished by illustrating their interrelationships, as well as the integration of emergent theory into existing knowledge. This chapter then presents the theoretical implications of the integrative framework.

Chapter 7, the Conclusion Chapter, provides a summary of key findings by answering the research questions. It also discusses the theoretical and methodological contributions, as well as the study's limitations. This chapter concludes with possible directions for future research.

2. Background and context

2.1 Introduction

Since the inception of 'Bahrain Vision 2030' (Bahrain Government, 2009), the country has attempted to put in place a comprehensive 'economic development strategy' based on the principles of sustainability (Cullen et al., 2014; Nakibullah, 2018; Yusuf, 2008). In the decade since the launch of the vision, Bahrain has adopted a series of government action plans and policies to diversify its economy and support innovation.

This chapter introduces the financial services sector ecosystem in Bahrain, where multiple and diverse actors from industry, academia, regulators, and public/civil society come together to develop innovative financial solutions. The purpose of this chapter is to determine the different collaborative frameworks that aim to encourage wider community inclusion. This chapter also examines the policies the government prompted to develop to incorporate

contributions from stakeholders and civil society, as key to its strategic direction and the perspective of the knowledge-based economy.

This chapter consists of three key subsections: (1) Shaping the Post-2000 development agenda; (2) The innovation and entrepreneurial agenda in Bahrain; and (3) The financial services sector in Bahrain.

2.2 Shaping the post-2000 development agenda

The economies of the 'Gulf Cooperation Council' (GCC) members, namely Saudi Arabia, Bahrain, Qatar, Kuwait, Oman, and United Arab Emirates, share a number of commonalities. GCC states are large oil exporters (Al-Hassan, Oulidi & Khamis, 2010), with a growing young national labour force and a private sector heavily reliant on expatriate labour (Sturm, Strasky, Adolf, & Peschel, 2008). Nevertheless, according to Sturm et al. (2008), these commonalities have posed a number of structural policy challenges to the GCC economies, in terms of the need for economic diversification and developing non-oil sectors (Al-Roubaie, 2013).

The concept of diversification was thus embedded in the policy making of all GCC member states (Nakibullah, 2018; Sturm et al., 2008), and their multi decade strategic visions (The Oxford Institute for Energy Studies, 2019). Bahrain formally launched its Economic Vision 2030 in 2008 (Bahrain Government, 2009), in an effort to coordinate economic reforms and capitalise on synergies (Derasat, 2018). The vision was guided by an economic agenda clearly stating the desire to expand into knowledge-based sectors, where "innovation and productivity have become critical sources of competitive advantage" (Bahrain Government, 2009, p.9) supportive of an "inclusive and cohesive society" (Bahrain Government, 2009, p.8).

A closer examination of Bahrain's economy, however, reveals a number of structural factors that appear to limit these aspirations (Al-Roubaie, 2013). The Economic Vision 2030 was described as "a macroscopic document that refrains from laying out a detailed implementation agenda" (Derasat, 2018, p.42). Therefore, to realise the goals laid out, there was a need to

translate the vision into a "tangible and coordinated national strategy" (Bahrain Government, 2009, p.2), whereby implementation is undertaken by a series of action plans (Derasat, 2018).

2.3 The innovation and entrepreneurial agenda in Bahrain

In addition to diversification, the ideas of 'innovation and entrepreneurship' (Bahrain Government, 2009), as well as their importance in the creation of a sustainable economy, were also embedded in the strategic Economic Vision 2030 (Bahrain Government, 2009). A national plan was therefore developed for the period 2014-2024 (Higher Education Council, 2014), with the purpose to create a conducive environment for innovation, and "create a national forum for linking academia, industry, and government" (Higher Education Council, 2014, p.30), and "improve public awareness and understanding of research and innovation" (Higher Education Council, 2014, p.22). The strategy for implementation was organised under three domains: "the economy, government, and society" (Derasat, 2018, p.42), with a strong emphasis on making investments in innovation and research (Bahrain Government, 2009), and ensuring partnerships in a range of cross-disciplinary areas "between education, business and policy-makers" (Bahrain Government, 2009, p.2).

The development goals were based on five components or dimensions: economic; social; environmental; cultural; and political (Central Informatics Organisation, 2015), whereby balancing between the different goals was deemed necessary (UNDP in Bahrain, n.d.). These goals mainly concentrated on and addressed individual problems rather than integrated goals (Ahmed et al., 2015; Weber & Khademian, 2010), as a consequence a number of unforeseen tensions emerged. For example, tension existed between realising economic growth and achieving integrated development goals (Derasat, 2018), as action in one area affected outcomes in others.

The government was further required to develop a widened perspective and ensure national ownership and civil society contribution (Central Informatics Organisation, 2015). A series of

complementary government action plans were undertaken in order to outline Bahrain's strategic priorities, advocating for civic consultation in key areas of government development work (Government Forum, n.d.). The most recent, 'The Government Plan', was initiated to outline Bahrain's strategic priorities over the period 2019-2022, and was built upon the principles of sustainability, transparency, justice and competitiveness (eGovernment, n.d.), in consultations with different actors of the society (Derasat, 2018). These involved "civil society organisations, the private sector, academics, research centres, educational and media institutions, women and youth" (The National Information Committee, 2018, p.3). Besides setting the strategic priorities for 2019-2022, the consultative processes were further expected to help identify priorities around sustainable development issues and raise awareness of the 2030 agenda's goals and objectives (Government Plan, n.d.). The plan focused on empowering the private sector, and enabling Bahrainis to actively participate in the country's development process (Government Plan, n.d.; Gulf Insider, n.d.). Moreover, the Bahraini leadership had already advocated civic consultation in its 'Government Forum' (Government Forum, n.d.). This is an annual gathering platform between senior government officials, where members of the public who have been invited are encouraged to outline and submit their aspirations regarding key areas of government development work (Government Forum., n.d.). The most salient goals taken by Bahrain include being less reliant on hydrocarbons and establishing Information and Communications Technology (ICT) infrastructures. Bahrain has also taken steps to establish "a financial technology research cluster", building an Islamic finance sector" (Derasat, 2018, p.30), advance women contribution to the economy, and develop innovative labour market policies (Derasat, 2018).

These efforts may facilitate knowledge transfer. According to Almajdoub (2018) they were not necessarily sufficient to drive a knowledge economy. As part of the reforms to identify and improve the propulsion of innovation in Bahrain, a research project was conducted to

investigate the skill requirement and identify gaps (Allen Consulting Group, 2009). A key finding was that educational institutions were not in line with industry requirements, and that Bahrainis were not always the first alternative for private-sector employers (Bahrain Government, 2009). The findings concur with an in-depth survey conducted by Ernst and Young Partnership (2015), of employers and students across the Gulf region, including Bahrain. This showed a fundamental misalignment between education and training and employers' needs and expectations. The gap between what employers needed in terms of skills and expertise and what the education system provided has become a pressing issue in terms of creating a supportive environment for entrepreneurship (Ernst & Young, 2015). The misalignment further called for closer collaboration between a range of diverse players, including companies, educators, governments, investors, employers and youth (Ernst & Young, 2015), where outdated habits were "ushered out, and in its place, a productivity-centric SME-mindset [was] encouraged" (Derasat, 2018, p.79). Significant investment were thus needed to motivate collaborations in science, research, technology training and education (Almajdoub, 2018; Lawrence, 2012).

According to Lawrence (2012), to lead an innovation ecosystem in Bahrain, education should take the initiative through strong industry links and research, while government should take the lead and develop broader policy frameworks to support innovation. An extension and a revised model to the trilateral interactions between industry, research and government highlighted recent recognition of the importance of developing policies in line with public preferences (Higher Education Council, 2016).

In this respect, Bahrain acknowledged the importance of investing in a variety of legal and economic frameworks in order to sustain innovation and entrepreneurial ecosystems (Ernst & Young, 2015). This has been seen as a growing interest to participate in the global digital economy (Central Bank of Bahrain, 2019). Several actions have been carried out in this regard,

including developing an innovation hub for the 'Middle East and North Africa' (MENA) region, in addition to a number of entities specifically established in support of entrepreneurs and start-ups (Bentrepreneur, n.d.). These involve the "Bahrain Development Bank, Bahrain Business Incubator Centre (BBIC), Riyadat Program for Women Entrepreneurs" (Derasat, 2018, p.64), and the 'Enterprise Development and Investment Promotion Program' (EDIP) (Bentrepreneur, n.d.). Bahrain has also witnessed a growing network of venture capitalists, incubators, accelerators, workspaces, start-ups (Bentrepreneur, n.d.) and educational institutions (Bahrain FinTech Bay, 2018). These aim to stimulate the entrepreneurial and start-up initiatives to develop the capacities of potential entrepreneurs, assist with business development and planning, and secure potential sources of capital (Bahrain FinTech Bay, 2018; Bentrepreneur, n.d.).

2.4 The financial services sector in Bahrain

Similar developments have been seen in the financial services sector. As the second-largest contributor to its national economy after hydrocarbons (Nor, Ku & Karem, 2011), the financial services sector, dominated by the banking industry (Al-Hassan, Oulidi & Khamis, 2010), was identified as one of Bahrain's sectoral priorities besides public health and ICT (Higher Education Council, 2014).

In a knowledge-intensive industry, the core competitiveness of banks is highly reliant and reshaped by expanding customer expectations for convenience and personalisation (Capgemini, 2018), and their increasing demand for sustainable banking and finance (Castilla-Rubio, Zadek & Robins, 2016; The National, n.d.-a). Banks are thus required to pay more attention to consumers as civil society participants (UNEP, 2015), and to how technology has been transforming their expectations (Arab Bankers Association, 2019). Accordingly, regulatory frameworks were amended to accommodate these new expectations (Central Bank of Bahrain, 2019). In addition, the financial sector regulators have been exerting pressure on

the banking industry (Weber, 2018) in realisation that the opportunity for development lies in establishing "financial systems that are more effective in serving the needs of inclusive, sustainable economies and societies" (UNEP, 2015, p. xvii). According to Ahmed et al. (2015, p.8), significant mobilisation of resources and engaging "different stakeholders including governments, businesses, financial institutions, civil society and non-profits" would be required to realise these development opportunities. The need to engage different stakeholders was further echoed by UNEP (2015), whereby the alignment of financial systems with sustainable development emphasised the importance of customers and financial institution employees as civil society participants.

Bahrain policy makers express strong opinions regarding retaining the country's dominant position in regional finance. It is considered crucial to have a potentially conducive and an enabling environment for innovation (Bahrain FinTech Bay, 2018b). Policy initiatives therefore advocate partnerships and the collaborations of diverse societal actors in trans-disciplinary areas (Bahrain FinTech Bay, 2018b). Since 2017, Bahrain has implemented a number of initiatives and policies to encourage Financial Technology (FinTech) innovation and collaboration, given its position as an established financial services hub, and the significant innovations that FinTechs bring to the market (Abdulkarim, 2020). According to The Telegraph (2021), Bahrain is praised and admired for implementing the highest number of regulatory reforms to ease business operations. These were manifested in Bahrain joining 'The GCC Working Group for Financial Technologies' (The GCC, n.d.), as part of the recent interests of regional authorities in the transfer of policy ideas across countries, and developing integrative initiatives for FinTech (The GCC, n.d.).

On the international level, Bahrain has ensured that the financial sector is regulated in adherence with international banking standards, led by the Central Bank of Bahrain. This is highlighted by initiatives such as "the Personal Data Protection Law and the Model Law on

Electronic Transferable Records" (Arab Bankers Association, 2019, p.27). Bahrain is also a member of 'The Global Financial Innovation Network' (GFIN) (FCA, n.d.), a co-operation framework and a joint 'RegTech' forum between financial services regulators, committed to open initiatives that support financial innovation and collaborative knowledge sharing (FCA, n.d.).

Other initiatives involved establishing a dedicated 'FinTech and Innovation Unit' within the Central Bank of Bahrain (Bahrain FinTech Bay, 2018a; CBB, n.d.). The aim of this unit is to shape pro-innovation regulatory frameworks, encourage investments in FinTechs and increase innovation within the financial services industry (Bahrain FinTech Bay, 2018a). These include conventional and Sharia compliant crowdfunding and data jurisdiction laws (The Telegraph, 2021), and data protection and bankruptcy laws (Bahrain FinTech Bay, 2018a). Bahrain further introduced a 'cloud-first policy', amid recent digital infrastructure developments, and the opening of 'Amazon Web Services' first centre in Bahrain (The Telegraph, 2021). Other key developments involved the launch of the 'Regulatory Sandbox' (Bahrain FinTech Bay, 2018a; CBB, n.d.). This was mainly developed in order to enhance n opportunities for commercialisation and knowledge spillovers to other sectors (Derasat, 2018). The Regulatory Sandbox is a simulated environment to test technology-based innovative solutions (CBB, n.d.), and is open to all companies, whether domestic or foreign, traditional financial services or firms expanding their FinTech offerings (Arab Bankers Association, 2019; CBB, n.d.).

The various FinTech initiatives were largely forged by top down initiatives, however, they were believed to be supplemented and enhanced by bottom-up insights originating from the private sector (Ernst & Young, 2015). The growth of FinTechs, for example, was supported by the national drive for improved banking experiences and financial inclusion by accommodating the unbanked, who possessed minimal access to financial services (Bahrain FinTech Bay, 2018a). Accordingly, Bahrain created an ecosystem whereby new technology-based financial

services were incubated (Arab Bankers Association, 2019), and where collaboration and community support could further spur innovation (Bahrain FinTech Bay, 2018a). This was believed to be manifest in Bahrain FinTech Bay (BFB), which fosters a FinTech ecosystem that aims for inclusive partnerships (Arab Bankers Association, 2019). BFB was established with the aim to provide FinTech focused companies a co-working space supported by corporate incubation, venture acceleration, and education/training to support scalable FinTech initiatives (Bahrain FinTech Bay, 2018a). The ecosystem engages and utilises a full spectrum of stakeholders, namely "governmental bodies, financial institutions, corporates, consultancies, universities, associations and start-ups" (Arab Bankers Association, 2019, p.26). Paradoxically, however, the rise of FinTech start-ups was found to disrupt multiple industries and the financial services industry in particular, via bypassing financial institutions, thus becoming perceived as a threat to banking (Bahrain FinTech Bay, 2018a).

2.5 Summary

This chapter introduced the financial services sector ecosystem in Bahrain, showing a potentially conducive and enabling environment for Quadruple Helix (QH) actors. Several indications were presented in this chapter.

First, by shaping the post-2000 development agenda and embracing inclusive programmes for economic change, policy initiatives advocating for partnerships required the collaboration of diverse societal actors in trans-disciplinary areas. A number of governmental action plans and forums were carried out to ensure national ownership and promote civic consultation in guiding the country's strategic direction. These plans were reflected in the country's efforts to align its action plans with sustainable development goals.

Second, entrepreneurship and innovation were emphasised in the development of Bahrain's sustainable economy and in particular the financial services sector. The financial sector has been one of the country's main sectoral priorities. With the recent rise of sustainable banking,

new projects such as FinTechs have also been undertaken to accommodate bottom-up public input and civic participation.

Third, a number of supporting entities were established for that purpose. These aim to support entrepreneurs, create linkages between academia, industry, and government and developing capacities.

Accordingly, the literature review chapter focuses on three key areas: (1) The inclusive bottom-up trans-disciplinary innovation models as promoted in the Quadruple Helix framework, particularly in (2) the FinTech ecosystem, and (3) the role innovation intermediaries play in supporting the different players.

3. Literature review

3.1 Introduction

This study focuses on understanding how diverse actors collaborate in Quadruple Helix innovation networks in Bahrain's emerging FinTech sector, as well as how these networks are structured, coordinated, and managed by innovation intermediaries. Hence the chapter on Literature Review is organised into three sections as shown in Figure 3.1: (1) The Quadruple Helix innovation model; (2) FinTech ecosystems; and (3) Innovation intermediaries.

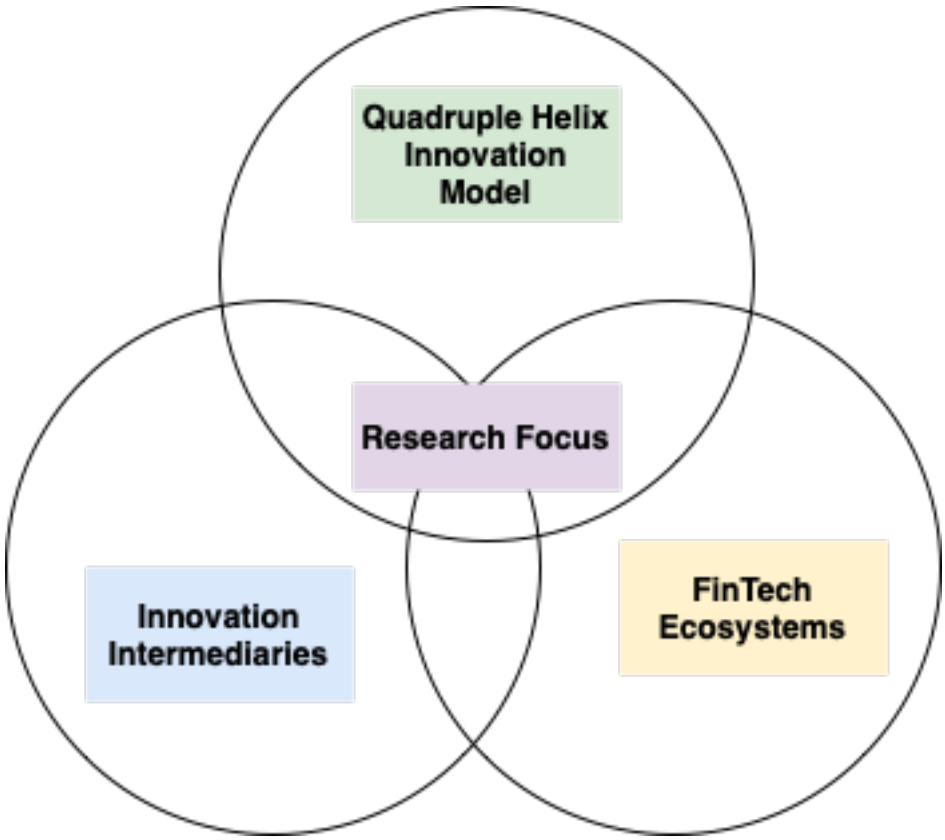

Figure 3.1 Research Focus.

3.2 The Quadruple Helix model of innovation

3.2.1 Introduction

To use the Quadruple Helix as a model for innovation, one must first situate it within the literature on innovation and innovation systems (Arnkil et al., 2010). Increasingly, innovation systems are conceptualised as a multiple helix and a multi-actor interface (Carayannis & Campbell, 2009; Etzkowitz & Leydesdorff, 2000), that relies "on the dynamic and flexible interaction of diverse elements" (Schütz et al., 2018, p.47).

Mercan and Götkas (2011, p.102) define innovation ecosystems and associated elements by explaining that they consist of "economic agents and economic relations as well as the non-economic parts such as technology, institutions, sociological interactions, and the culture". The definition further implies that innovation ecosystems can be viewed as a hybrid of various networks or systems (Carayannis et al., 2018), and that the interactions between the individuals,

groups or entities play an important role in the dissemination and articulation of information (Nonaka & von Krogh, 2009).

3.2.2 Innovation and innovation policy

In the quest for competitiveness, innovation has been identified as an important factor and policy area (Liljemark, 2004), and a key driver of economic growth (Björk, 2014; Colapinto, 2007; Lundvall, 2016). Furthermore, innovation has been interpreted as "interactive, and therefore a socially embedded, process that cannot be understood without taking into consideration its institutional and cultural context" (Lundvall, 2016, p.86). The term 'social innovation' is used to describe the mechanisms by which individuals and societies become empowered to solve major social issues and challenges (Benneworth, Cunha & Cinar, 2020). Various manifestations are often viewed in various ways as moves to more inclusive and participatory approaches (Stirling, 2008), where the focus shifts to non-linear, interactive, and multi-actor innovation networks (Arnkil et al., 2010).

Accordingly, global policy attention has shifted to new frameworks for promoting dialogue with stakeholders and the general public (Stirling, 2008), to shape development trajectories and stimulate innovation (Benneworth et al., 2020). The view on innovation has further undergone considerable development (Nilsson & Sia-Ljungström, 2013), and in turn has held important policy implications for innovation (Lundvall, 2007; Nilsson & Sia-Ljungström, 2013). An important implication, as proposed by Lundvall (2007), concerns the increased need for innovation policy to be systemic. Lundvall (2016) posits that governments must understand the systemic context of innovation in order to avoid introducing mechanisms incompatible with the basic logic of innovation systems.

In this respect, there has been a shift from viewing innovation processes as linear to newer frameworks advocating for interactive, cross sectoral, collaborative and inter-disciplinary

innovation processes (Chesbrough, 2003; Colapinto & Porlezza, 2012; Gibbons et al., 1994; Yawson, 2009). Accordingly, the significance of collaborative action networks in policy is emphasised as a means to enhance innovation (Lindberg, Danilda & Torstensson, 2012). The main theoretical underpinning here is that innovation increasingly demands diversified knowledge bases not restricted to one industry sector (Nordberg, 2015). They are therefore produced by integrating complementarities, capabilities and specialisation (Malerba, 2002) in an interactive and cumulative process (Sussan & Acs, 2017).

The growing relevance of the inter-disciplinary character of innovation, together with the rejection and obsolescence of linear processes (Chesbrough, 2003; Nordberg, 2015) is defined by Chesbrough (2003). This serves as a transition and shift in boundaries from closed to open innovation. Although this has recently attracted public interest, "the idea of opening up the innovation process to external ideas is not new" (Munkongsujarit & Srivannaboon, 2011, p.1). This transition is often featured in the literature using different synonyms with foci referring to past research (Munkongsujarit & Srivannaboon, 2011). This includes the literature on lead user innovation (von Hippel, 2005) and user centric innovation (Bilgram, Brem & Voigt, 2008). The premise behind the definition is that companies could no longer handle the whole innovation process on their own (MacGregor, Marques-Gou & Simon-Villar, 2010). This implies that diverse knowledge bases and combinations of different types of knowledge are becoming increasingly important in innovation processes (Nordberg, 2015), to complement those generated internally (Chesbrough, 2003; Chesbrough et al., 2006;). In this respect, Yawson (2009) argues that the Quadruple Helix innovation model can offer orientation in terms of economic policy. Moreover, proper policy intervention can become more helpful in this regard, especially in terms of facilitating the launch and diffusion of the emerging innovations (MacGregor et al., 2010). Yawson (2009) also emphasises that innovation that starts from citizens can have a significant impact on the success of innovation strategies.

3.2.3 The Helix Model of innovation: underlying assumptions

According to Colapinto and Porlezza (2012, p.346), the 'Helix Model', is interpreted as a "strategy of development based on the collaboration among different institutions". Similarly, Popa, Blok, and Wesselink (2020, p.877) refer to 'helices' as systems "joined together by some 'salient characteristics'". These provide the necessary infrastructure for economic and innovation development. The model is perceived as a set of innovation systems that emerge in different structures, such as the 'Triple Helix' and 'Quadruple Helix structures' (Liljemark, 2004). These models also stress the importance of pluralism (Carayannis & Campbell, 2009), manifested in the construction of a heterogeneous network of actors (Etzkowitz & Klofsten, 2005). The key assumption here is that actors seldom innovate alone (Afonso, Monteiro & Thompson, 2012; Malerba, 2002; Thomas & Autio, 2020; Yawson, 2009); rather, in interplay they are able to generate and exchange knowledge (Liljemark, 2004; Lundvall, 2016). The Quadruple Helix model overlaps with Lundvall's (2016) approach to innovation systems in terms of actors, areas and aspects. According to this approach, people, skills, relationships, and interactions are all considered essential agents. As a result, according to Carayannis and Campbell (2009), the co-founders of the 'Quadruple Helix theory', the convergence of the two concepts is judged to be appropriate; and hence, they refer to it as the "Quadruple Helix Innovation System" (Carayannis & Rakhmatullin, 2014, p.224).

The theoretical discussion here builds on the concept that the helix model is a result of a need for greater and differentiated involvement in the growth of society in general, and that it is part of a co-evolution of different systems (Nordberg, 2015). As a result, innovation systems can be described in two ways: generally, to include all elements that influence innovation as an activity, or, more narrowly, to include only the actors who have a direct impact on innovation (Inkinen & Suorsa, 2010). Carayannis et al. (2015) describe these elements as the components and the operating parts of a system, which are often connected through

relationships and interdependencies (Carayannis, Samara & Bakouros, 2015). According to Etzkowitz and Leydesdorff (2000), these components can be defined and specified analytically while the research project is being developed.

The concept of networking for innovations is also not new (Björk, 2014). The manner in which the co-evolution of the various systems is linked together is best investigated using Luhmann's (1995) 'Systems theory' (Colapinto & Porlezza, 2012; Nordberg, 2015). Luhmann (1995, (p.xi)) refers to a "functionally differentiated modern society": one that organised itself by delegating various responsibilities and functions to autonomous and interdependent societal systems (Niklas Luhmann, 1995). Whereby "industry corresponds to the economic system, government corresponds to the political system, universities correspond to the scientific system, and media corresponds to the media (or public) system" (Colapinto & Porlezza, 2012, p.348). The relationships between these different systems are often upheld to "cope with societal problems which could not be solved from other systems, or before the system has emerged" (Görke & Scholl, 2006, p.647). As a consequence, no system can effectively perform the function of another system (Görke & Scholl, 2006).

From this perspective, system theory further establishes the foundation for the growth of a higher dimension, helix type innovation system classification. The concept of innovation system, for example, was initially based on a 'Double Helix', emphasising the interaction between academia and industry (Ivanova, 2014). As a result, the state plays a minor role in the development of innovations (Lindberg, Lindgren & Packendorff, 2014). The 'Triple Helix' was later introduced by Etzkowitz and Leydesdorff (2000) (see Figure 3.2), highlighting government as a key player in the joint action networks of academia and industry (Etzkowitz & Leydesdorff, 2000). The Triple Helix was developed with the ambition of developing a conceptual framework and model. At that time, the aim was to study the dynamic institutionalisation process that occurs during the innovation process (Leydesdorff &

Etzkowitz, 1996), considering “the expanding role of the knowledge sector in relation to the political and economic infrastructure of the larger society” (p.280).

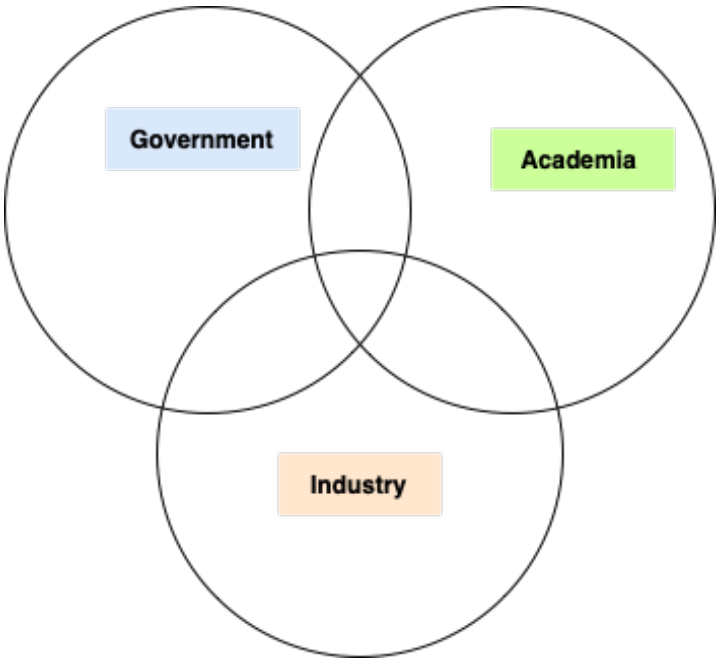

Figure 3.2 The Triple Helix Model of University-Industry-Government relations.

Adapted from Etzkowitz and Leydesdorff (2000, p.111).

The basic innovation core of the Triple Helix is centred around the knowledge economy (Carayannis & Rakhmatullin, 2014). Three dynamics, accordingly, must be taken into account in order to bring science and technology to work for innovation (Amir & Nugroho, 2013). In this triadic relationship, each actor contributes in accordance with their societal position (Borkowska & Osborne, 2018). In this way, “industry operates in the Triple Helix as the locus of production; government as the source of contractual relations that guarantee stable interactions and exchange; the university as a source of new knowledge and technology” (Etzkowitz, 2003, p.295). Despite the fact that the Triple Helix suggests a standard innovation format, there are numerous starting points on the path to the Triple Helix (Etzkowitz, 2003). The Triple Helix model is therefore derived from two opposing standpoints: “(1) a statist model of government controlling academia and industry, and (2) a laissez-faire model, with industry,

academia, and government separate and apart from each other, interacting only modestly across strong boundaries" (Etzkowitz, 2003, p.302). On the one hand, a statist regime, the leading role is played by the government (Etzkowitz, 2008). In a "laissez- faire triple helix regime, industry is the driving force, with the other two spirals as ancillary supporting structures" (Etzkowitz, 2008, p.8). In that respect, the Triple Helix encompasses the knowledge economy from a top-down angle (Carayannis, Campbell & Rehman, 2016).

As a result, innovation processes began to require more players than previously required, stressing the significance of the larger context for Triple Helix relationships (Grundel & Dahlström, 2016). The processes have been democratised through the inclusion of civil society (Carayannis & Rakhmatullin, 2014; Carayannis et al., 2012; Lindberg et al., 2014). The Quadruple Helix model (see Figure 3.3) as proposed by Carayannis and Campbell (2009), adds a 'fourth helix' to the Triple Helix, that of the 'public', defined as "media-based and culture-based public" (Carayannis & Campbell, 2009, p.206). At the micro level, in knowledge-driven innovation systems, the Quadruple Helix model is concerned with the interaction and collaboration of actors from four distinct subsystems in networks, namely "academic research, business, government, and society" (Schütz et al., 2018, p.47). The concept has not resulted in a clear and a generally accepted definition. Arnkil et al. (2010, p.65), however, more clearly define the Quadruple Helix as "an innovation cooperation model or innovation environment in which users, firms, universities and public authorities cooperate in order to produce innovations". The Quadruple Helix concept therefore emerges as a result of the 'co-evolution' of knowledge and political systems (Nordberg, 2015) for differentiated participation (Nordberg, 2015), inclusiveness (Carayannis & Rakhmatullin, 2014) and 'open innovation systems' (von Hippel, 2005). The Triple Helix and the Quadruple Helix are both "grounded on the idea that innovation is the outcome of an interactive process involving different spheres of actors, each contributing according to its 'institutional' function in society" (Cavallini et al.,

2016, p.5).

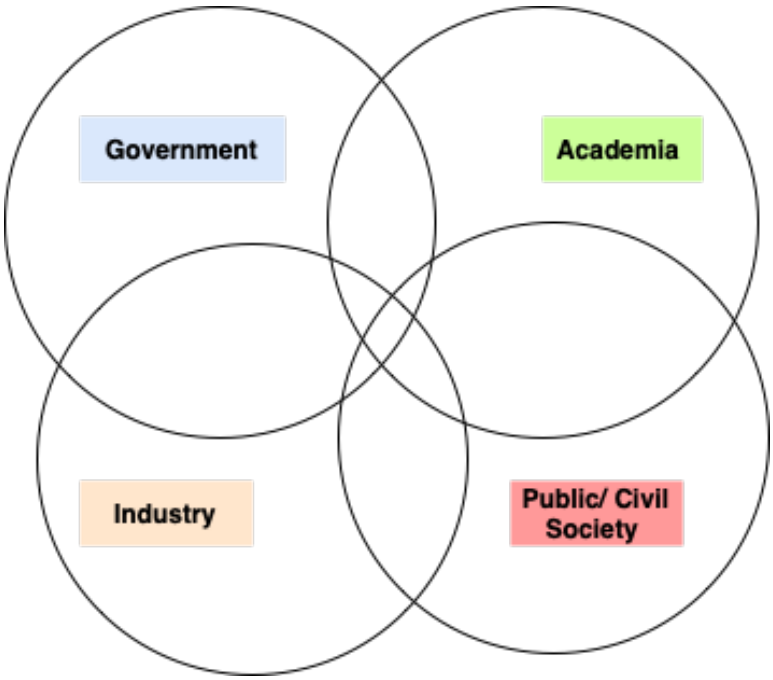

Figure 3.3 The Quadruple Helix.

Adapted from Carayannis et al. (2018).

From a knowledge and innovation standpoint, the Quadruple Helix system is considered to be broader than the Triple Helix system (Ivanova, 2014). The Quadruple Helix acknowledges the growing importance of end-users in regional innovation projects (Carayannis & Grigoroudis, 2016), and is characterised by both public 'bottom-up insights' and 'top-down policies' (Carayannis et al., 2012). This entails the views of a wider portion of the society (Jonsson et al., 2015), where "innovation policy communicate its objectives and rationales to the public to seek legitimation (legitimacy) and justification" (Carayannis & Campbell, 2011. p.357).

Carayannis and Campbell (2010, p.3) add a further fifth helix, representing the natural environment, thus proposing the 'Quintuple Helix', which "stresses the socioecological standpoint of nature, established as an essential component for new subsystems of knowledge models", thereby the key focus is on "society-nature interactions" (Carayannis & Campbell,

2010, p.59). Bearing in mind the focus of this research and that the drive for the financial services sector in Bahrain is a diminishing natural resource (Nakibullah, 2018), the Quadruple Helix is a more robust and appropriate model for framing the investigation and analysis of this research. For this reason, this research does not broaden the discussion to include the Quintuple Helix.

Figure 3.4 below summarises the core differences between the three helices in terms of their context as covered earlier.

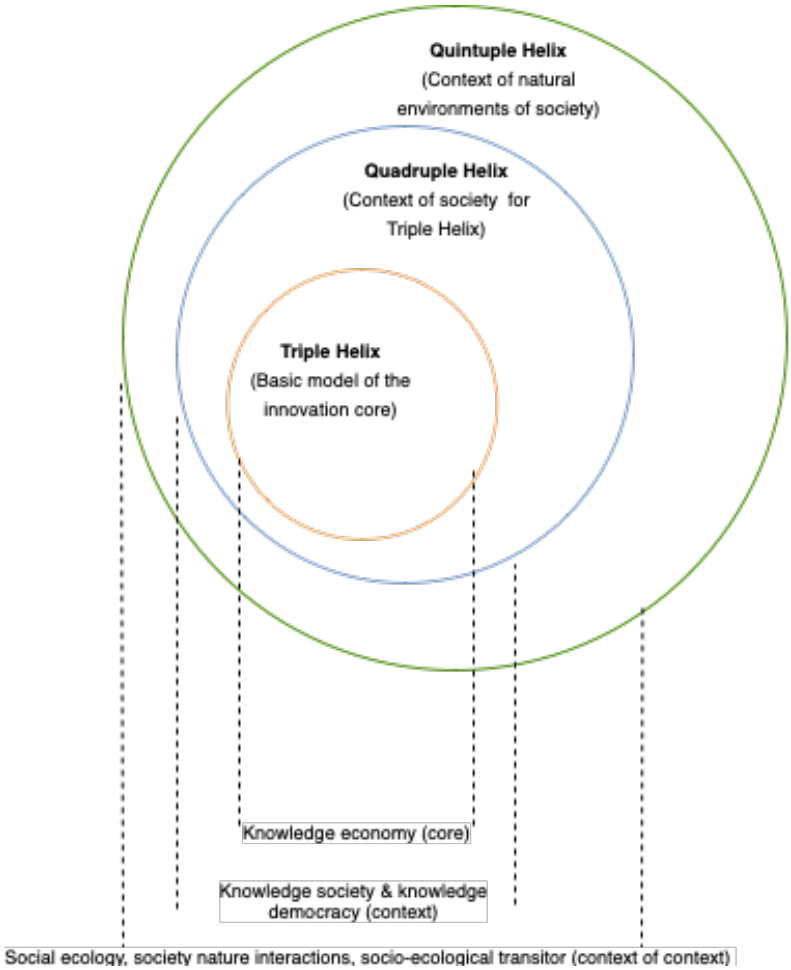

Figure 3.4 From triple to Quadruple to Quintuple Innovation Helix perspectives.

Source: Carayannis and Rakhmatullin (2014, p.231).

3.2.4 Critical perspectives on the helix models

Most critiques of the helix models are based on the Triple Helix (Brannback et al., 2008;

Cooke, 2005; Gunasekara, 2006; Lundberg, 2013; Miller, Mcadam & Mcadam, 2016; Muchmore et al., 2015; Power & Malmberg, 2008; Razak & White, 2015; Tuunainen, 2002). The theoretical discussion presupposes "that a network of relationships is present in a Triple Helix setting, though this is often not the case in practice" (Lundberg, 2013, p.212). in the literature, a number of critiques are featured, and these are discussed below.

First, the Triple Helix is characterised to be too macro-sociological to capture the quality of specific knowledge capabilities, that according to Cooke (2005, p.1147), "seldom, in reality, forge the kinds of links between researchers and business executives that ultimately create innovation of a systemic kind". As it stands, then, the Triple Helix is considered inadequate to explain innovative systems (Nordberg, 2015), and is criticised for "consolidating old structures rather than opening up for creative change" (Lindberg et al., 2012, p.36). The triple helix is also criticised for failing to establish a methodological basis and inadequately explaining the connections between its three systems, how they are created, and why they matter (Amir & Nugroho, 2013).

Second, in a 'top-down modus operandi' framework (Rodrigues & Teles, 2017), and while seeking means to push innovation and entrepreneurship activity, the Triple Helix model overlooks a fundamental element: that of the entrepreneur or the innovator (Brannback et al., 2008; Loet Leydesdorff & Meyer, 2007). Policy designs in this respect are often seen as over simplistic (Foray & Goenega, 2013). According to Foray and Goenega (2013) "[Policy designs] excluded knowledge essential for success-entrepreneurial knowledge" (p.5). Instead of addressing the requirements of those at the bottom of the pyramid, the Triple Helix model currently suffers from processing a structure found to only encourage research towards the aims that generate financial profits (Amir & Nugroho, 2013). This is in contrast to the Quadruple Helix which focuses on developing various types of innovations, such as "demand- or user-oriented innovations" (Arnkil et al., 2010, p.17). The Triple Helix has also been

regarded to be more appropriate for 'science-based high-tech companies' compared to other types of businesses (Arnkil et al., 2010).

Third, the Triple Helix also tends to be criticised for its "simplistic solutions, ill-defined problems and blurred actor roles" (Lindberg, Lindgren & Packendorff, 2014, p.99). The model, for example, provided "no practical directions on how to bridge differences and nurture cooperation" (Lundberg, 2013, p.213). The model therefore fails to deal with tensions between the diverse partners (Benneworth et al., 2020; Benneworth et al., 2015). Moreover, the Triple Helix overlooks the difficulties resulting from transferring research outcomes to the market (Tuunainen, 2002). As a result, the Triple Helix is found to work differently from one region to another (Power & Malmberg, 2008), resulting in unsuccessful regional innovation policies (Rodrigues & Teles, 2017), and doubts over its application in certain regions (Razak & White, 2015).

Fourth, the model is found to "not work satisfactory due to the influence of barriers between the actors involved" (Van Geenhuizen, 2016, p.79). The Triple Helix interactions and knowledge flows, for example, are still found to face a division between the research community and the business community (Van Geenhuizen, 2016), a characteristic that can lead to knowledge being internalised and isolated (Miller, Mcadam, Moffett, et al., 2016).

Fifth, it has been proposed that the overlapping of the three helices is "not a sufficient condition for long-term growth" (Colapinto & Porlezza, 2012, p.346). This is particularly the case regarding how knowledge creation is becoming more trans-disciplinary, and assessed by its social robustness and inclusivity (Afonso et al., 2012; Robert Arnkil et al., 2010; Liljemark, 2004). It has therefore been suggested that the model should display patterns of social structure that started from the people (Brannback et al., 2008; Muchmore et al., 2015). This provides strong justification for introducing a fourth helix of 'public' as a source for additional insights (Carayannis & Campbell, 2009).

Nevertheless, arguing that the Triple Helix is insufficient for 'long-term growth' has already been noted (Afonso et al., 2012; Van Horne & Dutot, 2017). After the Triple Helix, attempts were made to incorporate additional dimensions into the model, to depict current patterns in innovation and economic growth (Colapinto & Porlezza, 2012). The term "Triple", according to Ivanova (2014, p.358), "invites for further generalisation and implies that there also may be quadruple, quintuple, and other kinds of helixes". In their quote, Etzkowitz and Leydesdorff (2000, p.118) claim that "the Triple Helix overlay provides a model at the level of social structure", emphasising that the model should aid in the display of social structure patterns (Yawson, 2009). For example, at the fourth Triple Helix conference in Copenhagen (2002), discussion arose whether the Triple Helix model should be developed further and expanded to include a fourth or fifth helix (Leydesdorff & Etzkowitz, 2003). This suggests a more flexible Triple Helix model, or as described by Leydesdorff and Etzkowitz (2003, p.59), one where "everything can be subsumed under it". Similarly, Etzkowitz (2003, p.312), suggests that "the Triple Helix should not be viewed as a rigid framework", and missing elements should be inserted into the framework to aid the analysis.

In this respect, Etzkowitz and Zhou (2006) propose "Triple Helix twins' or a 'sustainability Triple Helix', by "introducing a missing element (public) into the model, while retaining the dynamic properties of a tertius gaudens" (p.77). In this model, two helices, the university-industry-government and the university-government-public, operated jointly (Etzkowitz & Zhou, 2006). With tensions arising between industry and the public in terms of sustainable development and technological innovation, Etzkowitz and Zhou (2006) emphasise that the public, in this case social and environmental movements, is important to ensure that innovations did not become harmful to the environment or health (Etzkowitz & Zhou, 2006). The authors, however, do not disclose collaborative approaches to the relationship between public and industry (Yang & Holgaard, 2012), therefore leaving public input in the Triple Helix

context lacking any explicit reference (Arnkil et al., 2010).

This provides Carayannis and Campbell (2009) with the rationale as to "why a fourth helix of "media-based and culture-based public" can serve as a useful analytical tool, providing additional insights" (p.219). To address the issue of marginalisation in innovation policies (Carayannis & Campbell, 2009; Carayannis & Campbell, 2010), public discourses are "transported through and interpreted by the media", and considered crucial "to assign top-priorities to innovation and knowledge" (Carayannis & Campbell, 2009, p.206-207). Most of the proposed Quadruple Helix approaches focus on user-centrality (Cavallini et al., 2016). The Quadruple Helix model in itself, however, does not necessarily imply a public or user-driven design process (Fitzpatrick & Malmborg, 2018). In a 'citizen-centred Quadruple Helix', for example, Arnkil et al. (2010), draw attention to how the varying levels of involvement can range from testing to product or service co-design.

Moreover, although Carayannis and Campbell (2009) present the significance of 'media and culture', the definition of the term 'public' remains unclear and ambiguous (Arnkil et al., 2010; Carayannis & Rakhmatullin, 2014; Hasche, Höglund & Linton, 2020). Public or civil society appear in a number of proposals, including as citizens, consumers, intermediaries, and various forms of non-governmental organisations (Arnkil et al., 2010; Carayannis & Campbell, 2009; Carayannis & Campbell, 2010; Galbraith & Mcadam, 2011; Liljemark, 2004; Lindberg et al., 2012; MacGregor et al., 2010). However, using the term 'public' in such a borad and open way runs the risk of creating "blurred borderlines among the four actors in terms of institutions" (Yang & Holgaard, 2012, p.139), and reducing the notion of the public to state or government (Yang & Holgaard, 2012). Therefore, according to Björk (2014, p.198), "it might be difficult to position all actor networks in the correct helix".

To overcome the different critiques, the following section highlights the different ways that the Quadruple Helix has been operationalised.

3.2.5 The operationalisation of Quadruple Helix

Firms must frequently draw on, and collaborate with, a large number of actors from outside their organisations in order to innovate, resulting in an openness paradox (Laursen & Salter, 2014). The widespread perception of ecosystem boundaries as open and permeable (Gulati, Puranam & Tushman, 2012) has served to raised questions concerning the nature of the ecosystem, and in particular questions regarding who belongs to an ecosystem and who does not (Autio & Thomas, 2014). The innovation system concept, according to Arnkil et al. (2010), can be interpreted "in both a narrow and a broad sense" (p.8). A 'narrow' definition primarily reflects a top-down model of innovation (Arnkil et al., 2010), but a 'broader' conception is considered to be "more interactive and bottom up" (Arnkil et al., 2010, p.8). According to Lundvall (2016), this includes "all parts and aspects of the economic structure and the institutional set-up affecting learning as well as searching and exploring" (p.97). Recent innovation studies have addressed the excluding patterns in the processes of growth and innovation, emphasising the significance of recognising a broader range of actors, sectors, and industries in order to comprehend the nature of innovation (Carayannis & Campbell, 2009; Lindberg et al., 2014). Thus, inclusive growth has been at the forefront of policy discussions (OECD, 2013).

To operationalise a Quadruple Helix, Park (2014, p.204) posits that the model should focus on "both top-down government, university and industry policies and practices as well as bottom-up and mid-level out civil society grass-roots initiatives". With this in consideration, policymakers are expected to revitalise current policies that are conceptualised with this view (Carayannis & Rakhmatullin, 2014), and to develop partnerships that aim for the "design, implementation and evolution of (smart, sustainable and inclusive) growth-driving entrepreneurship and innovation ecosystems" (Carayannis & Rakhmatullin, 2014, p.220). To capture this new innovation era, innovations are expected to develop in a context characterised

by the presence of collaborative partnerships and networks, interdependent relationships, knowledge-sharing and co-creation activities (Afonso et al., 2012). The implication of the changing nature of innovation is that "no single innovative agent has the resources or the competences to act alone" (Afonso et al., 2012, p.850).

The emergence of Quadruple Helix structures and the subsequent inclusion of the fourth helix (Carayannis et al., 2012; Leydesdorff, 2012) is therefore found to resonate within the concept of open innovation introduced earlier (Carayannis & Rakhmatullin, 2014; Chesbrough, Vanhaverbeke & West, 2006; Galbraith & Mcadam, 2011). In other words, open innovation strategies appear to embody the Quadruple Helix as key stakeholders whereby "government, firms, universities, and civil participants work together to co-create innovations and drive structural changes" (Curley & Salmelin, 2013, p.5).

Furthermore, the development of the Quadruple Helix model is motivated by the excluding structures of previous interaction models for innovation and growth (Lindberg et al., 2012). George et al. (2012) use the terms "'inclusive innovation' and 'innovation for inclusive growth' interchangeably to address innovations that create or enhance opportunities to improve the wellbeing of those at the BoP [base of the pyramid]" (George et al. 2012, p.663). Inclusive growth in a Quadruple Helix context, however, is viewed as a type of economic growth, which consequently primarily targeted economic outcomes for certain demographics (Carayannis & Rakhmatullin, 2014). To emphasise inclusiveness, according to George et al. (2012, p.661), inclusive growth must be based on targeting "individuals in disenfranchised sectors of society", and a combination of both, "top-down and bottom-up processes" (George et al., 2012, p.667). The Quadruple Helix is thus expected to help integrate actors, industries and sectors whose potentials have currently been insufficiently expressed or effectively supported (Sverige, 2015). In line with this inclusive setup, the Triple Helix model is extended by the Quadruple Helix model, which presumes that society, frequently the end user of innovation

(Carayannis & Grigoroudis, 2016), is relevant to economic development (Carayannis et al., 2012; Loet Leydesdorff, 2012) and the democratisation of innovation (Carayannis & Rakhmatullin, 2014). According to Carayannis and Campbell (2014, p.3), "There is no Quadruple Helix without democracy". The model is thus expected to address knowledge and innovation production in the context of democracy, whereby the development of "smart, sustainable, and inclusive growth" is encouraged (Carayannis & Campbell, 2014, p.213).

According to Arnkil et al. (2010, p.91), "what is common to all the QH [Quadruple Helix] type of innovation conceptions is they all have included some fourth group of innovation actors into the TH [Triple Helix] model". Nonetheless, as reported in the preceding section, different perspectives existed concerning who or what this fourth group consisted of (Arnkil et al., 2010; Carayannis & Rakhmatullin, 2014; Cavallini et al., 2016; Hasche et al., 2020; Nordberg, 2015), and thus different conceptual perspectives and proposals emerged with respect to the Quadruple Helix model of innovation (Cunningham & O'Reilly, 2018), with different emphases (Lindberg et al., 2014).

In addition to an active civil society, Carayannis and Grigoroudis (2016), argue that the Quadruple Helix's most important constituent element is knowledge. Knowledge flows among social subsystems and thus influences societal innovation and know-how (Carayannis & Grigoroudis, 2016). According to Arnkil et al. (2010), this includes acknowledging a broader range of knowledge sources and engaging in more versatile interactions with knowledge producers and users. Utilising a Quadruple Helix approach, new knowledge could therefore be created via a "dynamically intertwined processes of co-opetition, co-evolution, and co-specialisation within and across regional and sectoral innovation ecosystems" (Carayannis & Grigoroudis, 2016, p.37), stimulated by the complementary nature of this knowledge (Carayannis & Grigoroudis, 2016).

Furthermore, the innovations undergo strategic knowledge co-specialisation, encouraging

"individuals or groups to expand their roles into new areas and new domains, in a complementary and mutually-reinforcing fashion" (Carayannis & Grigoroudis, 2016, p.34). In accordance with this viewpoint, new innovative solutions are co-developed and co-created, allowing every sector, particularly users such as entrepreneurs or inventors, to be present (Afonso et al., 2012; Carayannis & Rakhmatullin, 2014). In turn, "the role of actors in the other three helices would be supporting citizens in such innovation activities" (Carayannis & Grigoroudis, 2016, p.38). Government, then, is regarded as an innovation catalyst, facilitating an innovation ecosystem and stimulating frameworks by bringing the various actors together in the innovation process (Yun & Liu, 2019). Industry, on the one hand, forms open collaboration approaches in order "to access external knowledge, form collaborations, and develop new products" (Yun & Liu, 2019, p.4). On the other hand, universities' traditional functions of advancing education and research begin to be replaced by a commitment "to more fully engage in co-creational KT [Knowledge Transfer] and open innovation with industry, government and end-users to enhance commercialisation efforts" (Miller et al., 2016, p.384).

3.2.6 Summary

Both the Triple Helix and the Quadruple Helix explain why integrating the fourth helix is vital for innovation and that it should be included in the tri-lateral interactions of the Triple Helix framework, but from different perspectives. The Quadruple Helix concept was found to have a different emphasis in terms of who constituted the fourth helix. Nevertheless, it is also important to operationalise the model, and introduce innovation systems to be implemented with a set of bottom-up insights derived from civil society and complemented by a top-down view.

3.3 The innovative and entrepreneurial FinTech ecosystem

3.3.1 Introduction

FinTechs emerged in view of the increased support for multi-actor, transdisciplinary and collaborative forms of innovation. FinTechs are defined by Still et al. (2016, p.2) "as companies that are integrating innovative business models and technological solutions to disrupt and remake financial services". The majority of FinTechs derive from the non-banking sector and disrupt the industry, earning a reputation for customer centricity (Capgemini, 2018). To achieve growth, however, FinTech firms need to collaborate with established financial sector stakeholders, incumbent financial institutions and other robust partners in the ecosystem to develop better products and services that are more 'customer-centric' (Capgemini, 2018; Still et al., 2016).

3.3.2 Innovation and entrepreneurial ecosystems; a Quadruple Helix perspective

The notion of ecosystems in this study is analysed in terms of the innovation and entrepreneurial ecosystems of FinTechs in the financial services industry in Bahrain, from the perspective of a Quadruple Helix model. The model is well-suited for the purposes of the FinTech ecosystem because of its inclusiveness, and given its potential, as previously mentioned, for enhancing and driving innovation among insufficiently expressed groups (Lindberg et al., 2014; Schütz et al., 2018; Sverige, 2015). According to Sverige (2015), employing the Quadruple Helix, is particularly effective for developing policies and practices that harness the entrepreneurial and innovative potential among young entrepreneurs.

To better understand innovation and entrepreneurship in FinTech, it is therefore necessary to locate it within the general context of ecosystems (Matthews & Brueggemann, 2015) and, particularly in the context of innovation (Russell, Still, Huhytamäki, Yu, & Rubens, 2011) and entrepreneurial ecosystems (Stam & Van de Ven, 2019). This should facilitate a better understanding of FinTech innovation activities utilising bottom-up inputs, and to describe the

value creating interactions and challenges between the diverse and interconnected organisations (Autio & Thomas, 2014).

Matthews and Brueggemann (2015, p.271) define an 'ecosystem' as "a purposeful collaborating network of dynamic interacting systems that have an ever-changing set of dependencies within a given context". In response to this development, 'innovation ecosystems' emerged as a concept (Adner & Kapoor, 2010) to "shed light on how firms' innovation activities are becoming increasingly interdependent" (Ritala, Agouridas, Assimakopoulos, & Gies, 2013, p.246). According to Autio and Thomas (2014), ecosystems are a compelling metaphor for illustrating a wide range of value-creating interactions among interconnected groups of organisations. Resonating with these definitions, innovation ecosystems are described as a "network of relationships through which information and talent flow through systems of sustained value co-creation" (Russell et al., 2011, p.28). According to Carayannis and Campbell (2009, p.206), an 'innovation ecosystem' can be described as 'multi-agent system of systems' that "form, re-form and dissolve within diverse institutional, political, technological and socio-economic domains including government, university, industry, non-governmental organisations".

These definitions all stress the importance of pluralism and the diversity of actors who are often "arranged along the matrix of fluid and heterogeneous innovation networks and knowledge clusters" (Carayannis & Campbell, 2009, p.207). Carayannis et al. (2015) further view these networks "as being open, dynamic, and social" (p.107). This implies that it was the social interaction between the economic actors that produces innovations, as they interact with their surrounding environment, and thus cannot be considered as an isolated act (Carayannis et al., 2015).

The multipolar interactions between individual and institutional stakeholders (Sussan & Acs, 2017) further draw attention to 'entrepreneurial ecosystems' (Stam & Van de Ven, 2019).

An entrepreneurial ecosystem, according to Mason and Brown (2014, p.5), is composed of "entrepreneurial organizations (e.g. firms, venture capitalists, business angels, banks), institutions (universities, public sector agencies, financial bodies) and entrepreneurial processes […] which formally and informally coalesce to connect, mediate and govern the performance within the local entrepreneurial environment". Similar to the Quadruple Helix, an "entrepreneurial ecosystem assumes a co-evolution of different subsystems" (Carayannis et al., 2018, p.158). Entrepreneurial ecosystems are viewed as complex, adaptive and dynamic (Cavallo, Ghezzi & Balocco, 2019). In comparison to innovation ecosystems which cover product and service innovation, entrepreneurial ecosystems tend to facilitate the creation of new start-up ventures as an ecosystem output (Thomas & Autio, 2020). The main distinction is that the extant literature on innovation systems primarily concentrate on organisations and institutions or the enterprise, with individuals being treated as outside the subject matter, whereas in the entrepreneurial ecosystem, the entrepreneur, rather than the enterprise, is the focal point (Cavallo et al., 2019).

A significant shift in the field of entrepreneurial research is proposed by Stam (2015), who shifts the focus of investigations to productive and innovative entrepreneurship, in terms of being more inclusive when considering new ventures (Cavallo et al., 2019). According to Stam and Van de Ven (2019), this new perspective assumes mutual interdependencies and cooperative and competitive relationships "among a complex nested system of diverse organizations and actors" (p.811). Entrepreneurs, for instance, "develop mutualistic interdependencies for knowledge with scientific communities, for financial resources from venture capitalists and investors, for competent human resources from universities and training institutes, for regulatory approval and licencing from various government departments, for parts and distribution from supply chains, and product sales from informed consumers" (Stam & Van de Ven, 2019, p.3). Consequently, all of these actors can fulfil critical roles in

entrepreneurial ecosystems growth and sustainability (Stam & Van de Ven, 2019). As emphasised by Carayannis et al. (2018), however, further work remains needed to achieve a common understanding of an effective implementation of entrepreneurship within the framework of national and regional development policies.

3.3.3 Coopetition in the FinTech ecosystem

The main assumptions underpinning FinTechs as ecosystems is that they are user-driven and bottom-up (Sussan & Acs, 2017), and small start-ups (Holotiuk et al., 2018) that create technological innovations, with applications for the financial sector (Arner, Barberis & Buckley, 2015; Fonseca & Meneses, 2019). According to Still et al. (2016), FinTechs (i.e., frequently non-banking entities), emerge to provide innovative digital financial products and services to businesses, banks, and individuals. FinTechs have a reputation for bridging the gap between traditional financial institution services and customer needs, earning them a reputation for customer centricity (Capgemini, 2018). According to Frame and White (2004), FinTechs may also reduce associated costs and risks by providing user friendly services, speed, and practicality (Chesneau, 2019). Traditional players (i.e. banks), have therefore faced huge pressure because of these digital structural changes, as they were generally not well equipped and mostly driven by "outdated silo approach[es]" (Still et al., 2016, p.2).

As a result, FinTechs are often viewed as a disruption to the traditional financial services sector (Holotiuk et al., 2018). FinTech strategies of innovation, on the one hand, tend to represent simplicity and process agility (Fonseca & Meneses, 2019) by corresponding particularly to the needs expressed by clients that the banking institutions have failed to take into account (Chesneau, 2019; Worimegbe, 2020). Although characterised by their credibility and security, banks are much less agile than FinTechs. This is a consequence of their massive clientele, and due to their structural rigidity, regulatory restrictions (Chesneau, 2019), bureaucracy and slow processes (Fonseca & Meneses, 2019). Banks, therefore, may lose

exclusivity and competitive advantage to FinTechs in terms of technology and client experience, while FinTechs are often at disadvantage compared to banks in terms of clientele portfolio (Chesneau, 2019; Fonseca & Meneses, 2019).

In the ecosystem construct and its interdependencies, the exchange networks are often characterised by simultaneous cooperation and competition (Adner & Kapoor, 2010). Fonseca and Meneses (2019) maintain that 'coopetition' strategies between banks and FinTechs can be a positive driver in the development of financial sector innovation. The concept of 'coopetition', originally conceived by Ray Noorda, Novell's CEO, and developed by Brandenburger and Nalebuff (1996), "underscores that there can always exist a complex balance of cooperation and/or competition" (Carayannis & Campbell, 2009, p.221). The intertwined processes of coopetition are also found to be one of the key foci of Quadruple Helix innovation models (Carayannis & Grigoroudis, 2016). The networks, as stressed by Carayannis and Campbell (2009, p.221), "are based primarily on cooperation, but may also allow a 'within' competition". This suggests that cooperation could motivate the relationship between different networks, however, in practical terms, and "while a network cooperates internally, it may compete externally" (Carayannis & Campbell, 2009, p.221).

In this respect, a paradigm shift emerged with respect to the need to adopt dynamic measures that could relate competitiveness and cooperation (Chesneau, 2019; Fonseca & Meneses, 2019; Worimegbe, 2020). The shift entails introducing novel forms of collaboration between various actors and the "integration of commercialisation, empirical knowledge, and the public good in order to sustain economic growth" (Colapinto & Porlezza, 2012, p.345). These also include cross-sectoral linkages and interdependencies in the context of innovation structures, between diverse actors, and a shift from in-house innovation and toward collaborative innovation (Chesbrough, 2003; Ritala et al., 2013). In response to this shift, the concept of innovation

ecosystems attempt to illustrate how the innovation activities of firms are becoming increasingly interdependent (Adner & Kapoor, 2010).

To compete in a business environment that has been significantly disrupted by digitalisation, as evidenced in the financial services industry, innovations require integrating heterogeneous sources of knowledge (Holotiuk et al., 2018), particularly with the existing gap in terms of technological know-how (Fonseca & Meneses, 2020; Holotiuk et al., 2018). According to Holotiuk et al. (2018), the strategic motivation of banks to become more digital is consistent with FinTechs' motivation to expand their clientele. Banks can therefore assist FinTechs with regulatory issues and access to customer bases, while FinTechs could help promote more personalised and informed customer interactions.

This realisation further stimulated various motives to form alliances to access external knowledge (Fonseca & Meneses, 2020; Holotiuk et al., 2018), and new opportunities arose for open banking (Chesneau, 2019). This approach, according to Omarini (2018, p.28) "relates to Open Innovation literature to the extent that banks rely on the flow of inside and outside ideas to develop products and services, and innovative processes". The banking industry, according to Chesneau (2019), needs to adapt to a new paradigm of openness toward third parties by providing access to various participants. As Omarini (2018, p.28) points out, these include "authorised third parties, customer and payment account information".

3.3.4 FinTech ecosystem participants

To gain a thorough understanding of the competitive and collaborative dynamics in FinTech, the ecosystem, according to Lee and Shin (2018), must first be analysed. According to Diemers et al. (2015, p.4), for a FinTech ecosystem to function, sustained collaboration must be maintained between "governments, financial institutions, and entrepreneurs". It is also critical that each participant fully understands their role and the benefits of participation (Diemers et al., 2015). A FinTech ecosystem requires the interplay and involvement of multiple

stakeholders, as shown in the surrounding area represented by pink wavy lines (see Figure 3.5), including "the media, disruptive non-bank players, universities, software and infrastructure providers, and venture capitalists" (Diemers et al., 2015, p.11).

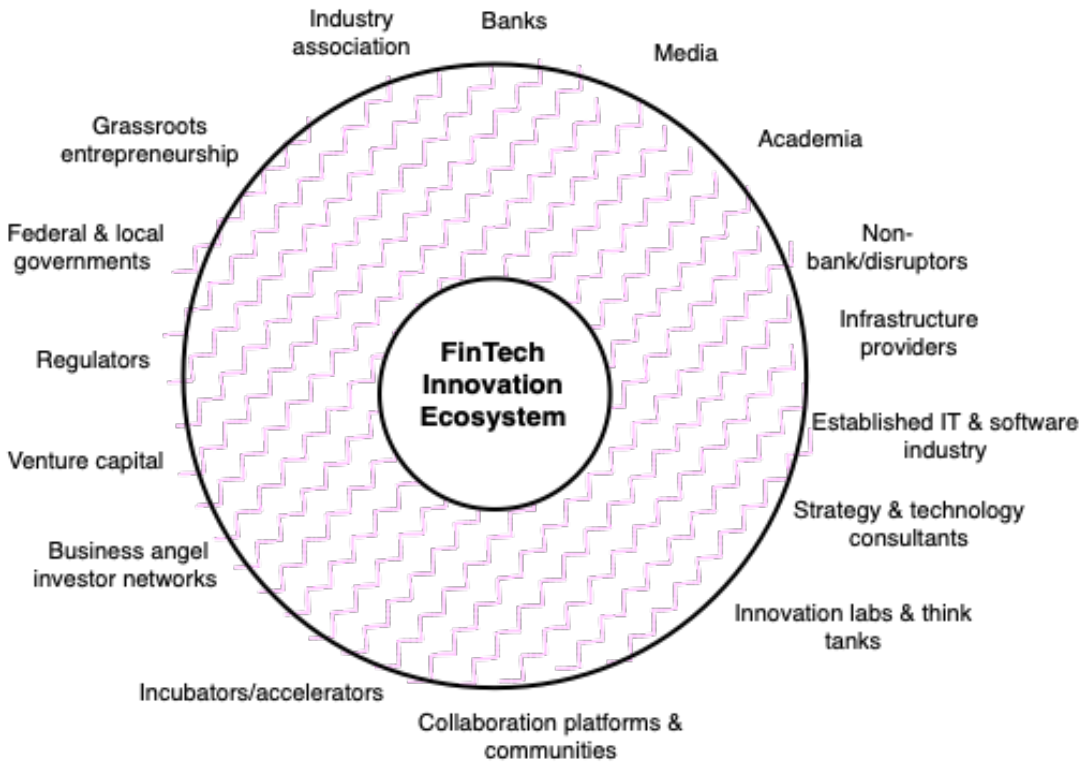

Figure 3.5 FinTech Innovation Ecosystem.

Source: (Diemers et al., 2015).

While Diemers et al. (2015) maintain that the ecosystem consists of three participants, entrepreneurs, government, and financial institutions, Lee and Shin (2018) identify five elements. These include "FinTech start-ups, technology developers, government (e.g. financial regulators and legislature), financial customers, and traditional financial institutions (e.g. tradition-al banks, insurance companies, stock brokerage firms, and venture capitalists)" (Lee & Shin, 2018, p.37). FinTech start-ups appear at the heart of the ecosystem, driving the financial services unbundling phenomenon, which has been extremely disruptive to banks (Lee & Shin, 2018). Customers can help test technology solutions in the FinTech ecosystem, and rather than relying solely on a single financial institution, they can choose the services that best

meet their needs from a wide range of FinTech companies (Lee & Shin, 2018). In exchange, entrepreneurs have access to capital and industry knowledge, as well as a market that is open to their innovative ideas and input (Diemers et al., 2015). Given the significant levels of investment required, venture capitalists are considered conducive to FinTech start-ups formation, while technology developers provided the digital platform to rapidly launch innovative services (Lee & Shin, 2018). Governments, on the one hand, and to facilitate global financial competitiveness, are responsible for providing a 'favourable regulatory environment' and various levels of regulation (e.g. financial services licensing) (Lee & Shin, 2018). This, according to Diemers et al. (2015), encourages entrepreneurial activity and facilitates the development of the FinTech ecosystem. Traditional financial institutions, including global and local banks, on the other hand, can contribute with market expertise to the ecosystem. This is achieved through revising their existing business models (Lee & Shin, 2018), partnering with FinTech start-ups (Diemers et al., 2015) and drawing on their insights to remain at the cutting edge of technology (Chesneau, 2019; Still et al., 2016).

As noted above, the interplay between all of these financial ecosystem players materialises via coopetitive strategies. According to Fonseca and Meneses (2019), they have to be regulated in order to maintain financial stability. Pertinent to this point, Diemers et al. (2015), emphasise that the challenge is to achieve the level of coordination that is necessary in order for the ecosystem to function.

3.3.5 Summary

To better understand FinTechs' innovation activities, interactions and relationships with the diverse stakeholders, it is necessary to locate FinTechs within the general context of innovation and entrepreneurial ecosystems. In an ecosystem construct and its interdependencies, the networks are often characterised by coopetition strategies, and as one of the Quadruple Helix model key areas of focus. This implies that cooperation can motivate the relationship between

different networks, but that in practice, competition also can exist. This further emphasises the importance of motivating people to adopt a new openness paradigm. As a result of this complex ecosystem, a group of actors known broadly as "intermediaries" emerged. These, according to Howells (2006), are expected to carry out different tasks throughout the innovation process.

3.4 Innovation intermediaries

3.4.1 Introduction

In regard to the practical application of the Quadruple Helix concept, one goal, according to Nordberg (2015), would be to use it in the construction of a conducive environment for innovation. Nevertheless, a more specific aim, according to Carayannis and Campbell (2009), would be oriented towards civil society inclusion in innovation processes. The task of actively including society in innovation projects is frequently carried out through different intermediary organisations that played key roles in bringing the actors together (Johnson, 2008). In complex settings such as the Quadruple Helix, with the continuous need to negotiate values among partners and participants (Fitzpatrick & Malmborg, 2018), mediating organisations come to play an important role, according to Nordberg (2015, p.354), "at the centre of development, activating society and channelling all kinds of knowledge and preferences".

3.4.2 Ecosystem management and coordination

As previously stated, innovation ecosystems describe a complex system of interactions and relationships that generate value between groups of interconnected innovation entities (Autio & Thomas, 2014; Etzkowitz & Leydesdorff, 2000). The ecosystems become increasingly complex as new actors from different disciplines are integrated (Munkongsujarit & Srivannaboon, 2011). This draws attention to the dynamics processes of producing innovation (Vallejo, Oyelaran-Oyeyinka, Ozord, & Bolo, 2019), and raises questions with regard to how these ecosystem are coordinated and managed (Autio & Thomas, 2014). In this context, it is critical to ensure that objectives are aligned and that an integrated understanding of value

creation mechanisms is gained, as described by Ritala et al. (2013). Similarly, Russell et al. (2011, p.28) stress that "the continual realignment of synergistic relationships of people, knowledge and resources is required for vitality of the ecosystem".

Much of the work on the network management theme stems from Möller and Svahn (2003), who argue that network management necessitated specific organisational capabilities. Möller and Svahn (2003) further argues that there has to be sufficient commonality between the network's overall goals and the goals of its constituent participants. According to Chesbrough and Appleyard (2007), the coordination device may reside with a single company or consortium in many contexts. These are considered as key factors influencing ecosystem stability, as they drive collective achievement and promote the creation and sharing of value (Autio & Thomas, 2014).

In general, social interactions, particularly with the recent need for civil society inclusion in innovation systems, have the potential to optimise having an entity acting as an 'agent or broker' to facilitate the innovation process (Johnson, 2008; Lindkvist et al., 2019; Munkongsujarit & Srivannaboon, 2011), what Howells (2006) terms an 'Innovation Intermediary'.

3.4.3 Defining innovation intermediaries

Intermediaries, although mentioned by researchers studying national, regional, or sectoral innovation processes, have been rarely described. Most researchers, according to Dalziel (2010, p.3), "have focused on particular organizations or classes of innovation intermediaries, few have found it necessary to define innovation intermediaries as organizational class". According to Klewitz et al. (2012), intermediaries are commonly understood as 'third-party organisations'.

Innovation intermediaries have been described in a variety of ways, types, and terms. Different authors have delved deeper into the varieties of their roles and organisational modes,

including Bessant and Rush (1995), Howells (2006), Chesbrough et al. (2006), and Landry et al. (2013), among others. According to Chesbrough et al. (2006), intermediaries can take many forms. These include "agents, representing one side of a transaction, brokers or market makers, who try to bring parties together to achieve a transaction" (Galbraith & Mcadam, 2011, p.4). Gredel et al. (2012) made note of the various forms of innovation intermediaries reported in the extant literature. These include "intellectual property brokers, venture capitalists, and technology trading platforms" (Gredel et al., 2012, p.536). Different terms are therefore used to refer to innovation intermediaries (Betz et al., 2016, p.594), namely: "intermediaries, technology brokers, knowledge brokers, innovation brokers, bricoleurs, boundary organisations, matchmakers, and open innovation accelerators". Other terms include bridge builders (Sapsed, Grantham & DeFillippi, 2007), trust builders (Porto Gomez, Otegi Olaso & Zabala-Iturriagagoitia, 2016), technological brokers (Hargadon & Sutton, 1997), and networks of promoters (Fichter, 2009).

Despite the fact that "different authors have coined different terms for intermediaries" (Vallejo et al., 2019, p.3), this study uses the term 'innovation intermediaries' (Howells, 2006) to describe the entire spectrum of organisations that carry out this function. According to Howells (2006, p.720) an innovation intermediary is "an organization or body that acts an agent or broker in any aspect of the innovation process between two or more parties". Dalziel (2010, p.3-4) define innovation intermediaries "as organizations or groups within organizations that work to enable innovation, either directly by enabling the innovativeness of one or more firms, or indirectly by enhancing the innovative capacity of regions, nations, or sectors". Intermediaries may thus involve a variety of actors, both "internal to universities (i.e. technology transfer offices)" (Van Horne & Dutot, 2017, p.287) and "external (e.g. surrogate entrepreneurs, venture capital firms and development agencies)" (Wright, Clarysse, Lockett, & Knockaert, 2008, p.1208).

3.4.4 Classifying innovation intermediaries: functions and purpose

With an increasing scholarly body of work on intermediaries, the variety of their roles, and their organisational modes (Bessant & Rush, 1995; Howells, 2006; Landry et al., 2013), conceptual challenges have emerged in terms of classifying them (Kanda, Río, Hjelm, & Bienkowska, 2019). These challenges, according to Kanda et al. (2019), are primarily attributed to "the different types of entities studied as intermediaries, their different characteristics and the different contexts within which they operate" (p.1137). The multi-focused nature of most of the functions undertaken by innovation intermediaries, for instance, resulted in overlaps, causing further redundancies and confusion in terms of classifying intermediaries (Galbraith & Mcadam, 2011; Inkinen & Suorsa, 2010).

According to the literature, innovation intermediaries are considered a collection of operational activities that connect various actors from various innovation systems (Katzy, Turgut, Holzmann, & Sailer, 2013), and supplement the competences lacking within a given network. Innovation intermediaries, according to Janssen et al. (2016), can thus help increase the likelihood of successful networking. Howell (2006, p.720) underscores the point that intermediary activities should include "helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations". Nevertheless, Munkongsujarit and Srivannaboon (2011), point out that intermediaries do not have to perform all of these functions and activities as long as they focus on the activities that serve the purposes of their existences.

On the one hand, and as discussed in the literature, most of the classifications in this section are based on the roles and activities of innovation intermediaries (Howells, 2006; Stadtler & Probst, 2012; Vallejo et al., 2019). Concerning the functions they perform, Howells (2006)

identifies five key functions or roles: “scanning and information processing; knowledge processing; gatekeeping and brokering; testing and validation; commercialisation” (Howells, 2006, p.720). He further classifies innovation intermediaries into four groups, highlighting how different studies in the literature on innovation focus different emphasis on intermediary roles and processes of intermediation (Howells, 2006). The groups are as follows: “(i) diffusion and technology transfer; (ii) innovation management; (iii) innovation systems and knowledge networks; and (iv) intermediation as a service” (Vallejo et al., 2019, p.3). In other classifications, Inkinen and Suorsa (2010, p.174), propose classifying intermediary roles with respect to three overlapping functions: “(1) funding support (direct funding or indirect funding through collaboration), (2) networking and collaboration (partnership building and knowledge dissemination) and (3) other supportive functions (e.g., direct contributions to product development)”.

Few classifications, on the other hand, are based on innovation intermediaries’ value propositions (Dalziel, 2010; Lopez-Vega & Vanhaverbeke, 2009), objectives (Comacchio, Bonesso & Pizzi, 2012; Stadtler & Probst, 2012; Vallejo et al., 2019), how they accessed and delivered knowledge (Colombo, Dell’Era & Frattini, 2015), and innovations’ market readiness (Nambisan & Sawhney, 2007).

In terms of value propositions, Lopez-Vega and Vanhaverbeke (2009, p.15), for example, classify innovation intermediaries into “innovation consultants, innovation traders, innovation incubators and innovation mediators”. Alternatively, Dalziel (2010, p.5), classify innovation intermediary on the basis of their purpose and into three categories of “interorganizational networking activities, technology development and related activities, and other activities”. According to Dalziel (2010), this type of classification can avoid two difficulties. First, with the heterogenous and diverse number of actors and platforms studied as intermediaries, it enabls limiting the class of organisations that undertake the role (Dalziel, 2010; Kanda et al.,

2019). Second, it avoids limiting innovation intermediary roles to merely brokers or agents between two or more parties (Dalziel, 2010), or reducing their role to notions of alignment, translation or matchmaking (Meyer & Kearnes, 2013).

Alternatively, the intermediary roles are classified based on the "systemic objectives of intermediaries as either knowledge or business oriented" (Vallejo et al., 2019, p.3), or as conveners who only connected stakeholders, or mediators who influenced the interactions between different partners (Stadtler & Probst, 2012). In a similar vein, Chesbrough et al. (2006) identify two major forms of innovation intermediaries: agents; and brokers. According to Gredel et al. (2012, p.538): "(1) agents, representing only one side of the technology transaction, and (2) brokers or market makers, who match buyers and sellers of a technology, shape the terms of the transaction and sometimes assist in the commercialization process". Other scholars, such as Comacchio, Bonesso and Pizzi (2012, p.947), further depict the objectives of intermediaries as "a dual process of information sharing and creating cognitive closeness". Information sharing corresponds to accessing complementary knowledge across institutional boundaries (Champenois & Etzkowitz, 2018; Villani, Rasmussen & Grimaldi, 2017). In contrast, creating cognitive closeness refers to externalising relevant knowledge (De Silva, Howells & Meyer, 2018), framing each other's various perceptions, expectations, and ideas (De Silva et al., 2018; Wright et al., 2008), transforming that knowledge (Carlile, 2002, 2004), and conveying influence between different groups of partners (De Silva et al., 2018; Wright et al., 2008). Another important distinction is made here between organisations whose primary goal was to act as an intermediary, such as innovation support centres, and organisations that supported innovation networks (Nilsson & Sia-Ljungström, 2013), and those "which act as intermediaries as a by-product of their principal activities" (Winch & Courtney, 2007, p.748), such as "consultancy firms and research-liaison offices of universities" (Nilsson & Sia-Ljungström, 2013, p.165).

In relation to how innovation intermediaries access and deliver knowledge, Colombo et al. (2015, p.3) combine these two dimensions to further identify four categories of innovation intermediaries, namely "brokers, mediators, collectors and connectors".

Intermediaries may also be differentiated according to the nature of the interaction between the client and the intermediaries, and "the market-readiness of the transaction" (Gredel et al., 2012, p.538), whether it is "raw ideas or market-ready businesses" (Nambisan & Sawhney, 2007, p.109). Accordingly, Nambisan and Sawhney (2007) categorise group innovation intermediaries as either invention capitalists, innovation capitalists or venture capitalists and business incubators.

In general, to create and sustain innovation networks, innovation intermediaries can further be classified as formal or informal (Brès, Mena & Salles-Djelic, 2019); undertaken as a core or a side activity; by a human or non-human (Poncet, Kuper & Chiche, 2010); by an individual, organisation or an institution (Jenson, Doyle & Miles, 2020); in a bilateral or multilateral or even systemic manner (Poncet et al., 2010) and directly or indirectly (Dalziel, 2010).

Nevertheless, the institutional structure of the different sectors is found to influence the functioning of innovation intermediaries (Intarakumnerd & Chaoroenporn, 2013). According to Intarakumnerd & Chaoroenporn (2013, p.107) "different sectors have different types of actors and linkages, different rates of technological change, different underlying institutions, and different market and systemic failures". As a result, various types of intermediaries specialising in specific roles may be required (Intarakumnerd & Chaoroenporn, 2013).

The challenges with regards to how to classify innovation intermediaries, and the lack of transparency and clarity regarding intermediary roles, also posed additional challenges to the generalisability of findings from one study to the next (Kanda et al., 2019). This section has attempted to combine various classifications in the literature in order to highlight what to expect from the various types of intermediaries, as well as how organisations acting as

intermediaries supported innovation activities and contributed to innovation system functions (Kanda et al., 2019).

3.4.5 Innovation intermediaries and knowledge transfer

In the context of Quadruple Helix relationships, facilitating knowledge transfer between the helices is considered the main pillar of the helix configurations (Van Horne & Dutot, 2017). According to Van Horne and Dutot (2017), knowledge transfer processes in a Quadruple Helix system were thought to be more complex than those found in more conventional settings. This is attributed to the fact that knowledge transfer as an activity is not only concerned with bringing knowledge into use in another organisation's context (Hong, Snell & Easterby-Smith, 2009), or "exploiting accessible resources, i.e. knowledge, but also about how to acquire and absorb it well to make things more efficient and effective" (Liyanage et al., 2009, p.7). Knowledge transfer is generally defined "as an event through which one organization learns from the experience of another" (Easterby-Smith, Lyles, & Tsang, 2008, p.677).

According to Landry et al. (2007, p.575), knowledge transfer is expected to "[nourish] the various needs and stages in the decision-making process of firms and government agencies", and help contribute to the development of improved products or services and the commercialisation of research results. Moreover, knowledge transfer processes within a Quadruple Helix environment were often described as both iterative and nonlinear, involving different actors at different stages (Van Horne & Dutot, 2017), in what Van Horne and Dutot (2017, p.288) view as "a process of processes". Thus, a successful transfer according to Van Horne et al. (2012) depends on multidirectional knowledge creation and knowledge exchange, where the transfer results help to assimilate new knowledge (Liyanage et al., 2009).

Amidst these inflows and outflows of knowledge (Chesbrough, 2011), entities come to play to facilitate the knowledge transfer processes, and these are the intermediary organisations (Yusuf, 2008). In the past, the role of innovation intermediaries as catalysts were frequently

overlooked in innovation policy (Janssen et al., 2016), and innovation intermediaries received little attention in studies of 'national' (Lundvall, 2007), 'regional' (Cooke, 2005), and 'sectoral' systems of innovation (Malerba, 2002). However, intermediaries have been recognised by policymakers as critical actors in an innovation system (Intarakumnerd & Chaoroenporn, 2013), given their potential to solve its systemic failures (Intarakumnerd & Chaoroenporn, 2013; Katzy et al., 2013). The role of these intermediaries are therefore proposed as key components in the innovation literature (Howells, 2006; Polzin, von Flotow & Klerkx, 2016), and appear as a prominent and a rapidly growing conduit of open innovation (Almirall & Wareham, 2011; Chesbrough, Vanhaverbeke & West, 2006), systems of innovation (Betz et al., 2016; Bjerregaard, 2009; Cornett, 2009; Leydesdorff & Etzkowitz, 2003; Liljemark, 2004; Nordberg, 2015), and inclusive innovation (Foster & Heeks, 2013).

Innovation intermediaries, for example, play important roles in open innovation frameworks as companies began to adopt open innovation to help improve their innovation processes' efficiency and effectiveness (Chesbrough, 2003; Lin & Wei, 2018). According to Katzy et al. (2013, p.298), broad agreement exist in literature that "innovation processes in open networks are coordinated through a visible hand, often referred to as innovation intermediary". Open innovation therefore emphasises the existence of innovation intermediaries that assist in maximising the value of external networking opportunities (Chesbrough, Vanhaverbeke & West, 2006), and alleviate knowledge transfer challenges (Almirall & Wareham, 2011).

In reference to helix models and systems of innovation, innovation intermediaries clearly play an important role. Several scholars have highlighted their importance as part of the need to extend the helix model to include organisations that bridge the gaps between the diverse actors (Lindberg et al., 2014). Analysing university-industry collaborations, Bjerregaard (2010) pointed to the complexity of 'institutional/cultural logics' in Triple Helix settings. According to Lindberg et al. (2014, p.99) this implies "the need for new ways of organizing

intersections between the helices" as well as intermediate organisations that can bring the partners together. In a similar vein, Cornett (2009) focused on the Triple Helix framework, suggesting that depending on the collaborative relationship at hand, various types of intermediate organisations could be required to stimulate linkages. Intermediaries, according to Etzkowitz (2003), are believed to help fulfil the gaps in the innovation system, particularly regarding strongly defended boundaries across the spheres (Leydesdorff & Etzkowitz, 2003), the high capital constraints to innovate (Malerba, 2004; Colapinto, 2007; Colapinto & Porlezza, 2012), and the unequal levels of influence shaping the innovation dynamics (Vallance, Tewdwr-Jones & Kempton, 2020).

The concept of innovation actors is therefore extended to include innovation intermediaries (Howells, 2006; Yao, Li & Weng, 2018). As a result, and as highlighted in the depiction of the four helical interactions between government, industry, universities and public, mediating organisations were found to be central to development (Betz et al., 2016; Nordberg, 2015). Innovation intermediaries are also considered as "the fourth partner in a revised model for explaining the knowledge-based economy" (Colapinto & Porlezza, 2012, p.346). Liljemark (2004), for instance, propose that intermediate organisations be included in the Triple Helix innovation model as innovation-enabler organisations. Intermediaries are also proposed as a relevant fourth helix of Quadruple Helix arrangements (Colapinto & Porlezza, 2012; Lindberg et al., 2014; Sverige, 2015; Van Horne & Dutot, 2017), reflecting a slightly different perception of the fourth helix, or the civil/public society proposed by Carayannis and Campbell (2009). For example, to enhance entrepreneurship and innovation among women and young entrepreneurs in the creative industries sector, the roles of civil society actors can be primarily encompassed by non-profit organisations, such as intermediaries to connect with partners and target groups (Sverige, 2015). In a further example, financial intermediaries such as venture capitalists, business angels, or financing organisations were introduced to help foster revenue

growth and commercialisation (Colapinto & Porlezza, 2012; Wright et al., 2008). The financial intermediary is able to assist start-ups, particularly in the FinTech ecosystem described earlier (Diemers et al., 2015), and support in terms of bringing further tacit knowledge in terms of know-how, contacts, troubleshooting skills or risk evaluation abilities (Wright et al., 2008; Yusuf, 2008).

Accountable to several actors belonging in the distinct spheres of government, university and industry, it is important to note that these intermediary organisations, according to Champenois and Etzkowitz (2018), often exist as entities independent from these spheres and thus are not fully determined by any actor in particular (Champenois & Etzkowitz, 2018). Intermediary value propositions essentially can act as matchmakers for ideas, talent, and technology (Galbraith & Mcadam, 2011), working across sectors to bridge gaps in practice (Vallance et al., 2020; Wright et al., 2008). According to Sieg et al. (2010) working with an innovation intermediary is motivated by the managerial challenges in relation to problem sharing, selection and formulation (Sieg et al., 2010). Using their 'knowledge-gathering' and 'processing skills' (Lopez-Vega & Vanhaverbeke, 2009) to help firms "compensate for the lack of, relevant innovative capabilities" (Bessant & Rush, 1995, p.11). These intermediaries are further found to reduce the potential for misunderstandings and disputes (Villani et al., 2017), and information asymmetries and uncertainty (Polzin et al., 2016). Intermediaries further emerge to mitigate systemic problems with regards to how the different actors addressed specific problems (Howells, 2006). Given that individual actors are not used to working together, and do not expect to draw the same benefits from the project (Gagnon, Mailhot & Ziam, 2019), they are often unable to achieve objectives that matched their needs entirely, without being influenced by other helix actors (Campanella, Della Peruta, Bresciani, & Dezi, 2017).

In an inclusive setup such as the one aspired by a Quadruple Helix (Carayannis & Campbell, 2009), the development of frameworks and relationships with new inclusive innovation intermediaries are needed (Heeks, Mirta, Kintu, & Shah, 2013; Howells, 2006), particularly with the roles they perform in the diffusion and scaling of innovations, and bridging the gaps in practice (MacGregor et al., 2010). According to Cavallini et al. (2016), and within the helices models, sharing and transferring knowledge are envisioned as a means of contributing to innovation. Innovation intermediaries, according to Colombo et al. (2015, p.8), are therefore expected to help transfer two forms of tacit knowledge, the "know-how and know-who". Related to this tendency, Nonaka (1994, p.17), makes the point that tacit knowledge is often "deeply rooted in action, commitment, and involvement in a specific context", and is therefore not easy to transfer (Yang et al., 2014). Accordingly, it can only be transferred by close contacts with the recipients of this knowledge (Lee, 2012; Nonaka, 1994). According to Yang et al. (2014), partners "should engage in communication frequently to develop the elements for shared interpretation" (p.354). The intervention of an innovation intermediary is therefore considered necessary to access, absorb, recombine and deliver this knowledge (Colombo et al., 2015).

In addition, innovation intermediaries are expected to help shape the direction of strategic policy and "externalise relevant knowledge in order to influence the actions and interests of potential partners" (De Silva et al., 2018, p.74). Clausen and Rasmussenb (2011) propose that innovation intermediaries can contribute significantly to 'open innovation' policies by transferring valuable resources and knowledge to society that would not have been transferred otherwise. As a result, Dalziel (2010, p.14) contend that "supporting innovation intermediaries may be the most effective way in which governments can increase the innovativeness of firms in the public interest".

Nevertheless, not all intermediary activities are specifically related to innovation (Howells, 2006). It is therefore important to point to what Howell (2006, p.723) considers as a conceptual issue: “when is an innovation intermediary not an innovation intermediary?”. As observed by Howells (2006, p.725), intermediaries engage in bilateral, and occasionally, unilateral activities, “supplying services direct to their clients on a one-to-one basis, which involved no other interaction with other organizations”. These frequently involve contractual research or training with no brokerage or third-party function (Howells, 2006). Accordingly, and as Dalziel (2010, p.4), explain, “organizations can all be classified as innovation intermediaries insofar as their organizational purpose is to enable innovation”.

3.4.6 Summary

This section underscored the point that innovation is heavily reliant on knowledge exchange and integration from all relevant players. The emergence of new modes to coordinate relations between multiple actors representing society, science and the industry can thus be seen as an indicator of the proliferation of intermediation and intermediary actors. The Quadruple Helix perspective on innovation systems, therefore, not only highlights the dynamics of creating innovations or solutions between different actors, but also stresses the forces involved when adapting, adopting and embedding it within local environments to create social impact. As a result of the overlap of these distinct institutional spheres, a favourable environment for innovation intermediaries has emerged. Innovation intermediaries were proposed as a key component of Quadruple Helix arrangements as they work across the different spheres to bridge differences in practice and promote cooperation.

3.5 Summary and implications: identification of gaps and research questions

This section aims to present and summarise the key areas in the reviewed literature on the Quadruple Helix innovation model, FinTech ecosystems and innovation intermediaries. This

is followed by identifying the main gap in the literature, the research aims and research questions.

Concerning the Quadruple Helix model of innovation, the reviewed literature reveals that the model is best understood when located in the context of innovation and innovation systems literature (Arnkil et al., 2010). An important implication of the new innovation policies is that of the need for differentiated participation and thus more open, interactive, inter-disciplinary and inclusive innovation processes. Among the structures stressing such pluralism were the helix models, which were developed with the key assumption that actors seldom innovated alone. The Quadruple Helix was viewed to represent the recent moves towards more open, inclusive and participatory approaches (Chesbrough, 2003; Nordberg, 2015; Stirling, 2008), where the focus has shifted to interactive, multi-actor networks and processes of innovation (Arnkil et al., 2010; Sussan & Acs, 2017). The model further implied the need for diversified knowledge bases (Nordberg, 2015), and stressed the significance of wider settings for Triple Helix relations (Grundel & Dahlström, 2016), by democratising the existing innovation processes with the inclusion of civil society (Carayannis & Rakhmatullin, 2014; Carayannis et al., 2012; Lindberg et al., 2014). Consequently, to operationalise a Quadruple Helix, innovation systems need to be implemented a set of 'top-down policies' "complemented and enhanced by a bottom-up set of insights coming from the civil society" (Carayannis & Campbell, 2014, p.217). Although the Quadruple Helix was initially proposed to overcome limitations exhibited in the Triple Helix framework, as well as the issue of marginalisation in innovation policies (Carayannis & Campbell, 2009; Carayannis & Campbell, 2010), there was no clear delimitation of the fourth helix (Arnkil et al., 2010; Carayannis & Rakhmatullin, 2014; Hasche, Höglund & Linton, 2020). This tendency resulted in rather blurred and ill defined borderlines among the four actors (Yang & Holgaard, 2012, p.139). Thus, positioning actors in the correct helix was found to be a particularly challenging task (Björk, 2014).

According to the reviewed literature on FinTech ecosystems, the financial industry has shown willingness to collaborate with FinTechs and introduce new creative solutions, especially in light of the national initiative to promote financial inclusion through digital means. FinTechs were found to fit with entrepreneurial ecosystems (Mason & Brown, 2014; Stam & Van de Ven, 2019), and the collaborating dynamics, mutualistic interdependence, and inclusiveness of the Quadruple Helix model (Lindberg et al., 2014; Schütz et al., 2018; Sverige, 2015). Two of the key assumptions underpinning FinTechs as ecosystems is that they are fundamentally user centric (Sussan & Acs, 2017) and are widely regarded as a threat to the traditional financial services industry (Holotiuk et al., 2018). Banks therefore may lose exclusivity and competitive advantage to FinTechs in terms of technology and client experience, while FinTechs may lose out to banks in terms of clientele portfolio (Chesneau, 2019; Fonseca & Meneses, 2019). In this respect, coopetition strategies between banks and FinTechs were proposed, and "the quest for new knowledge to develop digital innovation [triggered] various motives for partners to form alliances and seek access to external knowledge" (Holotiuk et al., 2018, p.303). Participants were thus expected to capitalise on the resulting synergy between the configured networks and the complementary worlds of FinTechs start-ups and banks through coopetition strategies. Accordingly, banks worked with FinTechs and start-ups with more openness, drawing on the agility the Fintech processes allowed, and including ideas from entrepreneurs for reforming banking's often long and rigid business processes.

The literature on innovation intermediaries also shows that the catalyst role of innovation intermediaries is often overlooked in studies of national, regional, or sectoral systems of innovation (Cooke, 2005; Dalziel, 2010; Lundvall, 2007; Malerba, 2002). Indeed, innovation intermediaries have therefore been proposed as key components of these innovation systems (Howells, 2006; Polzin et al., 2016), and particularly in the conduit of inclusive (Foster &

Heeks, 2013) and open innovation (Almirall & Wareham, 2011; Chesbrough, Vanhaverbeke & West, 2006). With growing scholarly contributions on innovation intermediaries, defining and classifying them were conceptually challenging (Bessant & Rush, 1995; Howells, 2006; Landry et al., 2013). Intermediaries are commonly understood as third-party organisations (Klewitz et al., 2012), who come in various forms and types (Bessant & Rush, 1995; Betz et al., 2016; Chesbrough, 2006; Fichter, 2009; Gredel, Kramer & Bend, 2012; Hargadon & Sutton, 1997; Gomez, Olaso & Zabala-Iturriagagoitia, 2016). Despite the various forms and types, the literature emphasises the point that the functioning of innovation intermediaries can be influenced by diverse institutional and sectoral structures (Intarakumnerd & Chaoroenporn, 2013), and thus different sectors may need different types of intermediaries (Intarakumnerd & Chaoroenporn, 2013). In the context of Quadruple Helix configurations, and the complex, iterative and non-linear knowledge transfer processes, the intermediary came into play (Betz et al., 2016; Nordberg, 2015; Yusuf, 2008). The systems of innovation were therefore extended to include innovation intermediaries (Colapinto & Porlezza, 2012; Liljemark, 2004; Lindberg et al., 2014; Sverige, 2015; Van Horne & Dutot, 2017), having a substantial value on its own (MacGregor et al., 2010), as well as reflecting a different perspective on the fourth helix presented by Carayannis and Campbell (2009).

Concerning knowledge gaps or research priorities related to the Quadruple Helix, the FinTech ecosystem and the role of innovation intermediaries, these were identified in a variety of recent publications, which are summarised below.

According to Carayannis et al. (2018), the Quadruple Helix innovation model was proposed as innovation and entrepreneurship ecosystems enabler or enactor, which is fundamentally "an action-based phenomenon that involves a highly interrelated set of creative, strategic, and organizing processes", as pointed out by Moroz & Hindle (2012, p.785). While several studies on networks and partnerships have emphasised the significance of inter-actor relationships,

few studies investigate Quadruple Helix configurations and interactions as a process (Björk, 2014; García-Terán & Skoglund, 2019; Lindberg et al., 2014). According to Kolehmainen et al. (2016) "the actual processes and dynamics of regional development have remained surprisingly veiled" (p.27). As a result, interactions have only been examined superficially (García-Terán & Skoglund, 2019). The works of Whitehead (1929) were especially influential in the development of such processual perspectives. In the most basic terms, Whitehead (1929) contends that reality is viewed as a continuous stream of "changing states of existence" (Moroz & Hindle, 2012, p.786) that may be divided into sets of experiences and then further divided into various processes.

While innovation platforms are designed to bring together a wide range of stakeholders to share knowledge and resources in order to resolve common issues (Cullen et al., 2014), few studies have taken into account understanding the interactions and activities, as well as their complexity, on a micro-level (Höglund & Linton, 2018; McAdam et al., 2018). Thus, it is unclear how these individual and process interactions converge to form a Quadruple Helix (Kriz et al., 2018). According to Schütz et al. (2019), gaining a clearer understanding of the micro aspects is critical to encouraging the Quadruple Helix innovations necessitated by policies and innovation research. Particularly in terms of the roles that actors from various sectors play in the formation of innovation networks, as well as understanding what drives the heterogeneous relationships among the members of the various helices (Schütz et al., 2019).

Building on these gaps, and as key constructs to explaining the effectiveness of the Quadruple Helix (Cunningham et al., 2018; Hasche et al., 2020; Scuotto et al., 2020), scholars have argued that the macro-analytical perspective, which focus on stakeholders' sectors of origin (McAdam & Debackere, 2018), should be supplemented with the micro analysis of "dynamic relationships, synergies, collaborations, coordinated environments, and value-creating activities" (Hasche, Höglund, & Linton, 2020, p.2). The current call for more micro-

level research is well founded in the literature, in order to "fully understand the complexity of activities that take place in a quadruple helix setting" (Hasche et al., 2020, p.6), and to aid in understanding interventions on how tensions can be overcome (Miller et al, 2016; Plewa et al., 2013).

The engagement of the fourth helix may also appear to create opportunities to participate actively in collaborations; however, their freedom to act is often constrained or rather governed (Gaventa, 2006). The mutual interdependence of all stakeholders is a distinguishing feature of an effective Quadruple Helix (Carayannis et al., 2012). The different actors, however, frequently exercise their salience to create power imbalances (Miller et al., 2014), that impinges on the Quadruple Helix's balance (Miller et al., 2016). This power struggle has the potential to influence stakeholders' willingness to participate in collaborations (Miller et al., 2016). As a result, in open innovation projects that involve different Quadruple Helix stakeholders, there is a greater need to fully understand and address power dynamics (Miller et al., 2016).

In relation to the financial services industry, the sector appears to be undergoing a marked paradigm shift (Fonseca & Meneses, 2019). The convergence of pervasive digital technology, according to Holotiuk et al. (2018), has intensified "the degree of heterogeneity and the need for dynamic balancing and integration of knowledge resources" (p. 303). As a result, the pursuit of new knowledge in order to advance digital innovation has triggered a variety of motivations for alliances to be formed and access to external knowledge to be sought (Holotiuk et al., 2018). Coopetitive strategies have therefore become more frequent in the financial services industry (Lee & Shin, 2018). This new strategic relationship, however, remains virtually unexplored in the literature (Fonseca & Meneses, 2020), particularly in terms of the impact on innovation (Holotiuk et al., 2018; Kraus, Schmid & Gast, 2017).

To gain a more detailed understanding of Quadruple Helix interactions, future research, as suggested by Carayannis and Rakhmatullin (2014), needs to identify the governance

mechanisms by which these interactions are enhanced. Further research, according to Vallance et al. (2020), should concentrate on determining the shape that these new structures will take and how they will aid in the integration of public engagement concerns into larger innovation processes. Cunningham and O'Reilly (2018) assert that future studies of the Quadruple Helix must broaden the unit of analysis at the micro level to include intermediaries, who can orchestrate the various spheres (Hasche et al., 2020). This is particularly the case with the limited knowledge that exists on intermediary contributions to knowledge transfer (Gagnon, Mailhot, & Ziam, 2019). The theory posits that intermediaries are essential "in bringing together partners with different knowledge bases" (Lindkvist et al., 2019, p.357), and were shown to be 'effective structures' in recognition of the advent of Quadruple Helix formations within regions (Lindberg et al., 2014; Nordberg, 2015).

Research in this field, however, remains emergent (Miller, Mcadam & Mcadam, 2016). Further, Miller et al. (2016) propose that there was a need to explore intermediaries in terms of how they balanced power relationships, eliminated the barriers of knowledge transfer, bridged gaps in practice and encouraged collaboration. However, there remains a lack of research on how their roles evolve throughout the various stages of the innovation process (Howells, 2006; Lindkvist et al., 2019), and whether their role in the early phases of the collaboration changes from that at the final stages of the collaboration (Cummings & Teng, 2003). Thus, their function over time remains unclear. Exploring this area can help clarify the role intermediaries play to facilitate Quadruple Helix stakeholder engagement (Almirall & Wareham, 2011; Gredel et al., 2012), identify the challenges in knowledge transfer and how the intervention of intermediaries aids in its progression (Lindkvist et al., 2019).

Concerning the emergence of the research questions, these have been informed by the reviewed literature and the knowledge gaps identified.

In relation to the literature on the Quadruple Helix model of innovation, there was no clear delimitation of the fourth helix, leaving blurred borderlines among the four actors. Thus, positioning actors, the fourth helix specifically, in the correct helix was found important particularly in the FinTech ecosystems which is closely correlated with the inclusiveness and user centrality of the Quadruple Helix model and its aim to increase public/civil society engagement (Q1).

Drawing on the FinTech ecosystems, their user centric and multi-agent systems tended to disrupt the financial services industry. It was therefore essential to identify the potential of participants capitalising on the resulting synergy between the configured networks and the complementary worlds of FinTechs start-ups and banks. It was also important to determine how they include ideas from entrepreneurs for reforming banking's often long and rigid business processes (Q2).

Overall, there is a general lack of understanding of the relationships in terms of interactions, as well as the complexity of Quadruple Helix models from a micro perspective. As a result, the research addresses this issue by demonstrating how the processual perspective can be used to analyse the tensions that arise as a result of integrating the fourth helix. It is thus possible to achieve a more detailed and deeper understanding of these tensions, as well as the mechanisms employed in their management. It is deemed necessary to investigate how the various actors and process interactions converge to develop a Quadruple Helix that includes public participants. Significantly, the latter is not fully explored in Quadruple Helix literature (Q3).

Intermediaries were demonstrated to be effective structures for accommodating the emergence of Quadruple Helix frameworks in the literature. There is, however, a lack of research on how they can aid in the integration of public engagement in collaborations involving multiple stakeholders and contribute to knowledge transfer. As a result, it was critical to identify the governance mechanisms. These can enhance interactions and help understand

how the intervention of an innovation intermediary; help overcome tensions and aid in the integration of the fourth helix (Q4).

Therefore, in order to generate a thorough understanding of how collaborations in the Quadruple Helix are structured, coordinated and managed in the emerging FinTech sector of Bahrain, where multiple diverse stakeholders are interacting, the following research questions have been established:

1. How is the fourth helix perceived in the existing entrepreneurial and innovative networks of the FinTech ecosystems?
2. How is it integrated?
3. What are the implications of their integration?
4. What is the role played by intermediaries in this integration?

4. Research design and methodology

4.1 Introduction

This chapter introduces the research design and methodology, starting with the research purpose, followed by a discussion of the philosophical assumptions that underpin the research in terms of the 'research paradigm', 'ontology', and 'epistemology'. The chapter then discusses the research approach, setting out the reasoning for adopting a qualitative research, and grounded theory in particular. This is followed by a discussion of the historical development of grounded theory, the various versions of the theory, and their distinct characteristics. Subsequently, the chapter discusses the research context, sampling and instruments, followed by a discussion of situational analysis and its mapping techniques. The chapter concludes by highlighting the research quality criteria, and addressing the ethical considerations governing the conduct of this research.

4.2 Research purpose

Prior to discussing the methodology, it is important to highlight the purpose of the research. Robson and McCartan (2016) recognised four purposes: exploratory; descriptive; explanatory; and emancipatory research purposes.

On the one hand, an exploratory study typically searches for new insights and ideas to help gain a narrower focus and understanding of a problem (Saunders, Lewis & Thornhill, 2009), particularly in situations where little understanding is available (Robson, 2002). A descriptive study, on the other hand, is used complementary to an exploratory research, and aims to describe people, events or situations (Saunders et al., 2009), requiring an extensive knowledge of the situation (Robson, 2002). Saunders et al. (2008) argued that "it should be thought of as a means to an end rather than an end in itself" (p. 140). Thus, descriptive research may utilise or precede other types of research. Regarding explanatory research, this type aims to "explain why people experience or understand a social phenomenon" (Matthews & Ross, 2010, p.476). It also aims to explain the patterns relating to a problem or a situation (Robson, 2002), and how these different patterns are related (Saunders et al., 2009). According to Mason (2002), emancipatory research is participatory in nature, where the research stakeholders are involved as partners in planning, designing and controlling the research (Bryant & Charmaz, 2019). Therefore, emancipatory research, accroding to Robson (2002), depends on the "opportunities and the will to engage in social action" (p.60). In summary, a particular study may have more than one purpose, sometimes all four, but often one purpose will prevail over the others. Nevertheless, "the purpose may also change as the study proceeds" (Robson & McCartan, 2016, p.64).

In line with the objectives of this study, this research has an exploratory purpose as it requires an understanding of how collaborations in a Quadruple Helix innovation network are structured, coordinated, and managed, in Bahrain's emerging financial services sector, where

multiple diverse stakeholders interact. This research also has an explanatory purpose, as it aims to explain the following: how is the fourth helix perceived in the existing entrepreneurial and innovative networks of the FinTech ecosystems? How is it integrated? What are the implications of their integration? And what is the role played by the intermediaries in this integration?

4.3 Research philosophy

The research philosophy is often "concerned with the question of how individuals make sense of the world around them" (Bryman, 2012, p.30), and refers to "the use of abstract ideas and beliefs that inform [the] research" (Creswell & Poth, 2016, p.49). These assumptions play an essential role in shaping the research strategy, methods employed, and how findings are interpreted (Saunders, Lewis & Thornhill, 2019). The section starts by addressing the research paradigm as a philosophical stance, and the philosophical assumptions underlying the research's ontological and epistemological positions.

4.3.1 Research paradigm

Guba and Lincoln (1994) defined the 'research paradigm' as "the basic belief system or worldview that guides the investigator" (p.105). Paradigms help "to distinguish between different views of research, knowledge, and truth" (Bryant, 2017, p.42), and thus the ontological, epistemological positions of the researcher (Denzin & Lincoln, 2005). Different authors have offered different views and definitions of a paradigm (Blaxter, 2006; Denzin & Lincoln, 2017). Instead of outlining all these different views, this section will follow Bryant's (2017) distinction, based on two views of knowledge: "the view that knowledge is discovered and the view that it is made or constructed" (p.42), or between positivism and interpretivism.

Positivism is often driven by "natural laws and mechanisms" (Guba & Lincoln, 1994, p.109). The researcher is considered to be "independent of, and neither affects nor is affected by, the subject of the research" (Saunders et al., 2009, p.548), and therefore, directs less

attention to impressions and more to facts (Saunders et al., 2009). Differing from this, the goal of interpretivism is to "study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them" (Denzin & Lincoln, 2005, p.43). This paradigm is thus context bound and takes into account participants' subjective and shared perspectives (Goldkuhl, 2012), and the researcher's interpretations of those perceptions (Cassell & Symon, 2004). One limitation, however, is that the interpretations made from participants' responses can be largely influenced by the researcher's prior experiences and views (Bryman, 2012; Saunders et al., 2019).

An interpretivist paradigm was therefore adopted here considering the research problem at hand, and the need to study actors' various interpretations and perceptions with respect to the experiences of Quadruple Helix actors working together in this context.

4.3.2 The ontological and epistemological positions

Ontology refers to the ways in which reality is perceived (Creswell & Poth, 2016; Matthews & Ross, 2010). This involves studying what represents reality and "what is out there to know about" (Grix, 2002, p.175), and "what kind of relationships exists" (Slevitch, 2011, p.74). Two philosophical positions are discussed under ontology: realism; and relativism. Realism assumes the existence of a single external reality (Burrell & Morgan, 1979), one "separate from the social actors involved in it" (Matthews & Ross, 2010, p.26). Alternatively, relativism assumes the existence of multiple realities (Denzin & Lincoln, 2017). Most importantly, the researcher, is considered part of this reality (Guba & Lincoln, 1994), and therefore, this position is built around the meanings and reflections constructed by the actors involved (Matthews & Ross, 2010). Given that the Quadruple Helix model involves a heterogenous groups of actors that must share knowledge interactively across functional and organisational boundaries, with the possibility of establishing different interpretations and meanings of their interactions, this study will follow a relativism ontology. The idea of studying reality apart from the subjective

meanings and understandings that participants attribute to a social phenomenon cannot be adopted.

Epistemology explains "how can one investigate whatever he or she believes to be known?" (Slevitch, 2011, p.75) and helps answer the question of "what and how can we know about it?" (Grix, 2002, p.175). Therefore, epistemology denotes the "assumptions about knowledge, what constitutes acceptable, valid and legitimate knowledge" (Saunders et al., 2019, p.133), and focuses on the researcher's relationship with the participants (Creswell & Creswell, 2018). Moreover, epistemology distinguishes between two ontological positions: objectivism; and subjectivism (Bryman, 2012; Guba & Lincoln, 1994; Saunders et al., 2019). On the one hand, objectivism represents "the position that social entities exist in reality external to social actors" (Saunders et al., 2009, p.110), where the researcher studies the object uninfluenced by the social actors involved (Guba & Lincoln, 1994; Matthews & Ross, 2010). Subjectivism, on the other hand, "holds that social phenomena are created from the perceptions and consequent actions of those social actors concerned with their existence" (Saunders et al., 2009, p.110). Thus, the researcher is often interactively engaged (Guba & Lincoln, 1994) in understanding the variant narratives, interpretations, and perceptions of social actors (Saunders et al., 2019). Hence, subjectivism is the epistemological position adopted here, given how actors' interpretations and perceptions shape the interactions between them.

4.4 Research Approach

The research approach can be examined and compared to 'qualitative' and 'quantitative' approaches, depending on the research questions and underlying philosophies. Qualitative research refers to the techniques or procedures that use non-numerical data (Saunders et al., 2009), whereby "the investigator and the object of the investigation are assumed to be interactively linked so that the 'findings' are literally created as the investigation proceeds" (Guba & Lincoln, 1994, p.111). Samples in qualitative research do not necessarily represent

the larger population, instead small and purposeful samples are used (Sale, 2016). In contrast, quantitative research refers to the generation and usage of numerical data (Saunders et al., 2009), with the aim to examine relationships between variables (Matthews & Ross, 2010), and "studying the object without influencing it or being influenced by it" (Guba & Lincoln, 1994, p.110). The researcher is therefore seen as independent from the research participants (Matthews & Ross, 2010). Compared to qualitative research, sample sizes are substantially larger to ensure they are representative (Sale, 2016).

Concerning the use of theory, another important distinction is the one seperating a deductive and inductive approach (Cassell & Symon, 2004). A deductive approach involves developing a theory through hypotheses (Creswell & Creswell, 2018) that are rigorously tested later (Saunders et al., 2009), with the aim to discover causal relationships between two or more factors (Lin, 1998). Alternatively, the inductive approach is more concerned with understanding the context of the event under study, in developing meanings regarding the phenomenon (Creswell & Creswell, 2018; Saunders et al., 2019) and discovering causal mechanisms and why factors are related (Lin, 1998). In association to the research philosophies discussed earlier, (see Section 4.3), the deductive approach was found to associate more with positivism, while the inductive approach associated with interpretivism (Bryman, 2012; Creswell & Poth, 2016; Saunders et al., 2019).

Due to the exploratory nature of this study, this research adopts a qualitative interpretive approach to gain in depth understanding of actors' interactions and individual experiences, as well as, the meanings they attach to them.

4.5 Methodology

Methodology is frequently confused with and used interchangeably with methods (Grix, 2002; Saunders et al., 2009). On the one hand, methodology is often underpinned by the ontological and epistemological assumptions that a study adopts, and thus it is concerned with

"the assumptions about the ways in which knowledge is produced" (Grix, 2002, p.179). On the other hand, methods are more concerned with the techniques that a researcher adopts to generate and analyse data (Mason, 2002). In contrast to methodologies, methods are seen as "free from ontological and epistemological assumptions, and the choice of which to use should be guided by research questions" (Grix, 2002, p.180).

4.5.1 Qualitative research strategies

Creswell and Creswell (2018) proposed five approaches to qualitative research: "narrative, phenomenology, ethnography, case study, and grounded theory" (p.259). These are explained below.

Narrative research is defined as "an account of an experience that is told in a sequenced way, indicating a flow of related events" (Saunders et al., 2008, p.497). A narrator is often involved in processing and interpreting the data, and depicting the events (Creswell & Creswell, 2018; Matthews & Ross, 2010). Various data collection methods can be used here, including observations (Creswell & Creswell, 2018), and in-depth interviews with small and purposive samples (Saunders et al., 2019). Narrative research was deemed incompatible with this research as the aim here is to explore the experiences of a heterogenous groups of actors rather than narrating events in a chronological order.

In contrast to narrative research, phenomenology aims to describe the common experiences of individuals who have lived a certain phenomenon (Schutz & Natanson, 1972; Creswell et al., 2007). Phenomenology attempts to present matters "as closely as possible to the way that those concerned understand them" (Denscombe, 2010, p.95), through conducting in-depth interviews, observations and document analysis (Creswell & Creswell, 2018). Phenomenology, however, "attempts to build the essence of experience from participants" only from a subjective point of view (Creswell & Creswell, 2018, p.109). Therefore, it was not ideal for this study.

Ethnographic research, according to Denscombe (2010), aims to provide "a description of peoples or cultures" (p.79). The research process often requires the researcher to be adaptive to any changes as new patterns may evolve from observation (Saunders et al., 2009). As this method is more concerned with groups' behaviours (Creswell & Creswell, 2018) and with descriptions of practices within a particular culture (Denscombe, 2014), often over prolonged periods of time (Saunders et al., 2009), ethnography was not considered suitable for this study.

Case studies, according to Stake (1995), refer to an "object to study" (p.3). A case study involves rich case descriptions (Creswell & Poth, 2016), as well as a thorough direct examination of a phenomenon in its particular context (Yin, 2014). As a methodology, Thomas (2011), has argued that what distinguishes case studies from other types of research is the detailed information they can capture. Case studies can help increase opportunities to access information that might not otherwise be available to the researcher (Eisenhardt & Graebner, 2007).

Last, grounded theory "consist of a set of inductive strategies analysing data" (Charmaz, 1996, p.27). Grounded theory, unlike other methodologies, goes beyond by developing "a general, abstract theory of a process, action, or interaction grounded in the views of participants" (Creswell & Creswell, 2018, p.50). According to Locke (2001), "Grounded theory overlaps to a degree with all of these approaches to qualitative research" (p.18), and thus it overlaps with case studies as an approach. Both lead to theory generation, explaining why a phenomenon occurs (Corbin & Strauss, 2015; Yin, 2014). The difference, however, lies in the analytical procedure. Although case studies and grounded theory can be used in tandem (Urquhart & Fernández, 2013), grounded theory is employed in this study as it is well suited on its own to provide an in-depth explanation "whether the researcher is analyzing a single organization or several" (Corbin & Strauss, 2015, p.368).

As noted previously, this study will adopt an interpretative epistemological approach, that fits with grounded theory, to "help the research participant to articulate his or her intentions and meanings […] and to learn about the research participant's experiences and reflections" (Charmaz, 2006, p.26). The interplay between gathering and analysing data to generate theory is what characterises grounded theory (Seidel & Urquhart, 2013). According to Denscombe (2010) "concepts and theories are developed out of the data through a persistent process of comparing the ideas with existing data, and improving the emerging concepts and theories by checking them against new data collected" (p.108). This contributes to the reasoning as to why grounded theory is seen as effective, as it explores a new context while "deliberately avoid[ing] specifying any theoretical propositions at the outset of an inquiry" (Yin, 2014, p.35).

Grounded theory was selected and used as it best serves the purposes of this study. Justification is provided in the section below.

4.5.2 Justification of Grounded Theory approach

Grounded theory was selected among the other four qualitative research methods as it offered a number of attributes. First, "the openness of Grounded Theory and the chance to really generate concepts that make sense of what is going on" (Glaser, 1999, p.838). It therefore provides rigorous insight into unknown areas by the researcher (Jones & Alony, 2011). Second, grounded theory was found to be effective in terms of overcoming issues of bias and a priori assumptions and enforcing preconceptions that other methods may have (Jones & Alony, 2011). Third, and for the purposes of this research, grounded theory was deemed suitable to enter the world of the participants (Clarke, 2005), investigate their perceptions (Denscombe, 2014), and allow the researcher "to elicit a fresh understanding about relationships, their patterns, and how interactions actively construct reality" (Villasana, 2011, p.49).

Grounded theory can be useful in studying topics with a social aspect (Jones & Alony, 2011), particularly regarding the social processes of innovation and knowledge production

under a Quadruple Helix (Carayannis & Campbell, 2011). It is essential to highlight that grounded theory has been applied in other helix studies, specifically in the context of collaborations in a triple helix setting. For example, Villasana (2011) used grounded theory to gain a better understanding of the motivations for developing industry-academic relationships. Bjerregaard (2010), for example, used grounded theory to capture interacting actors' perceptions concerning institutional cultures and how they shape university and industry collaborations.

Further, grounded theory was particularly found to be suitable for this study to gain a thorough understanding of the complex interactions under a Quadruple Helix setting and how the multiplicity of actors shapes the collaborative processes as they unfold.

4.6 Grounded Theory

The section introduces grounded theory as a methodology. Starting with an overview of its origin, this section examines the different versions of the approach and their distinct features, followed by the rationale for choosing the Clarkeian version.

4.6.1 Grounded Theory development

Historically, during their study of 'dying in hospitals', grounded theory was initially developed by Glaser and Strauss (1967). A systematic methodological strategy was developed as they constructed their analyses of dying, 'The Discovery of Grounded Theory', as their first attempt to articulate an approach to theory development grounded in data (Charmaz, 2006). Although originally designed for sociological research, grounded theory has been extensively applied in other various fields (Vasconcelos, 2007).

Despite being the most cited method in qualitative research articles (Langley, 2011), grounded theory "has been used in many different ways" (Vasconcelos et al., 2012, p.121), and thus there exist a variety of approaches to grounded theory research (Heath & Cowley, 2004).

The debate on what grounded theory is and how it is implemented continues (Bryant, 2017). Initially, three versions existed: original; Glaserian; and Straussian (McCallin, 2003). Apramian et al. (2017), however, contrasted four schools of thought, named by their founders: Glaserian; Straussian; Charmazian; and Clarkeian. Each one holds varied assumptions with respect to theory.

As explained by Apramian et al. (2017, p.361), "for Glaser a Grounded Theory is abstract, for Strauss it captures complexity, for Charmaz it is about theorising an argument about the world, and for Clarke it is about theorising comparisons". The first two schools were assumed to have a shared ontology with slightly different epistemologies (Heath & Cowley, 2004). The key fundamental difference lies in the position taken to address the research questions, the coding tools and the processes employed (Apramian et al., 2017). For example, Apramian et al. (2017) found that the coding processes under the Glaserian and Straussian schools focused on coding exceptions, while the focus under the Charmazian and Clarkeian schools rested on the story built from the participants' social phenomenon.

Concerning the Glaserian school, the original text of Glaser and Strauss (1967) was extended by Glaser (1978) to provide detailed explanations on "theoretical sampling, theoretical coding and use of theoretical memos" (Heath & Cowley, 2004, p.142). The Glaserian position assumes that grounded theory is generated as "a way of arriving at theory suited to its supposed uses" (Glaser & Strauss, 1967, p.3). The model depends on data, rather than hypotheses to construct codes and categories using the constant comparative method (Charmaz, 2006), which involves "open, selective and theoretical coding" (Seidel & Urquhart, 2013, p.239). The theory develops as data is collected and analysed at each stage (Charmaz, 2006), allowing the researcher(s) to see the problem outside of the context from where it was discovered (Apramian et al., 2017).

Alternatively, the Straussian position follows a procedure that is more systematic (Creswell et al., 2007), offering analytic tools that are more structured such as the 'coding paradigm' and the "conditional or consequential matrix" (Creswell & Poth, 2016, p.408). The process is perceived as being more structured given the coding process followed and its three distinct phases: "as open, axial, and selective" coding (Corbin & Strauss, 2014, p.361). The researcher is also expected to identify the interplay between "how the actors respond to changing conditions and to the consequences of their actions" (Corbin & Strauss, 1990, p.5).

Charmazian or constructivist grounded theory, in contrast, adopts an interpretive position of qualitative research, where "a constructivist would emphasise eliciting the participant's definitions of terms, situations, and events and try to tap his or her assumptions, implicit meanings, and tacit rules" (Charmaz, 2006, p.32). Therefore, the focus is more on "individuals' views, values, beliefs, feelings, assumptions, and ideologies than on research methods" (Creswell et al., 2007, p.250). Concerning the coding process, the Charmazian approach to grounded theory is considered to be less structured and more flexible compared to the Straussian version (Creswell & Creswell, 2018), and follows Grounded theory coding of at least two phases: initial and focused coding (Charmaz, 2006, p.42). Initially offering a two-step approach of open codes and category development (Charmaz, 2006). Charmaz (2014) later introduced concepts and themes to the Straussian version.

The Clarkeian school by Clarke (2005) used Strauss's original framework and his social worlds/arena as a tool (Vasconcelos et al., 2012) to introduce 'Situational Analysis' (Clarke, 2005). The fundamental focus here is to look at certain aspects of the actors, their social lives and activities that, as stated by Apramian et al. (2017), are not commonly acknowledged, by "making differences more visible and making silences speak" (Clarke, 2005, p.9). Situational analysis is believed to have pushed grounded theory around 'the postmodern turn' (Clarke, 2003). Postmodernism is viewed as a set of 'foundational assumptions' (Bryant & Charmaz,

2007) whereby the “complications, messiness, and denseness of actual situations in social life are central concerns” (Clarke & Friese, 2007, p.6). Postmodernism thus emphasises “instabilities, irregularities, contradictions, heterogeneities, situatedness and fragmentation” (Clarke & Friese, 2007, p.6). As a result, the researcher is expected to “bring a self-reflexive component to practice by consistently interrogating their own standpoint” (Clarke et al., 2017, p.157). This involved using the situations as the unit of analysis, with the aid of “three kinds of maps in situational analysis (situational and relational, social worlds/arenas, and positional maps)” (Clarke et al., 2017, p.171). The goal of situational analysis is to produce “concepts and theoretical integration toward provocative yet provisional grounded theorizing” (Clarke & Friese, 2007, p.9).

In summary, the different versions of grounded theory were found to emphasise a number of common aspects (Charmaz & Bryant, 2016), such as the concurrent processes of data collection and analysis (Corbin & Strauss, 2015), theoretical sampling and comparative analysis (Glaser & Strauss, 1967). According to Birks et al. (2013), researchers interested in grounded theory “should not be overly concerned with the type of grounded theory adopted” (p.4) as long as the key standards of the methodology are implemented.

4.6.2 Justification for selecting the Clarkeian version

Based on an understanding of the key features of the various versions of grounded theory, the Clarkeian version (Clarke, 2005) and situational analysis grounded theory was selected for several reasons. First, situational analysis focus on “differences and complexities found in the postmodern world” (Uri, 2015, p.139), which aligns with the primary purpose of this study. The study was based on conducting thirty-two interviews with different participant groups representing academia, the regulators, industry, intermediaries and public members to generate information on how the fourth helix is perceived in the existing entrepreneurial and innovative networks of the FinTech ecosystems. Instead of focusing on basic social processes, “the

situation itself is a key unit of analysis per se" (Bryant & Charmaz, 2007, p.364). This enables analysts to fully elaborate the complexities of their situations of inquiry, including how a diverse array of elements constitute and shape participants' reported experiences (Clarke, 2005). Clarke (2005) criticised the traditional grounded theory for being homogeneous. Instead, Clarke & Friese (2007) advocated for investigating the "dense complexities of the situation of inquiry" (p.369). In this study, difference, complexity, and sameness were best exhibited in the social arena maps that focused on meaning-making (Clarke, 2005). The Clarkeian version aims "at capturing, describing and thus rendering susceptible to analysis the multiple simultaneous organized actions" (Clarke, 1991, p.131). These actions are the consequence of "the negotiations within and between worlds that are most consequential for the development of the arena over time" (Charmaz, 2006, p.64). According to a review of the literature on open innovation, innovation systems are conceptualised as a multiple helix and a multi-actor interface (Carayannis & Campbell, 2009; Etzkowitz & Leydesdorff, 2000), that relies on "dynamic and flexible interaction of diverse elements" (Schütz et al., 2018, p.47). However, it has also identified the need to investigate how the various actors and process interactions converge to develop a Quadruple Helix around shared problems or goals. This necessitates more emphasis placed on participants' interactions and the outcomes of their interactions. As a result, this study employed the Social Worlds/Arenas Theory to aid in the consideration of "the negotiated meanings and mindsets" (Vasconcelos et al., 2012, p.131) that comprise the arena of financial services sector interactions.

Second, methodologically, situational analysis "evolved from rather than supplanted classic grounded theory […] and is intended to supplement rather than replace the basic analytic approaches of grounded theory" (Uri, 2015, p.139). Namely coding, memoing, and auditing (Grzanka, 2021). Similarly, Clarke (2005) posits situational analysis as an extension of Grounded theory, not a replacement. Furthermore, situational analysis retains the strong

systematic approach of grounded theory to analyse through mapping (Clarke, 2005). Situational analysis mapping helps identify important silences (Mathar, 2008). The mapping helps move beyond interview transcripts to elucidate marginalised perspectives (Rachel, Adele & Carrie, 2020), revealing which group of actors have been silenced and which "groups have lost parts of their capacity to perform and shape action and how" (Glück, 2018, p.52). One of the Social Worlds/Arenas theory strengths is "turning up the volume on the less powerful actors, empowering them in the arena" (Clarke & Montini, 1993, p.69). Clarke directs the theory development process toward identifying and describing "things, people, and kinds of work that are not commonly acknowledged" (Apramian et al., 2017, p.367). Compared to other analytic approaches, the analysis of social worlds/arenas aims to represent the majority of social worlds in a particular arena (Clarke, 2005). As a result, in terms of representation, it was considered more democratic, whereby significant power is granted to the less powerful worlds (Clarke, 2005).

Third, and in relation to the second reason, carrying out a situational analysis involves using three different mapping strategies to analyse and describe the different facets of the situation (Clarke, 2019). These maps help provoke new ideas (Mathar, 2008), and identify relevant differences (Clarke, 2005) and elements in relation to the researcher's inquiry (Glück, 2018). Without this explicit attention to difference, Clarke contended, grounded theories from other schools functioned to hide power from public view (Apramian et al., 2017). The Clarkeian version of grounded theory helps embrace the complications of situations, enhance the researcher's reflexivity in terms of analysing discourses of power (Clarke, Friese & Washburn, 2017), contingencies and multiplicity (Clarke, 2005). In situational analysis, differences, power, contingencies, and multiplicity are all treated extremely seriously as approaches to research (Clarke, 2005). According to Arnkil et al. (2010), issues of power are "very seldom addressed in the QH [Quadruple Helix] literature, even if there is a clear (but implicit) in-built

tension and a potential conflict of interest" (p.75). Situational analysis appeared relevant here, as it helps explore the crucial aspects of interaction (Clarke, 2005). Clarke (2005) embraces the complications of situations, drawing upon the work of Foucault (1982) to develop a deeper interpretation and analysis of the power relations and contexts (Mathar, 2008; Mills, Chapman, Bonner, & Francis, 2007). According to Foucauldian theory, 'power is everywhere' (Foucault, 1982). Reinforcing the fact that "power infrastructure is not static. The locus of power is continually shifting" (Huxham, 2003, p.407). The various Quadruple Helix actors have vastly different levels of power. Embracing complexity and mapping the situation aids in identifying and exploring issues and tensions in the action situation (i.e., cross-sectoral collaboration among Quadruple Helix actors).

The Clarkeian version of grounded theory was thus deemed useful for the purposes of this study and the Quadruple Helix setting in particular. The mapping strategies helped identify the areas of gap concerning the integration of the fourth helix, marginalised actors, and the tensions that emerged.

4.7 Research design

This section discusses the research design and the strategies of how the research was conducted. First, it explains how literature was used in the research, followed by an overview of the research context and the sampling approach. This section then describes the data collection process in relation to the instruments for collecting data and sample methods, followed by a discussion regarding how the comparative analysis was conducted. The section ends by setting out how memos and diagrams were employed, and the use of 'Computer Assisted Qualitative Data Analysis Software' (CAQDAS).

4.7.1 The use of literature

A common and persistent misconception about grounded theory is the use of literature (Urquhart & Fernández, 2013). The premise, according to Urquhart and Fernández (2013), is

that “the grounded theory researcher is a ‘blank slate’, who launches into data collection without first looking at the literature” (p.4). Glaser and Strauss (1967) acknowledged the fact that entering the field of inquiry free from ideas was impossible, as prior ideas helped the researcher in generating his/her own theory, where the researcher then “tend to combine mostly concepts and hypotheses that have emerged from the data with some existing ones that are clearly useful” (p.46). The researcher is thus expected to keep an open mind about what literature might be useful, in what Glaser and Strauss, (1967) described as “theoretical sensitivity”. This requires an “ability to have theoretical insight into [one’s] area of research, combined with an ability to make something of [one’s] insights” (Glaser & Strauss, 1967. p.46). Moreover, the researcher is expected to maintain “sensitivity to all possible theoretical relevance among the hundreds of possible runs” (Glaser & Strauss, 1967, p.149). According to Urquhart (2012), theoretical sensitivity requires integrating different sets of literature together, in addition to engaging the emergent theory with existing literature.

This research follows the two-phase process of Urquhart and Fernández (2013). Linking the emergent theory to existing literature is the final step in developing a grounded theory (Corbin & Strauss, 2015). For theoretical integration with the literature, two phases can be applied. The first phase (also known as the noncommittal literature review) is where “the researcher scans the literature to develop theoretical sensitivity and find the research problem and learns about the methodology” (Urquhart & Fernández, 2013, p.9).

The researcher thus conducted an initial review of the literature to formulate the focus and develop the primary research question(s). This helped contextualise the research problem and identify any overlooked areas. This involved a review of previous research and theories on Quadruple Helix innovation model, FinTech ecosystems, and innovation intermediaries (see Chapter 3). The second phase (the integrative phase) is where “the researcher compares the emergent theory with extant theories” (Urquhart & Fernández, 2013, p.9). The literature comes

from various disciplines, and sources to help enrich both the categories and the emergent theory (Urquhart, 2012). The focus was on whether the emergent theory confirmed or else contradicted with the existing literature, and the contribution is viewed in terms of extending the existing literature or suggesting new avenues for future research (Urquhart, 2005).

The goal is "extending and scaling up the theory" through integrating the emergent theory with a formal or a meta theory (Urquhart & Fernández, 2013, p.7). On the one hand, Formal theories are thought to be broad and less specific to the issue at hand (Corbin & Strauss, 2015, p.63). Nevertheless, they help provide "an initial direction in developing relevant categories and properties and in choosing possible modes of integration" (Glaser & Strauss, 1967, p.79). Meta theories, on the other hand, are formal theories that "tend to have a very wide scope and apply to almost all aspects of organisational or social life" (Urquhart, 2012, p.136). According to Schad, et al (2016, p.14), the value of a meta theory lies in its ability to "[bridge] between more specific, previously applied theories". Thus demonstrating scholarly contributions and the role of "the new theory in the context of existing theory" (Urquhart, 2012, p.30), and in forming a lens through which to view an emergent theory (Urquhart, 2012). According to Urquhart (2012), theoretical integration, is a way to "view our emergent theory through the lens of higher-level, more formal theories and, in this process, start to abstract our emergent theory still further" (p. 169). In order to achieve "the full potential of GTM" (Urquhart, 2012, p.228), the emergent theory in this study is framed and discussed in relation to relevant studies in the Quadruple Helix innovation models, FinTech ecosystems and innovation intermediaries literature.

Moreover, memos were integrated to form a pattern that subsequently developed into a conceptual framework (Glaser & Holton, 2004). The Discussion Chapter contains the integrative literature review (see Chapter 6).

4.7.2 Research context and sampling approach

To begin any form of qualitative research that can be considered credible (Guba & Lincoln, 1982), "the researcher must immerse her- or himself within the context" (Clarke, Friese & Washburn, 2017, p.218). Context not only helps investigate a social process but also to understand how it influences a social process (Glück, 2018). Clarke et al. (2017) dissolved the idea of a context into comprehensive situations, understood as both "an object and an ongoing process" (p.144). The aim of this section, then, is to introduce the research context of this study, followed by general information about its main participants.

The research looks into the Quadruple Helix innovation model and how it unfolds in the FinTech ecosystem in Bahrain, wherein innovations are envisioned to be stimulated by a collaborative process. The focus is thus to investigate the interactions between diverse actors representing the regulator, academia, industry, public and intermediaries.

The selection of the participants was influenced by a preliminary exploratory study, as well as the analytical framework that developed with it. Key actors were then interviewed face-to-face. Committed to catering to the training needs of the financial services sector, members of academia here included universities and Higher Education Institutes (HEIs), training service providers and internal intermediaries. With the main discourse to tap into the global digital economy, the financial services industry consisted of "traditional financial institutions (e.g., tradition-al banks, insurance companies, stock brokerage firms, and venture capitalists)" (Lee & Shin, 2018, p.37). Following the new regulatory initiatives that aim to invest in entrepreneurial platforms such as FinTechs, the key players consisted of the financial services sector regulator, start-ups regulators, academic regulators, FinTech working groups, and FinTech innovation networks. The regulator was found to hold the position of mediator in the relationship between the other actors, expressed in the development of a regulatory framework serving the development of innovation. Public representatives were represented by

students/learners, financial institutional employees, clients/customers, and entrepreneurs. The role of intermediaries was undertaken by internal and external intermediaries. On the one hand, internal intermediaries were represented by actors from academia, who were found to serve as mediators with the aim to enable key actors from industry, the regulatory system and public members to connect. External intermediaries, on the other hand, were represented by public and private agencies, (e.g. angel investors, start-ups accelerators, venture capitalists, incubators) aiming to facilitate collaborations between the various actors, provide the necessary funding, co-working space and mentorship to establish FinTech start-ups.

In terms of sampling, there are two kinds of sampling involved in doing grounded theory research (Clarke et al., 2017). First is "the usual sampling driven by attempts to be 'representative' of some social body or population and its heterogeneities—to examine a full array of persons and sites of the phenomenon" (Clarke et al., 2017, p.122). Since theoretical sampling can only be applied after data analysis, the first data collection was based on open sampling (Strauss & Corbin, 2008). According to Strauss and Corbin (2008, p.206), the investigator is expected to be "open to all possibilities during interviews, during observations, when reading documents, and so on and will want to take full advantage of every opportunity that comes up, exploring each as much as is feasible". This was discovered to be a useful approach in the first stage of data collection in order to maximise data variations and be able to develop concepts and begin sampling theoretically. To gain a foothold in the study, an initial group of participants was selected who potentially provided later access to the intended participants. Selecting the group of possible participants is the initial step for collecting data. In this study, by taking into consideration the availability of possible participants and their willingness to participate, the first six participants were academic representatives with different roles and different levels of experience.

The selection was also guided by the 'theoretical relevance' of research question (Glaser & Strauss, 1967), in addition to the value they may add to the data being obtained (Alony, Whymark, & Jones, 2007). For example, the researcher can purposefully collect data from participants who are more likely to provide rich and relevant data about the phenomena. Since the main research question is related to gaining an understanding of how collaborations are structured and managed in Quadruple Helix innovation networks and the emerging FinTech sector of Bahrain, the group of possible participants includes a heterogenous sample representing academia, industry, regulators, public/civil society, and intermediary, who come together in Quadruple Helix co-development and co-design processes. Participants were thus selected based on how they could help explore the interorganisational knowledge transfer between the four helix actors from various perspectives. Table 4.1 shows the participants recruited in this research. The data analysis commenced immediately after the interviews and further selection of participants was based on theoretical sampling, the results of analysis and constant comparison (Glaser & Strauss, 1967).

The second kind of sampling is 'theoretical sampling' guided explicitly by theoretical concerns that have emerged in the provisional analysis. Participants were selected on the basis of 'theoretical sampling', which is one of the main features of the grounded theory methodology (Glaser & Strauss, 1967). According to Clarke et al. (2017, p.123), theoretical sampling "remains a fundamental strength of [grounded theory's] analytic approach and is also crucial for [Situational Analysis]". Theoretical sampling refers to collecting data based on concepts derived from data analysis to densify categories and to enrich understanding of the phenomena (Glaser & Strauss, 1967). The literature can aid in suggesting theoretical sampling by providing "insights into where (place, time, papers, etc.) a researcher might go to investigate certain relevant concepts. In other words, it can direct the researcher to situations that he or she might not otherwise have considered" (Strauss & Corbin, 2008, p.51). Theoretical sampling

also emphasises the importance of selecting participants based on their potential to contribute to the development of the theory (Creswell & Creswell, 2018). Therefore, the data gathering aimed to answer questions about the emerging theoretical categories (Jørgensen, 2001), and address "interesting facets of the emergent analysis" (Clarke, 2003, p.557).

The findings of the qualitative research were generated from thirty-two semi-structured interviews. As participants will be quoted, but left unnamed in the research outputs, participants' verbatim coding, used through-out this research, is presented in Table 4.1.

Helix Dimension	Participant's position	Code	Research stage (pilot/main)	No. of interviews
Academia	Head - Leadership, management and assessment centre	A1	Pilot	14
	Head - The Academic centre	A2	Pilot and main	
	Head - Islamic Finance centre	A3	Pilot and main	
	Head - The quality assurance unit	A4	Pilot and main	
	Member of the advisory panel	A5	Pilot	
	Member of the programme review committee	A6	Pilot and main	
	Member of the Mapping panel	A7	Main	
	Marketing Manager	A8	Main	
	Assistant Manager	A9	Main	
	Senior Officer	A10	Main	
Industry	Senior trainer and lecturer from industry	IND1	Pilot	3
	General Manager	IND2	Main	
	Research Consultant	IND3	Main	
Regulator	Head - Projects, talent acquisition and development	R1	Pilot	4
	Head-Conventional Insurance and reinsurance firms	R2	Main	
	Academic Consultant	R3	Main	
	Head of FinTech and Innovation Unit	R4	Main	
Public/Civil society	Student (head of student council)	P1	Main	3
	Student (member of the advisory committee)	P2	Main	
	Marketing and client support Manager	P3	Main	
Intermediary	Member from the business development team	INT1	Pilot	8
	Senior Manager-Centre for Leadership and Management	INT2	Pilot	
	Manager Financial Services	INT3	Main	

	Senior Manager - Partnerships and Customer Engagement	INT4	Main	
	Head of Business Development and Acceleration	INT5	Main	
	CEO - Angel investor	INT6	Main	
	Senior Program Manager – Start-up accelerator	INT7	Main	
	Strategy Manager - Venture Accelerator	INT8	Main	
				Total: 32

Table 4.1 Participants' verbatim coding and distribution of interviews.

4.7.3 Data collection methods; research instruments considered

In grounded theory different instruments can be used for data collection, including: "fieldnotes, interviews, and information in records and reports" (Charmaz, 2006, p.14). This section discusses: (1) interviews; (2) focus groups; (3) observation; and (4) document analysis (Robson & McCartan, 2016). Two instruments were considered in this research: semi-structured interviews; and document analysis. Interviews are considered to be the main tool for data collection in grounded theory (Creswell & Creswell, 2018).

One commonly used typology differentiates between "structured interviews, semi-structured interviews and unstructured interviews" (Saunders et al., 2019, p.437). 'Structured interviews' or quantitative research interviews depend on a questionnaire with predetermined questions (Saunders et al., 2019). These are less common in grounded theory, however, because it necessitates a more flexible interview design (Corbin & Strauss, 2015), as well as the opportunity to ask follow-up questions (Saunders et al., 2019). In contrast, 'unstructured interviews' commence with no predetermined themes or questions, enabling a detailed narrative of participants' perceptions and experiences (Bryant & Charmaz, 2019; Saunders et al., 2019). Alternatively, 'semi-structured interviews' use a flexible list of questions that vary with the flow of conversations (Saunders et al., 2019). This helps researchers to "ask additional questions to clarify certain points or to delve further into a topic" (Corbin & Strauss, 2015, p.59).

Focus groups can be viewed as a more adapted version of interviews, in which a group of people is brought together to discuss a topic, allowing researchers to collect the data generated and associated with group reactions to a situation rather than individual reactions (Matthews & Ross, 2010). According to Robson and McCartan (2016) it can be difficult to facilitate a focus group because some participants may dominate the discussion. Because this study aims to explore the interactions between five different actors, the focus group approach was not employed due to the assurances made regarding anonymity and confidentiality (Matthews & Ross, 2010). Moreover, it is difficult to follow up the views due to how "group dynamics or power hierarchies affect who speaks and what they say" (Robson & McCartan, 2016, p.299). This may lead to participants withholding valuable data that, in turn, may affect the development of the emergent theory (Birks & Mills, 2015).

Observation is "when the researcher takes field notes on the behaviour and activities of individuals at the research site" (Creswell & Creswell, 2018, p.262). Observations help understand "why specific practices occur, which might be cultural, for example, but could also include working practices" (Matthews & Ross, 2010, p.257). In this study, observation was considered as a supportive data instrument to complement the use of interviews (Robson & McCartan, 2016). However, due to the Covid-19 pandemic and the resultant lockdown restrictions, all forms of official activities in a face-to-face context were suspended. Research strategies for the second and main phase of data collection (see Section 4.7.4) had to be rescheduled and re-considered. For example, observation had to be put on hold until the lockdown is eased, and participants resume normal activities.

Document analysis is typically used as secondary data sources (Birks & Mills, 2015; Glaser & Strauss, 1967; Saunders et al., 2019), and include written documents, such as books and newspapers. According to Robson and McCartan (2016), secondary data sources can extend to non-written documents including films, drawings and photographs. However, access to these

documents may not always be available, as some require permission to use (Saunders et al., 2019).

This study employed semi-structured interviews, whereby different interview guides were prepared for the individual actors under the Quadruple Helix. The interview guides consisted mainly of open-ended and follow-up questions. Two sets of guides were developed. The first one was initially developed for the pilot stage of the data collection (see Appendix 1). The questions were informed by the overall research questions as well as the literature review (Corbin & Strauss, 2015). Malmqvist et al. (2019) has argued that conducting a pilot study will enable the researcher to be better informed, and to be "more confident in the instruments to be used for data collection" (p.1), as a result of which the main research project can be planned more effectively. The researcher carried out ten interviews at this stage (see Table 4.1). Participants involved a heterogenous sample of six representatives from academia, one participant from industry, one from the regulator, and two representing the intermediary category.

Post-interview and conceptual memos (Urquhart, 2012a) (see Section 4.7.5) offered some guidance in terms of formulating further questions. As the research progressed, and in accordance with the principles of "theoretical sampling and comparative analyses" (Glaser & Strauss, 1967, p.77), another interview guide was developed for the main stage of data collection (see Appendix 2). In total, twenty-two interviews were conducted as part of the main stage of data collection (see Table 4.1). These involved seven members from academia, two from industry, three representing the regulator, three members of the public, and seven intermediaries.

The interviews were audiotaped and lasted for at least one hour with some variation. At the start, the interviews were open-ended, allowing participants more freedom to talk; subsequently, the interviews were more directed, particularly following the initial analyses, as

data accumulated into categories (Glaser & Strauss, 1967). The interviews concentrated on five areas. The first centred on participants' professional backgrounds, primary roles, and primary responsibilities in those roles. The second area aimed to explore the context, dynamics, and key actors in a Quadruple Helix configuration. The third area concentrated on the efforts to increase public participation and the challenges encountered. The fourth area focused on the conceptualisation of power and how it coalesced with Quadruple Helix interactions, and the roles the intermediaries played in aligning the various interests. The fifth area of the guide was added to allow participants to provide any information that they perceived was pertinent to the study.

This study also used a number of documents to support the interview data. These included both publicly available reports (e.g. newspapers, official reports, policies, publications) and private documents (e.g. minutes of meetings). The documents provided useful information regarding organisational context and the nature of their work, thus helping the researcher to understand the individual actors' backgrounds and the nature of their relationships.

4.7.4 Comparative analysis and coding

Grounded theory is expected to develop "as different categories and their properties tend to become integrated through constant comparisons" (Glaser & Strauss, 1967, p.109). Constant comparison is described in four stages of: "(1) comparing incidents applicable to each category, (2) integrating categories and their properties, (3) delimiting the theory, and (4) writing the theory" (Glaser & Strauss, 1967, p.105). Constant comparison further guides the ongoing data collection and analysis by drawing out similarities and differences (Vasconcelos et al., 2012).

The coding process started using the 'Glaserian' grounded theory essential elements of: 'open coding'; 'selective coding'; and 'theoretical coding' (Glaser & Holton, 2004). Each stage guided the following stages of coding. The developed codes were subsequently laid out on the messy map (see Figure 4.5). It is important to note that the analysis was carried out

simultaneously with data collection (Seidel & Urquhart, 2013). Thus, the usage of the coding stages are not meant to be distinct and linear (Heath & Cowley, 2004).

Open coding further facilitated identifying the direction of the study (Glaser & Holton, 2004). The process began with "line-by-line analysis to identify first level codes" (Glaser & Holton, 2004). Incidents were coded "into as many categories of analysis as possible, as categories emerge or as data emerge that fit an existing category" (Glaser & Strauss, 1967, p.105). Constant comparisons were then employed, whereby emerging properties started to integrate, taking out irrelevant properties (Glaser & Strauss, 1967). Some of codes were later subsumed by other codes, relabelled, or dropped altogether.

Selective coding begins "only after the analyst is sure that he/she has discovered the core variable" (Glaser & Holton, 2004, p.55). According to Glaser and Holton (2004), this "selective data collection and analysis continues until the researcher has sufficiently elaborated and integrated the core variable, its properties and its theoretical connections to other relevant categories" (p.56). The core category has been described as being "central, relating to as many other categories and their properties as possible and accounting for a large portion of the variation in a pattern of behaviour" (Glaser & Holton, 2004).

Theoretical coding is where the relationships among codes are established by looking at the interrelations between concepts (Glaser & Holton, 2004, p.61). According to Glaser and Holton (2004, p.58), "incidents articulated in the data are analyzed and coded, using the constant comparative method, to generate initially substantive, and later theoretical, categories". Theoretical codes then help conceptualise how these categories may relate to each other and be integrated into the theory. According to Heath and Cowley (2004, p.58) theoretical codes thus add an "integrative scope, broad pictures and a new perspective". The theoretical coding stage resulted in three main categories: *gaps*; *tensions*; *and intermediaries.* Appendix 6 contains a sample of the open codes, selective codes and main categories. Appendix 7 contains

the subthemes that were generated later, while Appendix 8 contains the broader themes that guided the Discussion Chapter.

Since this research has employed a Clarkeian approach to grounded theory, all generated codes at this stage, the theoretical coding stage, will be subject to a rigorous level of secondary analysis, using the situational analysis mapping tools (see Section 4.8).

Importantly, in grounded theory data collection and analysis are expected to be carried out until the categories reach theoretical saturation. This occurs when "no additional data are being found whereby the sociologist can develop properties of the category" (Glaser & Strauss, 1967, p. 61). The criteria for assessing saturation, according to Glaser and Strauss (1967), is "a combination of the empirical limits of the data, the integration and density of the theory, and the analyst's theoretical sensitivity" (p.62). After conducting thirty-two interviews with different participant groups representing academia, the regulators, industry, intermediaries and public members, this research reached saturation.

4.7.5 Memos and diagrams

Memo writing and diagramming are considered fundamental in relation to data analysis and theory development in grounded theory (Creswell & Creswell, 2018; Urquhart & Fernández, 2013). According to Glaser and Strauss (1967), it is often useful to write and collate memos written about each category, and, as Urquhart et al. (2010) suggest, reflect on the emerging theory. Memos can further help capture research progress as different insights and decisions are recorded (Mills, Birks & Hoare, 2014), in addition to reflecting on the researcher's experiences as the study is carried out (Birks & Mills, 2019). Memo writing was utilised to record notes and ideas throughout the research process in this study.

Memos were written immediately following the interviews, as part of an effort to improve the process of constant comparison. These memos helped "tap the initial freshness of the analyst's theoretical notions and to relieve the conflict in his thoughts" (Glaser & Strauss, 1967,

p.107). They also aided in the process of theoretical sampling, for example, where more data was needed to develop and refine the developed categories (Jørgensen, 2001). Further, the memos helped identify gaps, and this necessitated either returning to the same field setting or a different setting. Figure 4.1 depicts an example of a post-interview memo.

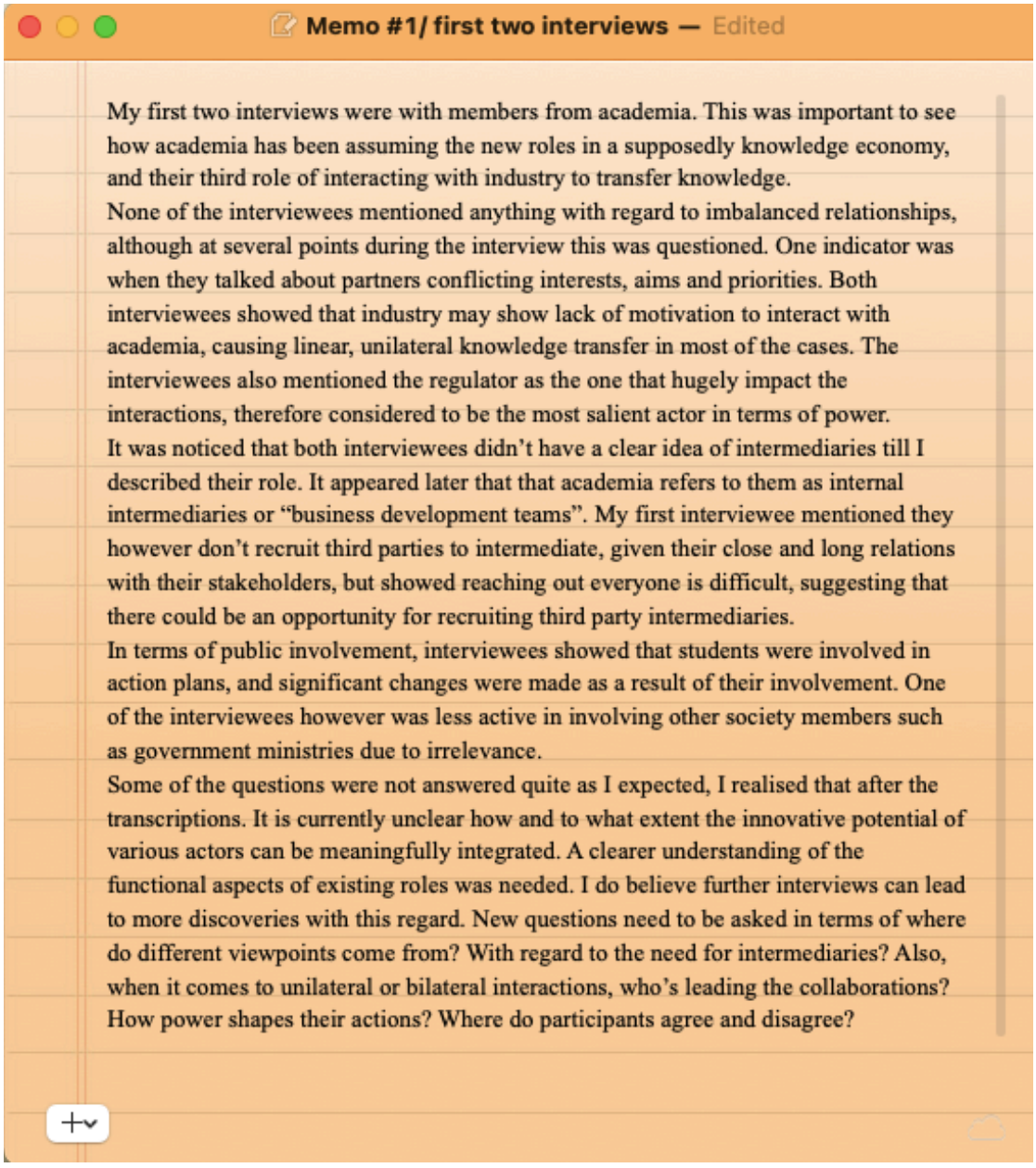

Figure 4.1 Post interview memo.

Another type of memo is the conceptual or theoretical memo, as termed by Urquhart (2012). This memo type involved examples of concepts and categories that emerged from the analysis,

helping to interpret the data and identify possible relationships between concepts (see Figure 4.2).

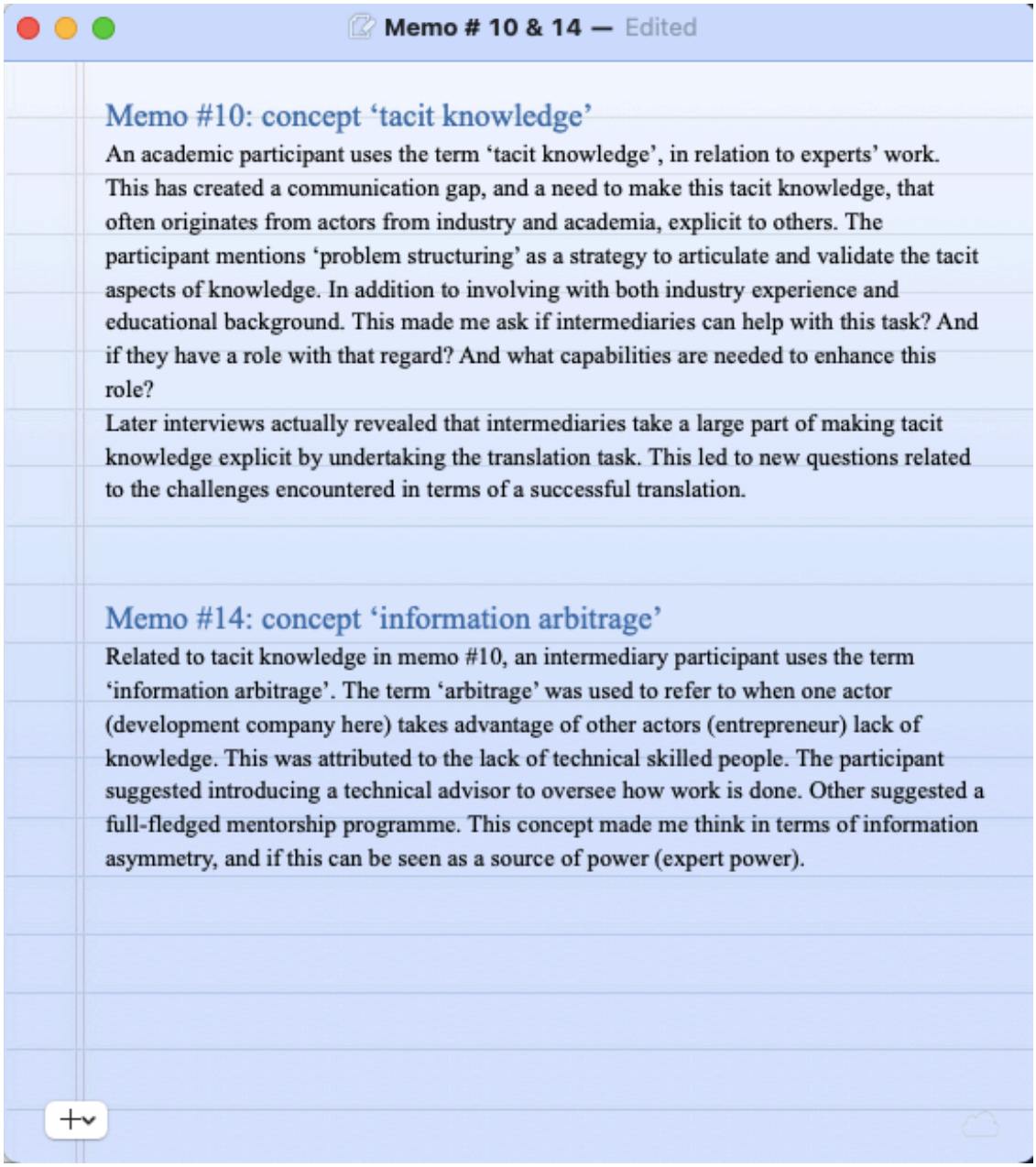

Figure 4.2 Conceptual memos.

Other memos were developed as part of describing the analytic drawings of the situational maps, and the social worlds/Arenas maps (Clarke, 2005). These memos narrate key discourses of these social worlds/arenas and suggest new directions (see Figure 4.3). The memos

describing the social worlds focused on: “What is the work of each world? What are the commitments of a given world? How do its participants believe they should go about fulfilling them? How does the world describe itself—present itself—in its discourse(s)? How does it describe other worlds in the arena? What actions have been taken in the past and are anticipated in the future? How is the work of furthering that social world’s agenda organised? What technologies are used and implicated? Are there particular sites where the action is organised? What are they like? What else seems important about this social world?” (Clarke, 2005, p.115). Similar memos were developed describing the arenas of concern, and who was involved and who was implicated. The memos focused on answering the following: “What is the focus of this arena? What social worlds are present and active? What social worlds are present and implicated or not present and implicated? Are there any worlds absent that you might have expected? What are the hot issues/contested topics/current controversies in the arena’s discourses? Are there any surprising silences in the discourse? What else seems important about this arena?” (Clarke, 2005, p.115).

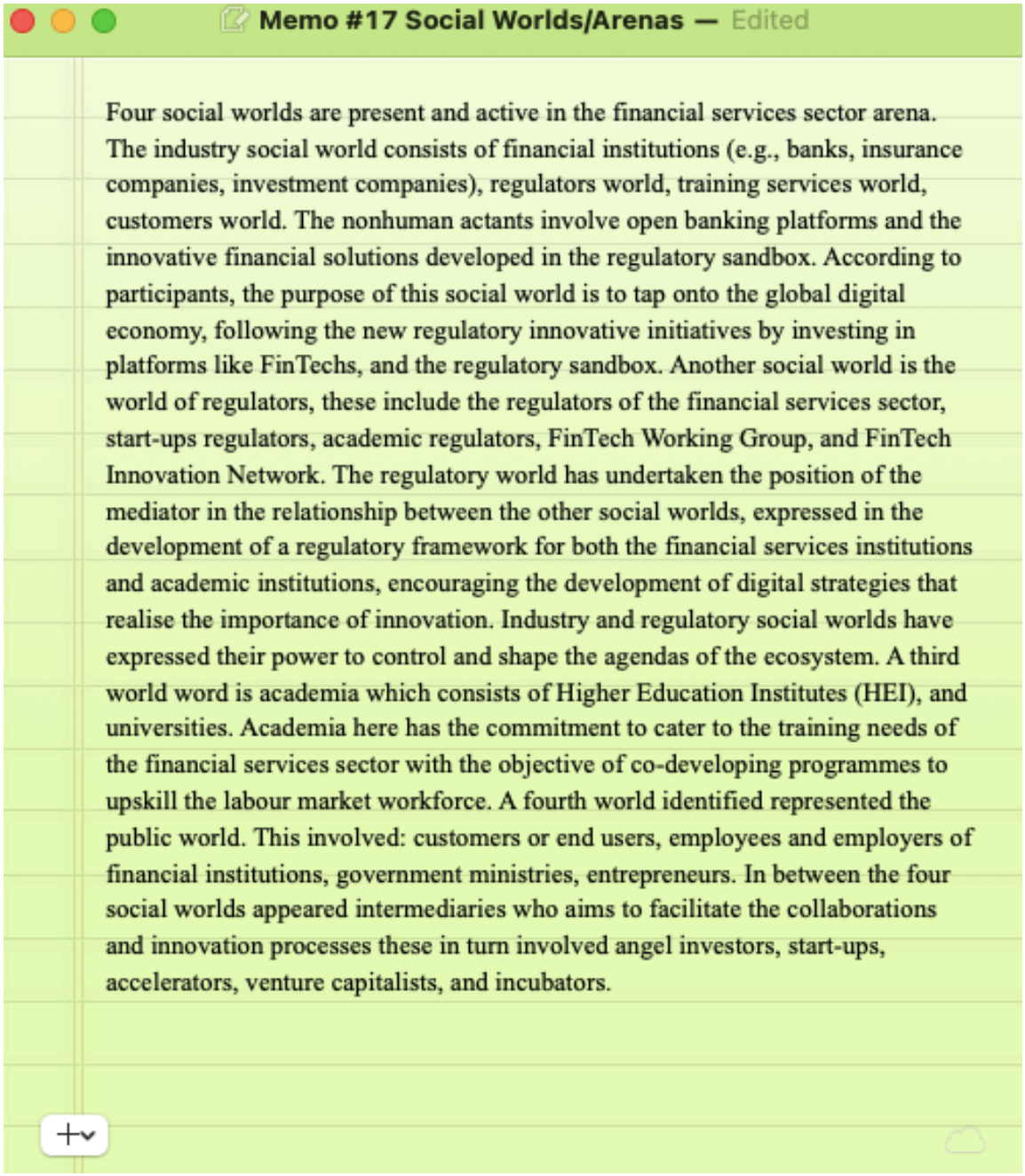

Figure 4.3 Social Worlds/Arenas memo.

A final type of memo is the storyline memo. According to Birks and Mills (2019), "the researcher needs to tell the story of the analysis as it exists at a particular point in time, with a focus on flow and integration" (p.5). The storyline memo is provided in Figure 4.4 below and was accompanied by a description of the integrative diagram (see Chapter 6).

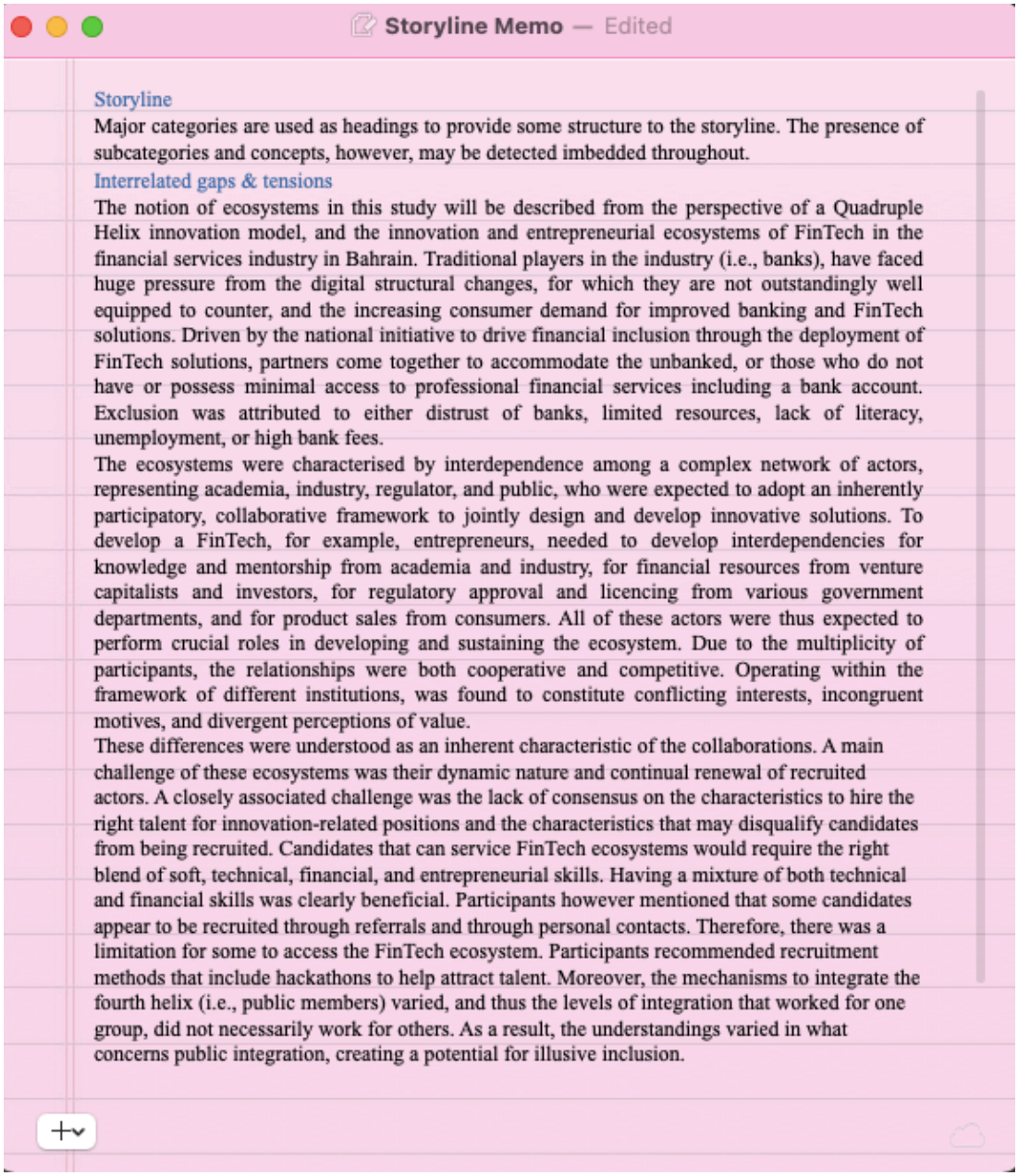

Figure 4.4 Storyline memo.

In addition to memos, diagrams can be a useful analytical exercise (Clarke, 2005). For the purpose of this study, this involved diagramming situational maps through the analytical process (see Section 4.7).

4.7.6 Computer Assisted Qualitative Data Analysis Software

As part of the analytical process, it is important to make an informed choice about the software used to help with the organisation and management of data (Saunders et al., 2019).

Using CAQDAS can aid the researcher in managing and storing large amounts of data with less time and effort, and later with retrieving the data (Silverman, 2013). In this research, CAQDAS was used in coding and attaching labels to a data segment (Bryant & Charmaz, 2007). Although CAQDAS, has been subject to criticism for marginalising the role of the researcher, i.e. distancing them from the data (Ahmad & Newman, 2010), in contrast, Silver and Lewins (2014) have argued that the recent enhancements made in terms of linking data with codes has helped reduce this distance. Among the various examples of CAQDAS, including ATLAS and HyperRESEARCH™ (Saunders et al., 2019), the data analysis was undertaken using NVivo™, given the researcher's prior knowledge in using the software through the training for doctoral students offered by the University of Sheffield. Although the data analysis was undertaken initially using Microsoft Word's basic functions, coding line by line directly onto word-processed data, NVivo™ was later used, primarily to ease retrieval by keeping the data rooted in the participant's own language, and to import and link all memos to pertinent categories and transcripts.

4.8 Situational analysis

Clarke's (2005) 'situational analysis' takes a well-known Glaser dictum 'All is data' (Glaser, 2002), and the fundamental principles of 'theoretical sensitivity', 'theoretical sampling', 'constant comparative methods' (Glaser & Strauss, 1967), 'memoing' and 'diagramming' (Charmaz, 2006), to build the structural properties that shape a situation and then plot them on the map (Charmaz, 2006). Clarkeian grounded theory, for example, was viewed as primarily "supplemental" (Clarke, 2005, p. xxxvii), as it analysed previously created codes (Apramian et al., 2017). According to Clarke (2005) the traditional grounded theory method was used for coding in situational analysis. Furthermore, Clarke used these codes and "adds a second type of initial coding family […] and subjects them to a sophisticated and rigorous level of secondary analysis" (Apramian et al., 2017, p.372).

Although significant overlap exists between the Clarkeian and the original version of grounded theory, various differences remain. Although Clarke showed her appreciation for the different facets of the grounded theory, nevertheless she has made clear her disagreement with many of "Glaser's fundamental(ist) points" (Clarke, 2007, p.437), turning instead to Strauss (Clarke, 2007). On the one hand, Glaser & Holton (2004, p.55) propose that "context must emerge as a relevant category or as a theoretical code like all other categories in a GT. It cannot be assumed in advance". Glaser & Holton (2004) position is that "the goal of GT is conceptual theory abstract of time, place and people" (p.56). Clarke on the other hand seeks to push grounded theory by extending the analysis to "discursive data including narrative, historical and visual materials" (Clarke, 2007, p.433). This was explained by the fact that for many qualitative projects, "analyzing only individual and collective human actors no longer suffices" (Clarke, 2007, p.369). Instead, as stressed by Clarke (2007), all elements 'constitutive' of and 'consequential' to the study must be considered. In situational analysis, "the situation itself becomes the object of analysis" (Grzanka, 2021, p.13). Thinking situationally means, according to Grzanka (2021, p.13), "understanding the problem or issue under investigation in terms of the social worlds/arenas that co-constitute the situation". Situational analysis, therefore, supports this direction and "allows researchers to draw together studies of discourse and agency, action and structure, image, text and context, history and the present moment—to analyze complex situations of inquiry broadly conceived" (Clarke, 2005, p. xxii).

Clarke's (2005) situational analysis utilises three mapping strategies: 'situational maps'; 'social world/arenas maps'; and 'positional maps'. Clarkeian grounded theory explicitly focuses on identifying possible sources of difference (Clarke, 2005). Although not all of these maps must be used (Clarke, 2005), it was discovered that all of the techniques were useful in gaining a better understanding of the data in this study. While each of these mapping strategies

is presented one at a time in this section, they were pursued together, with some aspects constructed simultaneously. The three situational maps are described below.

4.8.1 Situational maps

The analysis first commenced by constructing the situational maps, which have been considered as "strategies for articulating the elements in the situation and examining relations among them" (Clarke, 2005, p.86). Situational analysis, in this sense, satisfies the fundamental premise of grounded theory, as defined by Glaser & Strauss (1967) that it is "a general method of (constant) comparative analysis" (p.vii). According to Clarke, Friese and Washburn (2017), the researcher must examine the context of the actors' social worlds, and thus "the situation itself becomes the fundamental unit of analysis" (p.99). The researcher therefore asks, "who and what are in the broader situation?" (Clarke, 2005, p.94), why they come together, and what discourses are evoked (Clarke, 2005). At this point, it was also important to ask the questions posed by Clarke (2005, p.87), "Who and what are in the situation? Who and what matters in this situation? What elements 'make a difference'?".

Situational maps further consist of three maps: 'a messy map'; an 'ordered map'; and a 'relational map' (Clarke, 2005).

4.8.1.1 Messy map

The very first situational abstract map, (see Figure 4.5), is the "messy/working version" (Clarke, 2005, p. 87). This map "roughly lays out all the elements [the researcher] think may be in that situation" (Clarke, 2005, p. 267). To capture the "messy complexities of the situation" (Clarke, 2005, p.370), and the relations between the diverse actors, the researcher used the map as a brainstorming exercise. The goal is to lay out "all the most important human and nonhuman elements in the situation of concern" (Clarke, 2005, p.86-87). The messy map was constructed using PowerPoint using the transcripts, open codes and memos constituted around Quadruple

Helix actors' interactions and experiences working together. Open codes from the initial codebook were first placed, as described in Section 4.7.4, on the messy map.

The maps' messiness is due to the fact that "too much order provokes premature closure, a particular hazard with grounded theory" (Clarke, 2005, p.95). According to (Clarke & Friese, 2007, p.378) "working with these maps has been an iterative process; the maps continued to change and develop" as the data analysis process progressed. The alternating process of creating the maps, which involved rearranging, deleting, and adding, has proven to be effective for carefully examining the transcribed data and memos and preventing the analysis from "premature closure" (Clarke & Friese, 2007, p.120), as mentioned earlier. The researcher concluded that the research had reached saturation when, as stated by Clarke (2005), that "it has been a while since you felt the need to make any other changes" (p. 108–109).

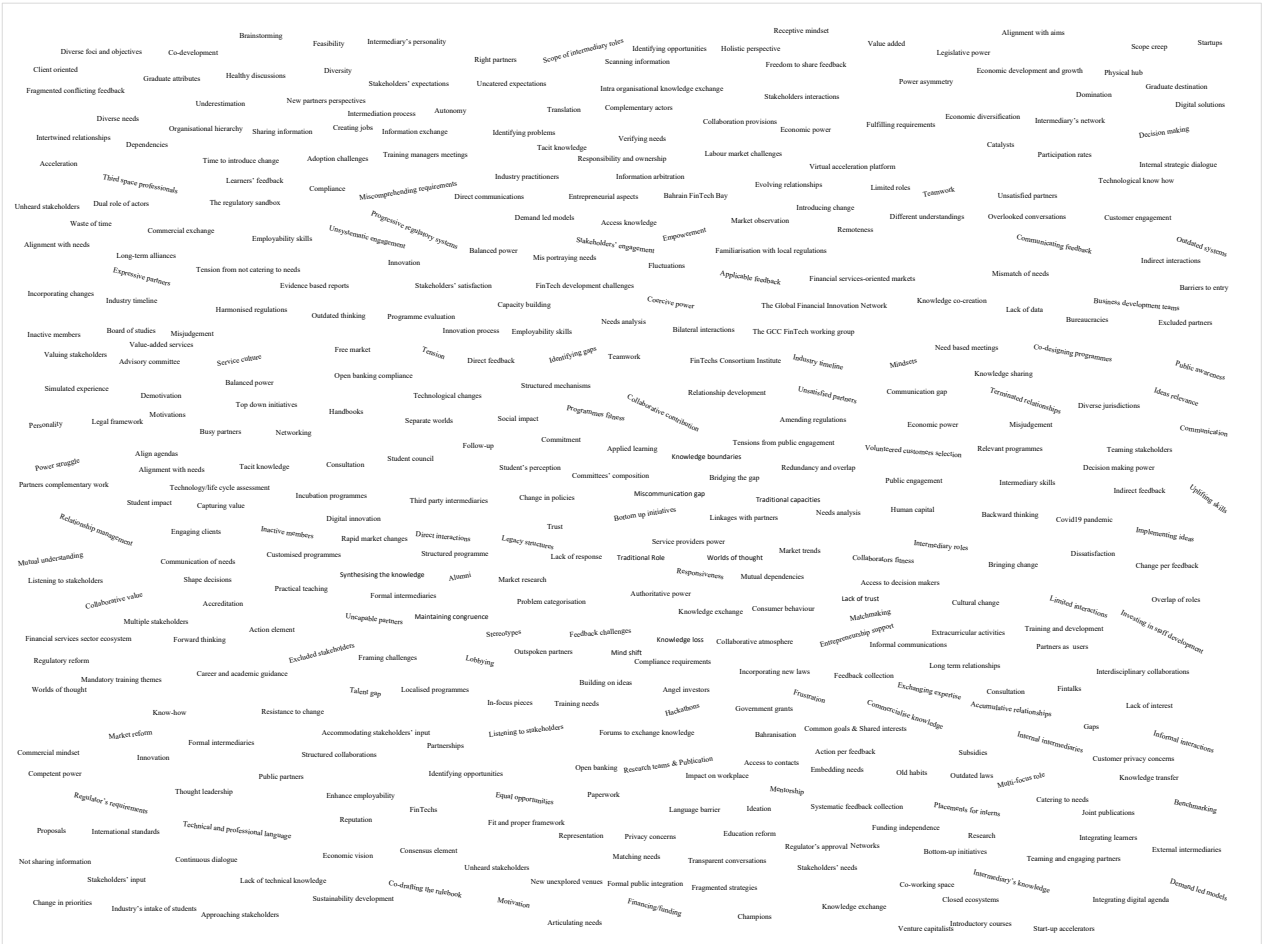

Figure 4.5 Messy map.

4.8.1.2 Ordered map

After finishing the messy map, the researcher moved to the second phase of the analysis and prepared the ordered map, using Clarke's (2005) thirteen categories (see Table 4.2) to "examine [the] situation of inquiry thoroughly" (Clarke, 2005, p.89). Although not all categories need to be shown in the analysis (Clarke & Friese, 2007), the researcher outlined them all. According to Clarke and Friese (2007), the map should be undertaken with simultaneous memoing, and thus new memos were written, to note new insights or shifts in theoretical sampling directions (Clarke, 2005). Consideration of the relationship between academia and industry, for example, led to interviews with intermediaries.

To develop the ordered map, the following questions addressed by Clarke (2005, p.87) were reviewed: "Who and what are contained in this situation? Who and what matters in this situation? What elements 'make a difference' in this situation?". The questions were asked by going back to the messy map, and other sources of data, such as the transcripts, codes, themes, and memos. The ordered map (Table 4.2) helped illuminate the main actors (e.g. Academic/HEIs, industry partners, intermediaries, academic regulators, financial services regulator, public members), key elements and debates (e.g. importance of communication, reaching consensus and taking action, framing needs and issues, inactive actors, power and information asymmetries, overcoming stereotypes) and the main related discourses (e.g. discourses on knowledge sharing and communication, public integration, intermediary roles, conflicting interests, values and motives, group formation, identifying right partners, lack of funding discourse). The labels comprising the thirteen categories are listed briefly below.

(1) Individual human elements/actors. This category includes "key individuals and significant [unassembled] people in the situation" (Clarke, 2005, p.90). The data mapping in 'messy map' (see Figure 4.5) and categorising in 'ordered/working map' (see Table 4.2) identified the following as fitting into this category in relation to the situation. The

categorisation was also found to fit the financial services sector interactions and the collaborating Quadruple Helix actors and representatives from academia, industry, regulator, and public members, in addition to intermediaries. According to Clarke (2005, p.110), the social worlds/arena map presented in Figure 4.8 articulates how individual human actors "become social beings again and again through their actions of commitment to social worlds and their participation in those worlds". Individuals can simultaneously be members of multiple arenas at the same time, demonstrating that membership is not mutually exclusive.

(2) Nonhuman elements/actants. According to Clarke (2005), this category includes "Technologies, material infrastructure, regulations, specialised information or knowledge, material things" (p.90). For example, these included: training programmes/plans, timeframe; financial technology (FinTech) solutions; regulations/policies; funds/grants; experience exchanged; market needs and gaps; proposals; innovation process; internal market research; tacit/technical professional knowledge; ideas; decisions; relationships; information; and the knowledge to be able to function and operate.

(3) Collective human elements/actors. The category here includes groups in a collectivist context: "partial groups, specific organisations" (Clarke, 2005, p. 90). Examples in this study included FinTechs and start-ups, FinTech working groups, and financial innovation networks, advisory committees/panels, business development teams, and hackathons. Relationships that facilitate coordination and functionality are critical for the operation of these organisations and groups.

(4) Implicated/silent actors/actants. 'As found in the situation'. According to Clarke (2005), there are two types of implicated actors. First, those "who are physically present but are generally silenced/ignored/made invisible by those in power in the social world or arena. Second are those implicated actors not physically present in a given social world but solely discursively constructed; they are conceived, represented, and perhaps targeted by the work of

those others; hence they are discursively present" (p.46). Those in power do not invite or include either category, "nor are their thoughts or opinions or identities explored or sought out by other actors through any openly empirical mode of inquiry" (Clarke, 2005, p.46). Concerning those physically present, "their perceptions are largely ignored and/or silenced" (Clarke, 2005, p.46). Accordingly, implicated actors and actants included absent participants, non-represented or excluded partners, unheard stakeholders, media, structured mechanisms, market research, and overlooked conversations. Some of these groups (e.g. members of public) were described as lay persons who may not have the knowledge or the financial literacy to join the collaborations, and thus were marginalised or implicated, and not given a voice or allowed to participate. This was attributed to another implicated actant, that of the media and their role in communicating innovation policy objectives to the public, and public discourses back to decision makers.

(5) Discursive constructions of individual and/or collective human actors. These involved embarking on new opportunities for innovation, actors' diverse expectations and priorities, matchmaking, aligning aims and objectives, identifying gaps and opportunities and creating mutual understanding or shared interest among partners. Thus, this category involved actors' opinions, relationships, dual roles, supporting roles, responsibilities, ownership, rules, voices, expectations, purposes, communications, concerns, reactions, silences, and absences.

(6) Discursive constructions of nonhuman actants. Examples of elements under this category involved the demand for infrastructure supportive of FinTechs and open banking, inclusiveness, and sustainability development. Other elements were the fragmented strategies, lack of data, individualism, collectivism, and stereotyping.

(7) Political/economic elements. According to Clarke (2005), this category involved descriptions of "The state, particular industry, local/regional/national/global orders, political parties, NGOs, politicised issues" (p.90). Elements that populated this category involved

competition, hierarchies, power relations, initiatives for economic diversification and growth, labour market challenges, and funding and policy challenges. Other elements involved top-down and bottom-up initiatives related to FinTech and innovation.

(8) Sociocultural/symbolic elements. Under this label, Clarke (2005) included elements that represented the following: “Religion, race, gender, sexuality, ethnicity, nationality, logos, icons, other visual/oral symbols” (p.90). In this study, this was associated with sustainability development, collaborative culture, complementary work, equal opportunities, and fairness. Other elements involved reputation, loyalty, transparency, motivation for teamwork, and forward thinking. The analysis also identified consensus, boundaries, relationships, and dominance.

(9) Temporal elements. These involved “historical, seasonal, crisis, trajectory aspects” (Clarke, 2005, p.90). Actors illuminated several temporal aspects in this regard. These involved nationals not being first choice due to their insufficient training skills, and lack of technical skills. Other aspects involved information arbitrage, and the time required to introduce change and amend or introduce new policies. Time was considered a significant influence, as it cannot be saved or observed all at once. Thus, participants found setting plans necessary to enable interactions in an ordered fashion.

(10) Spatial elements. This label described “Spaces in the situation, geographical aspects, local, national, regional, global, spatial issues” (Clarke, 2005, p.90). Examples included the non-availability of incubation and co-working spaces for everyone, and the controlled environment of the regulatory sandbox.

(11) Major issues/debates (usually contested). Within the innovation networks and at the various stages of collaboration, actors contested many issues, concerns, problems, disagreements, and gaps, for example, related to communication, reaching consensus and

taking action, framing needs, privacy concerns, structural barriers, integrating public, need for intermediaries, motivations, and overcoming stereotypes about actors' contributions.

(12) Related discourses (historical, narrative, and/or visual). According to Clarke (2005), this label described "normative expectations of actors, actants or other specified elements, moral/ethical elements: mass media and other popular cultural discourses: situation specific discourses" (p.90). Some of the discourses may fall outside of the verbal discourse of the Quadruple Helix actors, which are specifically non-verbal unsaid communications. In relation to public integration/engagement, trust and credibility, group formation and identifying partners, these often included interruptions, exclusions, withdrawal, silent discourses, non-verbal communication, and hidden motives.

(13) Other kinds of elements. The researcher identified other elements that fitted under this label. For example, intermediary skills/capabilities, and the collaborative overall atmosphere.

The researcher prepared several different versions of the ordered map, clustering similar elements together, renaming them and moving elements between categories, ensuring that the elements were correctly situated. This suggested that the ordered map is not fixed and indeed can be considerably fluid (Clarke, 2005). The final version of the ordered map is presented in Table 4.2.

"INDIVIDUAL HUMAN ELEMENTS/ACTORS Key individuals and significant (unrecognised people in the situation)" (Clarke, 2005, p.90) Members from academia, industry, regulator, and public members, intermediaries.	**"NONHUMAN ELEMENTS/ACTANTS** Technologies, material infrastructure, regulations, specialised information or knowledge, material things" (Clarke, 2005, p.90) Training programmes/plans, timeframe, financial technology (FinTech) solutions, regulations/policies, funds/grants, experience exchanged, market needs and gaps, proposals, innovation process, internal market research, tacit/technical professional knowledge, ideas, decisions, relationships, information.
"COLLECTIVE HUMAN ELEMENTS/ACTORS Partial groups, specific organisations" (Clarke, 2005, p.90) FinTechs, start-ups, advisory committees/panels, business development teams, hackathons, relationships.	**"IMPLICATED/SILENT ACTORS/ACTANTS** as found in the situation" (Clarke, 2005, p.90) Ministries/government entities, excluded partners, unheard stakeholders, structured mechanisms to collect feedback, market research, overlooked conversations, media, limited access to data, absent participants, non-represented or excluded partners.
"DISCURSIVE CONSTRUCTIONS OF INDIVIDUAL AND/OR COLLECTIVE HUMAN ACTORS as found in the situation" (Clarke, 2005, p.90)	**"DISCURSIVE CONSTRUCTIONS OF NONHUMAN ACTANTS** as found in the situation" (Clarke, 2005, p.90)

Collaborations, opportunities for innovation, diverse objectives, problem structuring, identifying gaps, matchmaking/aligning aims, continuous dialogue, mutual understanding, intermediary roles, bilateral/unilateral interactions, actors' opinions, relationships, dual roles, supporting roles, responsibilities, ownership, rules, voices, expectations, purposes, communications, concerns, reactions, silences, absences.	Demand for applied programmes, supportive infrastructures for FinTechs, client-oriented services, fragmented strategies, outdated systems, structured frameworks, direct communication channels, lack of information/data, pitching for ideas, individualism, collectivism, stereotyping.
"POLITICAL/ECONOMIC ELEMENTS The state, particular industry, local/regional/national/global orders, political parties, NGOs, politicised issues" (Clarke, 2005, p.90) Competition, global changes and trends, hierarchies, power asymmetries, economic diversification, diverse jurisdictions, labour market challenges, market reform, regulatory reform, economic vision, funding and policy challenges, digital innovation agenda, top-down/bottom-up initiatives.	**"SOCIOCULTURAL/SYMBOLIC ELEMENTS** Religion, race, gender, sexuality, ethnicity, nationality, logos, icons, other visual/oral symbols" (Clarke, 2005, p.90) Sustainability development, collaboration culture, complementary teamwork work, reputation, diversity, commitment, transparency, loyalty, motivation, forward thinking, boundaries, mindsets, consensus, relationships, and dominance.
"TEMPORAL ELEMENTS Historical, seasonal, crisis, trajectory aspects" (Clarke, 2005, p.90) Nationals not being first choice of employers, low financial literacy, lack of technical skills, information arbitrage, time and commitment.	**"SPATIAL ELEMENTS** Spaces in the situation, geographical aspects, local, national, regional, global, spatial issues" (Clarke, 2005, p.90) Non-availability of incubation and co-working spaces, controlled environment.
"MAJOR ISSUES/DEBATES (USUALLY CONTESTED) as found in the situation" (Clarke, 2005, p.90) Consensus, taking action, framing needs, inactive actors, privacy concerns, power and information asymmetries, stereotypes, integrating public, need for intermediaries, motivations, structural barriers, communication.	**"RELATED DISCOURSES (HISTORICAL, NARRATIVE, AND/OR VISUAL)** Normative expectations of actors, actants or other specified elements, moral/ethical elements: mass media and other popular cultural discourses: situation specific discourses" (Clarke, 2005, p.90) Public integration/engagement, knowledge sharing, entrepreneurship, discourses around intermediary roles, equal contribution, trust and credibility, group formation and identifying right partners. non-verbal unsaid communications, interruptions, exclusions, withdrawal, silent discourses, hidden agendas/motives.
"OTHER KINDS OF ELEMENTS as found in the situation" (Clarke, 2005, p.90) Intermediary skills/capabilities, collaborative atmosphere/environment.	

Table 4.2 Ordered map.

The next stage of mapping began only after the researcher was satisfied with the saturation of the ordered map and how the thirteen categories were populated.

4.8.1.3 Relational maps

The third phase of the analysis involved preparing the relational maps. A relational analysis was used to identify key storylines in the data and to aid with sampling strategies in order to make sense of the messy map (Clarke, 2005). This can be viewed as supplemental to theoretical coding (see Section 4.7.4), where relationships among codes are established using the 'constant comparative method' (Glaser & Holton, 2004).

These maps are intended to broaden the researcher's interpretation of the field (Mathar, 2008), and provide a "provocative way to enter and memo the considerable complexities of a project" (Clarke, 2005, p.103), representing an analysis that "looks a bit chaotic" (Clarke, 2005, p.103). The relational analyses here, according to Rachel et al. (2020), parallels the line-by-line coding procedures in grounded theory, and depend largely on the researcher's approach to analysis (Clarke, 2005). The elements and categories from the messy and ordered maps were imported into the mapping interface. The researcher constructed the relational maps using a PowerPoint template, to visualise the relationships as enclosed within the messy and ordered map. The researcher then centred attention on each element, using ovals, and drew connecting relational lines between them (Clarke, 2005), constructing a diagrammatic network of relations to establish a distinction between the types of partnerships, in particular those absent or missing.

These maps made it easier to see the gaps in relationships as well as the connections. The researcher was able to change, add, and delete, and thus produce multiple maps. A memo explaining why the changes were made was written on each occasion. These were then taken into account when revisiting the relational maps, following Clarke's (2005) suggestion of thinking about why (or why not) a line is not drawn, rather than going through the process silently.

The relational maps, according to Clarke (2005, p.102), aided in determining "which stories -which relations- to pursue". These are discussed in detail in the Findings Chapter (see Chapter 5). Rather than analysing individual relationships between its elements, the goal of these maps is to graphically illustrate the complexity and large number of relationships under a Quadruple Helix framework. It is worth mentioning that these relationships are not static as they reposition themselves and reshape (Mathar, 2008). The researcher, therefore, had to work on many versions of the map to ensure that no important relative entry was missed out. When more

elements or lines could no longer be added, deleted or rearranged, saturation was achieved. Looking 'chaotic' (Clarke, 2005), the developed relational map is shown below (see Figure 4.6). The map will however be separated into three parts in the Findings Chapter (see Chapter 5) with respect to the relational map's categories and elements.

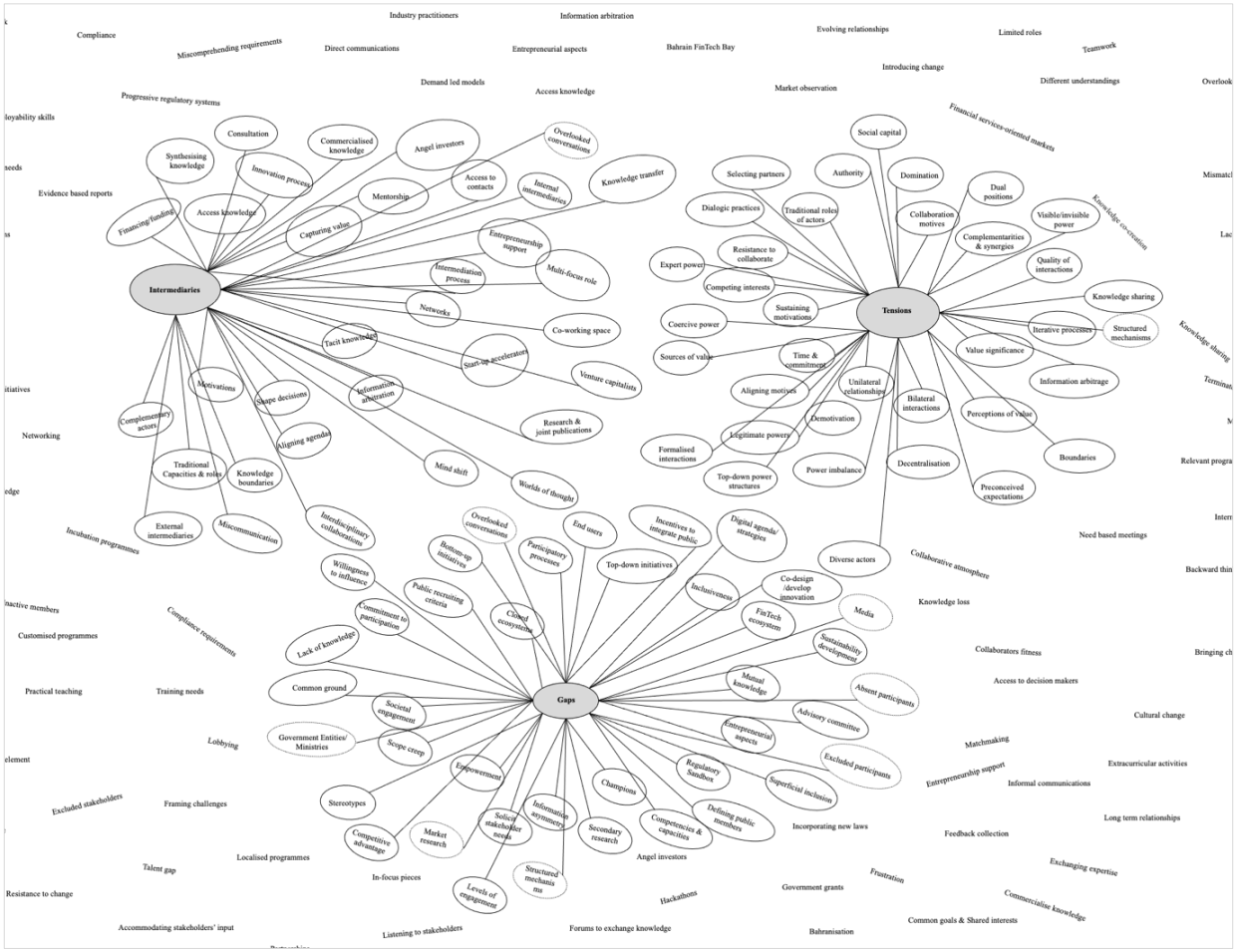

Figure 4.6 Relational maps.

4.8.2 Social Worlds/Arenas maps

Following the completion of the relational map, the drafting and the development of a social world map began, keeping all drafts of the three situational maps, as well as the memos. This section outlines the creation of the second mapping strategy in situational analysis; social worlds/arenas maps (Clarke, 2005). The maps describe which 'actors/actants', concerns and relationships exist in the financial services sector arena where the Quadruple Helix actors

interact. As Clarke (2005, p.116) stated, the maps depict a "working big picture of the structuring of action in the situation of inquiry", and are "intended to reveal certain broader conditions-constraints, opportunities, and resources […] [and] a key part of situational analysis that replaces the conditional matrix" (Clarke, 2005, p.119).

In what concerns social worlds, these are "actor-defined, permitting identification and analysis of collectivities construed as meaningful by the actors themselves" (Clarke, 2005, p.110), and defined as "universes of discourses" (Strauss, 1978, p.121), collective action and shared commitments (Clarke, 1991). As defined by Clarke and Star (2008, p.115) social worlds are "groups with shared commitments to certain activities, sharing resources of many kinds to achieve their goals and building shared ideologies about how to go about their business". Social worlds/arenas maps are more about 'organizational processes' (Grzanka, 2021) and "porous and highly dynamic interactions between and among collectivities" (Grzanka, 2021, p.23). According to Glück (2018, p.46), because "social worlds overlap one another and across arena […] their actors most probably form part of several social worlds and can act in different arenas, which can also imply the presence of conflicting and opposing logic".

In what concerns arenas these are viewed as "a field of action and interaction among a potentially wide variety of collective entities" (Clarke, 1991, p.128). Arenas, therefore, "pertain to a specific concern and include several social worlds that controversially discuss and negotiate the definition of problems and solutions relating to the primary matter of a given arena" (Glück, 2018, p.47). In arenas, the individual actors that compose social worlds frequently act as social world representatives, and thereby perform their collective identities (Clarke, 2005).

Creating social worlds/arenas maps therefore draws on the "collective social action" (Clarke, 2005, p.114). This type of mapping helped structure the analysis and findings (see Chapter 5), reflecting on, as stressed by Clarke (2005), "difference(s) and variation(s) of all

kinds within worlds as well as between worlds" (p.111). According to Clarke and Casper (1996, p.614) "a social worlds/arena analysis will reveal profoundly conflicting interests and commitments in these processes that other analyses could miss". Furthermore, "because perspectives and commitments differ, arenas are usually sites of contestation and controversy" (Clarke, Friese, & Washburn, 2017, p.89). The "analytic focus can be on action as process" (Clarke, 2005, p.113). The "meanings of the actions in the arena are to be understood by developing a dense understanding of the perspectives taken by all the collective actors, the social worlds involved in that arena" (Clarke, 2005, p.113) and the diversity of concerns and needs among the heterogeneous actors in the arena (Clarke & Montini, 1993). Furthermore, creating these maps is expected to help investigate absent, or according to Clarke (2005), implicated actors. Clarke (2005) argued that investigating 'implicated actors and actants' can be especially beneficial in "the explicit analysis of power in social worlds and arenas" (p.48). In other words, attempts focused on making a collective social sense of power or diminished worlds.

According to Clarke (2005), developing social worlds/arena maps requires asking a number of questions. These include "which social worlds, subworlds or segments come together in a particular arena and why? What are their perspectives and what do they hope to achieve through their collective action?" (Clarke, 2005, p.110). Social worlds/arenas maps can be created following Clarke's (2005) "conceptual toolbox" (p.112) (see Table 4.3), and Clarke's (2005) "Situational Matrix" (p.73) (see Figure 4.7). The conceptual toolbox proposes a number of tools to analyse data and identify the relationships with a focus on the collective social actions. It is important to note that the researcher does not need to employ all of these analytical tools (Clarke, 2005); only those deemed relevant are selected, considering its dependence on the elements described in the ordered/working map (see Table 4.2), and the level of duplication between the two.

Social Worlds/Arenas Theory Conceptual Toolbox	
Universes of discourse	Implicated actors and actants
Situations	More formal organisations
Identities	Going concerns
Commitments	Entrepreneurs
Shared ideologies	Mavericks
Primary activities	Segments/subworlds
Particular sites	Reform movements
Technology(ies)	Bandwagons
Specialised knowledges	Boundary objects
Intersections	Work objects
Segmentations	Discourses

Table 4.3 Social Worlds/Arenas Conceptual Toolbox.

Adapted from Clarke (2005), p.112.

The situational matrix, in contrast, builds on Corbin and Strauss (1990) earlier works and versions of conditional matrix, and details the analytic foci of the situation (Rachel et al., 2020). Clarke (2005) asserted that "the conditions of the situation are in the situation" (p.71), whereby "everything in the situation both constitutes and affects most everything else in the situation" (Clarke et al., 2017, p.98-99). The situational matrix was used as a referential guide each time the researcher revised the social worlds/arena map. Similar to the conceptual toolbox, It is not necessary to use all of the analytical tools offered (Clarke, 2005). The researcher must choose which tools to employ and which to discard based on their relevance to the current investigation. The researcher employed the conceptual tools in conjunction with the ordered/working map (see Table 4.2). The social world/arena maps were created by referring back to interview transcripts, situational maps, categories and memos. Creating the social worlds/arenas maps was further accompanied by a memo describing them.

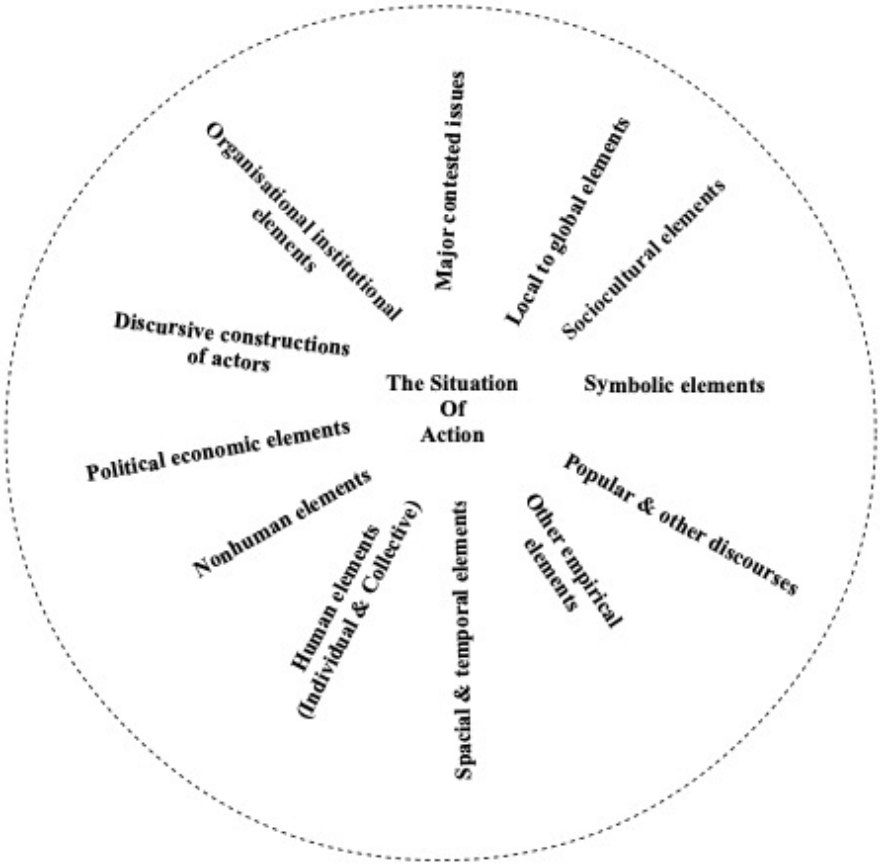

Figure 4.7 Clarke's situational matrix.

Source: Clarke (2005, p.73).

Although the social worlds/arena maps (see Figure 4.8) are shown in a graphical representation that is static, the analysis helped construct the Findings Chapter in terms of allowing "a more fluid reading of the situations as they unfolded" (Clarke et al., 2017, p.183). The researcher drew the maps using a diagramming application available at (www.draw.io). The process of creating a social worlds/arenas map began with placing the subject of the research in the centre of the page, writing out the various social worlds that come together around that area of shared concern, and drawing circles with dotted lines around each (Clarke et al., 2017). Throughout the process, the researcher must determine whether the research topic is an arena, a subset of an arena, or a combination of arenas. If it is part of an arena, it is depicted on the map with lines indicating how the topic of the research is embedded in and, if applicable, exceeds an arena. As the map took shape, the relationships between the various social worlds had to be considered, as well as whether or not they overlapped.

The circles of social worlds maps are often drawn with dotted rather than solid lines to show the porosity of organisational life (Clarke et al., 2017). The solid dashed lines (- - -) encompass the arena. The social worlds that are within or cross over arenas are surrounded by dashed/dotted lines (....). The text boxes represent the primary human and non-human actors, and they are placed as nearly as possible within or crossing over the worlds and arena with which they are associated. For social worlds that were more central, the circle were made bigger; for social worlds that were more marginal, the circle were made smaller (Clarke et al. 2017). By displaying the numerous voices engaging in a dispute, social worlds/arenas maps made it evident that there were more than 'two sides to a debate' (Clarke et al. 2017). In the process, these maps also assisted in better understanding social hierarchies (Clarke et al. 2017), which groups are centrally involved in an arena and which are not, and why some groups are more central and perhaps more powerful or influential than others by examining the discourses that each group produces and engages in.

According to Clarke (2005), when multiple social worlds come together to address issues of common interest and action, they become an arena; the financial services interactions arena (see Figure 4.8). The financial services interactions arena is a space where several social worlds interact, with the main discourse centred on the need for social worlds, each with their own agenda, to collaborate in order for innovations and entrepreneurship to thrive. This entails encouraging the development of digital services, which can be fundamental to the growth of new start-ups. Looking at Figure 4.8, there are many diverse social worlds in the arena, all of which have the ability to constrain and enable interactions differently. As a field of action, the arena involves a number of social worlds that integrate, overlap, and conflict. It was critical for these various worlds to come together and have conversations about building a shared commitment to promoting innovation and entrepreneurship. In this study, social worlds/arenas theory was used to investigate how the fourth helix - public/civil society - is perceived and

integrated into existing trilateral innovative networks of the financial services interactions arena, as well as the implications of such integration. From this emerged the different Social Worlds discussed below.

The following describes how groups self-organised in the financial services sector. Analytically, this section examines the key social worlds that have committed to action and collaboration. As a result, the emphasis is squarely on academia, regulators, industry, the public/civil society, and intermediary social worlds. The task was to identify the present and absent social worlds, the actors involved, any specific sites of action, the arena's main discourses, and patterns of collective commitments. It is important to note that this is only a partial discussion and that not all of the actors and positions are represented here. Moreover, breaking the situation into separate sections for description was found challenging because of how these social worlds overlapped.

4.8.2.1 The Academia Social World

In this study, academia social world was one of the first worlds explored. Interestingly, academia as a social world simultaneously has a presence in the broader educational and training arenas outside the financial services interactions arena as well. The financial services sector interactions arena is thus only one of several arenas that this social world is active in. Traditionally, and as part of a structural legal change in which the government restructured the majority of the ministries, this social world was established as a specific council looking after the financial services sector's training needs. More recently, the training discourse and action in academia has grown, expanding to increase the Bahranisation rate for the sector, after abolishing higher council for vocational and educational training, transferring its roles and responsibilities to becoming under the central bank as its training arm.

The rise of FinTech has resulted in an increased demand for a specific set of skills and expertise, as described in the Background and Context Chapter (see Chapter 2). As a result,

collective concerns focused on upskilling, capacity building, and designing curricula that serve entrepreneurial and innovative mindsets while aligning with national priorities and business and industry skills needs in order to stay ahead of financial disruption. Producing and effectively deploying knowledge is a complex process, so knowledge is generated and supported by a variety of other actors. Those involved include universities, students, academics, academic regulators, training service providers, third space professionals, intermediaries, and a labour fund. The primary driver of collective action is to address the lack of technically skilled Bahrainis or locals, and thus considerable effort was required to transfer international expertise, skills, and knowledge to locals.

Academia as a social world intersects with the industry and regulatory social worlds in a couple of ways. Both worlds have shown a keen interest in academic work. Regulatory interests in particular have been more of a facilitator rather than merely enforcing regulations. Being a part of the central bank has benefited academia as a social world by giving academia the weight of knowing what the market requires. The social worlds of industry, on the other hand, complicated the relationships between the regulatory and academic worlds, owing to the levy imposed by the regulator on industry and received by academia to run its programs.

4.8.2.2 The Regulator Social World

The regulatory social world encompasses the work and commitment of regulatory systems, the legal context, and the regulations and policies that guide their work. As part of the reforms to identify and improve the propulsion of innovation, this world has adopted the role of mediator in the relationship between the other social worlds (i.e., academia and industry), as expressed in the development of a regulatory framework for both financial services institutions and academic institutions, encouraging the development of digital strategies that recognise the importance of financial innovation and inclusion. This social world also assists in identifying strengths and areas for improvement, primarily by providing policy advice to key stakeholders

and encouraging greater collaboration between the higher education and business sectors. The actors that constitute this world are academic regulators, the regulators of the financial services sector, start-ups regulators, FinTech working groups, and FinTech innovation networks. A key regulatory actor is the regulator of the financial services sector, which ensures the stability of financial institutions (such as banks, insurance, and capital markets). Since Bahrain began repositioning itself as a regional FinTech hub (see Chapter 2), a dedicated FinTech unit, a regulatory sandbox, and a FinTech Bay have all been established, resulting in an ecosystem dedicated to accelerating FinTech start-ups and driving innovation. As for the FinTech working groups and FinTech innovation networks, these were established in response to recent regional authorities' interests in the transfer of policy ideas across countries and the development of an integrative initiative for FinTechs, as described in Chapter 2.

The primary concerns of these groups were investor and customer protection, as well as financial sustainability. As a result, in order for regulators to welcome any innovative financial solution developed by FinTechs, banks, or existing financial institutions, the benefits derived by customers from such solutions must outweigh the associated risks; otherwise, failure to meet this criterion means no approval. Other key actors included academic regulators, who work in collaboration with higher education institutes, industry practitioners, and other stakeholders to assess the quality of education and training institutions' performance, as well as other educational actors. The data revealed differences in academic regulators' approaches to reviewing academic program offerings. There is a collaborative and egalitarian approach. This entails working in an egalitarian manner with actors in the academia social world, and another that is more described as a top-down approach. Another actor was the Ministry of Industry and Commerce, which is in charge of regulating start-ups and overhauling the process of acquiring and managing a commercial registration.

4.8.2.3 The Industry Social World

According to the data, this world shares collective commitment patterns with the regulator social world, where the main discourse is to tap into the global digital economy, as a result of new regulatory initiatives aimed at investment in entrepreneurial platforms such as FinTechs. The social world of the industry has seen dramatic technological changes to drive innovation and open banking. This has necessitated the collaboration of a number of actors, including the banking system, governmental bodies, customers, intermediary organisations, and FinTech start-ups, all of whom are also involved in other social worlds, as discussed further below. The data revealed differences in the interests of the actors. While FinTechs and intermediary actors backed the agenda of the industry social world, banks were found to be challenging the main agenda of this social world. Because of the increased competition between the two, significant challenges were encountered in forming alliances and integrating FinTechs with banks. Furthermore, because profitability has frequently been the primary motivator from an industry standpoint, no existing industry social world actor has expressed interest in research. In sum, both the industry and the regulator social worlds were found to be the most powerful worlds, capable of controlling and shaping the agendas of the larger financial services interactions arena.

4.8.2.4 The Public/Civil Society Social World

The main discourse of the public/civil society social world is to present new ideas, advance dialogue and cooperation for programs that promote entrepreneurship and innovation and push issues onto the government policy agenda. There are a number of social worlds in the financial services interactions arena that are loosely defined and are frequently not viewed as collective actors, such as FinTech start-ups, clients/customers, and young entrepreneurs. This absence of a shared identity and willingness to work together has had a significant role in in understanding how these public representatives are situated and integrated differently in the arena. In terms

of active voice and participation in the co-design and co-production of knowledge and innovations, public representatives were typically marginalised.

There was also considerable contention and diversity of perspectives among public actors in terms of willingness to assume influence and responsibility. Some of the public representatives were described by participants as lay persons who did not have the knowledge or the financial literacy to join the innovation frameworks. As a result, they were more likely to be 'implicated actors' (Clarke, 2005). Under some circumstances, however, these public representatives can become collective and agentic actors when they organise themselves into hackathon or regulatory sandbox participants, who are often concerned with promoting the development of financial technology or testing technology-based solutions. The lack of public active voice was also attributed to an implicated actant, the media, and their role in communicating innovation policy objectives and rationales to the public, as well as public discourses back to decision makers.

4.8.2.5 The Intermediary Social World

The main discourse of the intermediary social world was to help stimulate innovation and create more jobs in the market by providing access to grants, co-working space, and mentorship to establish FinTech start-ups. This was often achieved by utilising its actors' networking tools and facilitated contacts. The intermediary world involves several actors, some of whom are situated in academia's social world and aim to connect key actors from the industry, the regulatory system, and public members. Others, such as angel investors, start-ups, accelerators, venture capitalists, and incubators, were frequently represented by public and private agencies. Despite the multifaceted nature of most intermediary work and obvious overlaps, the actors differed in terms of their ability to persuade regulators to amend regulations, as well as in terms of supporting local or international start-ups. Notwithstanding the well-developed entrepreneurship ecosystem, many entrepreneurs were unaware of the financial assistance,

advisory services, and co-working space that these actors provided. The main problem was lack of access to these support services, as is the general lack of technical skills required. This indicated that there are additional actors/actants who have not been investigated. The media, for example, is unquestionably an actant in the arena of financial services interactions.

In summary, the financial services interactions arena has been rather varyingly constructed as:

- A means of disrupting the financial services industry,
- A strategy for fostering an environment conducive to innovation and entrepreneurship,
- A means of aligning training and employment needs and expectations,
- A means for partnership between academia, industry and policy-makers,
- A means for promoting financial inclusion and civil society contribution,
- A means of bottom-up initiatives being challenged by top-down approaches.

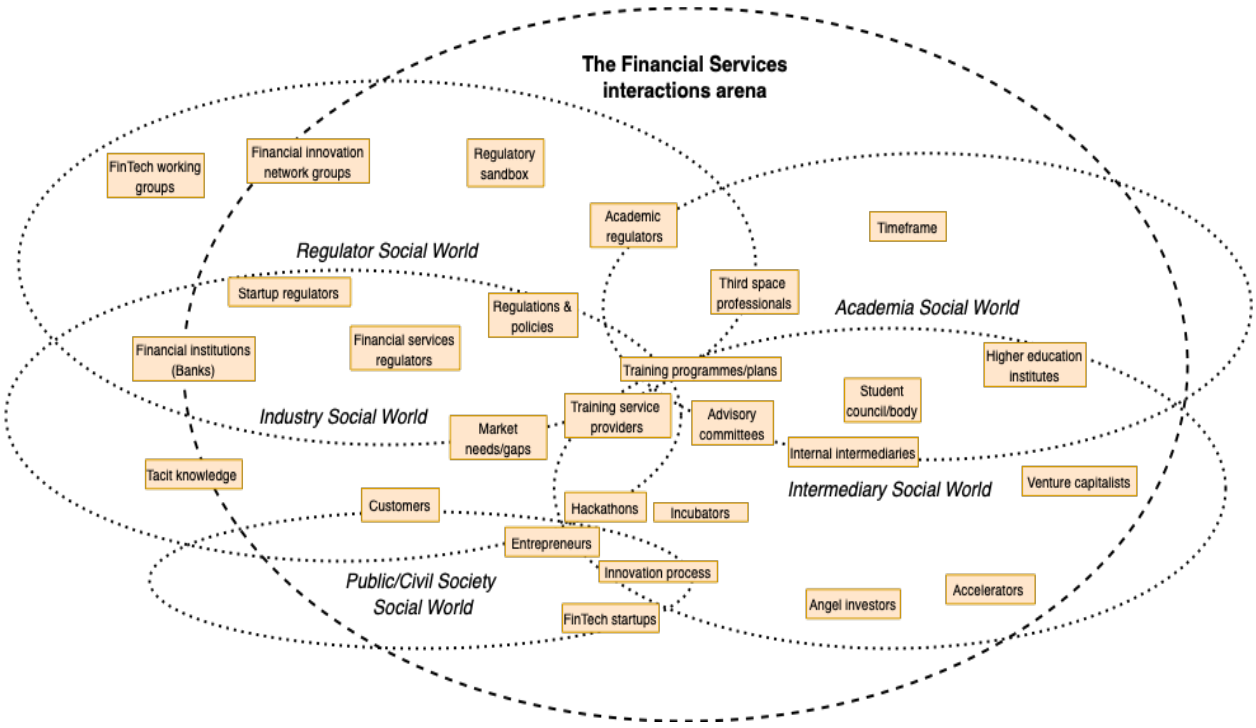

Figure 4.8 Social worlds/arenas map: The Financial services interactions arena.

4.8.3 Positional maps

This section discusses positional maps as the third mapping strategy in situational analysis. According to Clarke et al. (2017), "constructing positional maps are not intended to be representations of individuals, groups, or institutions" (p.177); rather, the goal is to represent the entire range of positions. The "basic grounded theory coding and situational and social worlds/arenas mapping-opens up data for positional analyses" (Clarke, 2005, p.126). The coding process allows the researcher to identify the different positions taken and show "where do we see differences and where do we see agreements" (Clarke, 2005, p.127). One significant feature of developing positional maps "is that they allow the researcher to see possible positions that are not taken in the data, positions that remain unarticulated" (Clarke, 2005, p.136). Unfilled positions should either result in further valuable data collection or be indicated in memos. According to Clarke (2005, p.136), "the presence and/or absence of articulations of particular positions in various sites is itself information that aids in the analysis and in situating research more broadly".

The positional maps in this section distinguish various discourses in the situation as well as different positions held by actors in various social worlds. The number of positional maps produced depended on the number of controversial issues found in the study. Two positional maps, therefore, were produced. These have been explained in detail in the context of the Findings Chapter (see Chapter 5). The different positions were displayed dimensionally on a two-axis map. Axes can be arranged in terms of "more versus less", alternatively, other "means of clearly articulating the axes could be pursued" (Clarke, 2005, p.128).

The first positional map (see Figure 4.9) is related to actors' willingness to collaborate and share influence in the innovation networks. The map aims to present the spectrum of public participation with regards to the extent of power and influence actors have on decision-making processes and on the development of the final solution. This has further guided the analysis in

Chapter 5 (see Sections 5.2.2 and 5.3.4). The differences in the positions are related to the importance of public participants having sufficient knowledge to meaningfully influence the design of innovations. This is explained in more detail in Chapter 5 (see Sections 5.2.3.1 and 5.2.3.2). The map has two axes: The X-axis is knowledge and capacities with regards to the subject matter; the Y-axis represents the willingness to collaborate and share influence, and in this context, refers to two extremes on a spectrum (non-inclusive (-) and inclusive innovation (+)). Data is used to articulate three basic positions. At the bottom left, there is a position of actors who are unwilling to share influence and include a provision for public input due to a lack of competence on the part of public participants to contribute meaningfully to the issues at hand. The top right position is held by those actors who are more visionary and creative, and who want to work toward a better future. Another position was held, but because it did not fit well on this map, it was placed in the centre. That is the position of actors who has a traditional and conventional way of thinking, or who do not challenge the status quo and accept reality as it is, with no intention of influencing social change. From a visual standpoint, it is worth noting that no positions are assumed in the top left quadrant of the positional map. This reflects that there is no group that would be willing to share influence with other public participants while having no knowledge on the subject matter. Highlighting this specific final position allowed seeing “the full range of positions taken and not taken in this situation” (Clarke, 2005, p.129).

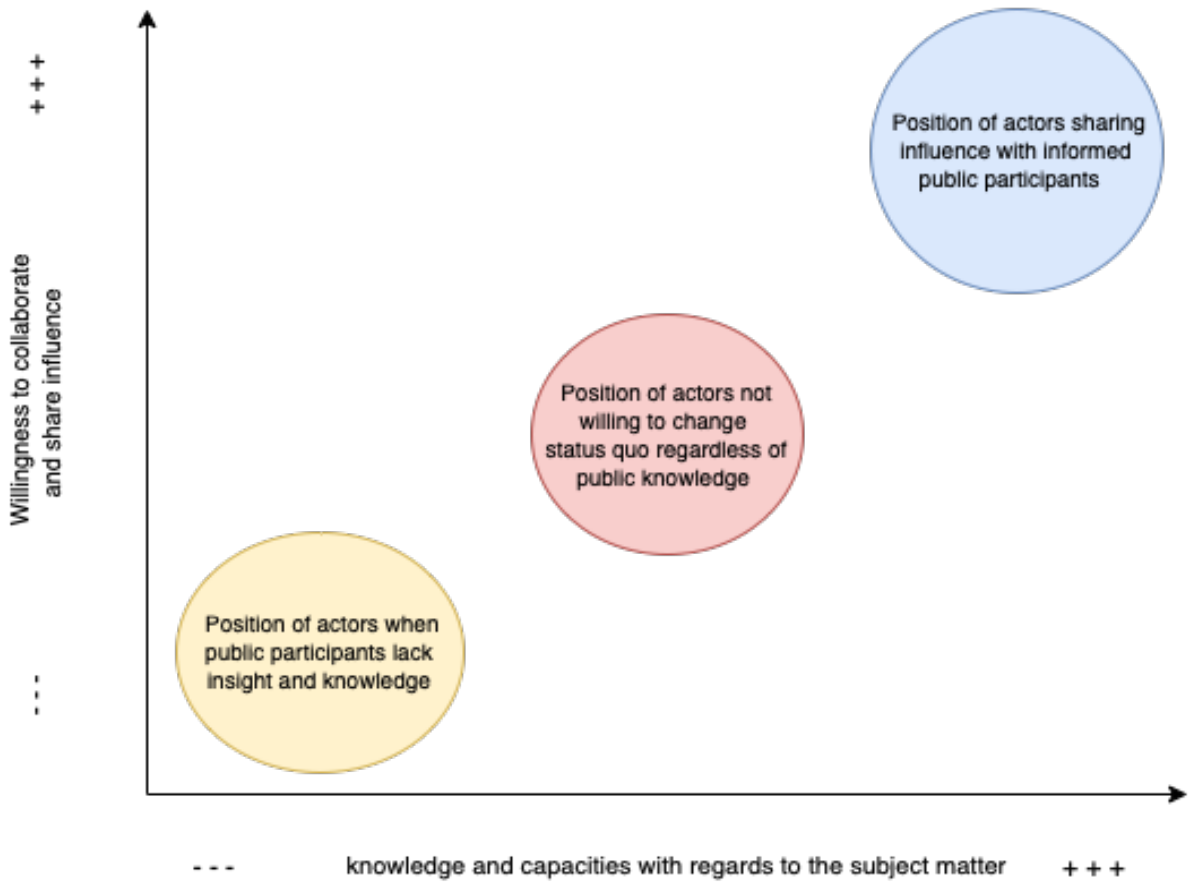

Figure 4.9 Positional map. Willingness to collaborate and share influence.

The second positional map (see Figure 4.10) is related to actors' different positions with regards to their need for intermediaries in different stages of the innovation process. Actors indicated different viewpoints with regard to the importance of intermediary work, whether intermediaries should be involved throughout the different collaboration stages and whether their role stopped at a certain stage. The reason why more than one position exists is that their importance in terms of how and when intermediaries become beneficial can vary (see Section 5.4). The positional map below has two axes: The X-axis shows the stages of the innovation process (early-stage or ideation, mid-stage, design, testing and late-stage) and the Y-axis represents the need for intermediaries, in this context referring to two extremes on a spectrum (no role for intermediary (-) and significant role for intermediary (+)). A position of actors at the bottom left limits intermediary engagement to the early stages of the innovation process.

Actors in the top right position believe in the importance of intermediary work at all stages of the innovation process. Another position was held in the centre of the map by actors who were unsure whether intermediary work should begin or end at a specific stage.

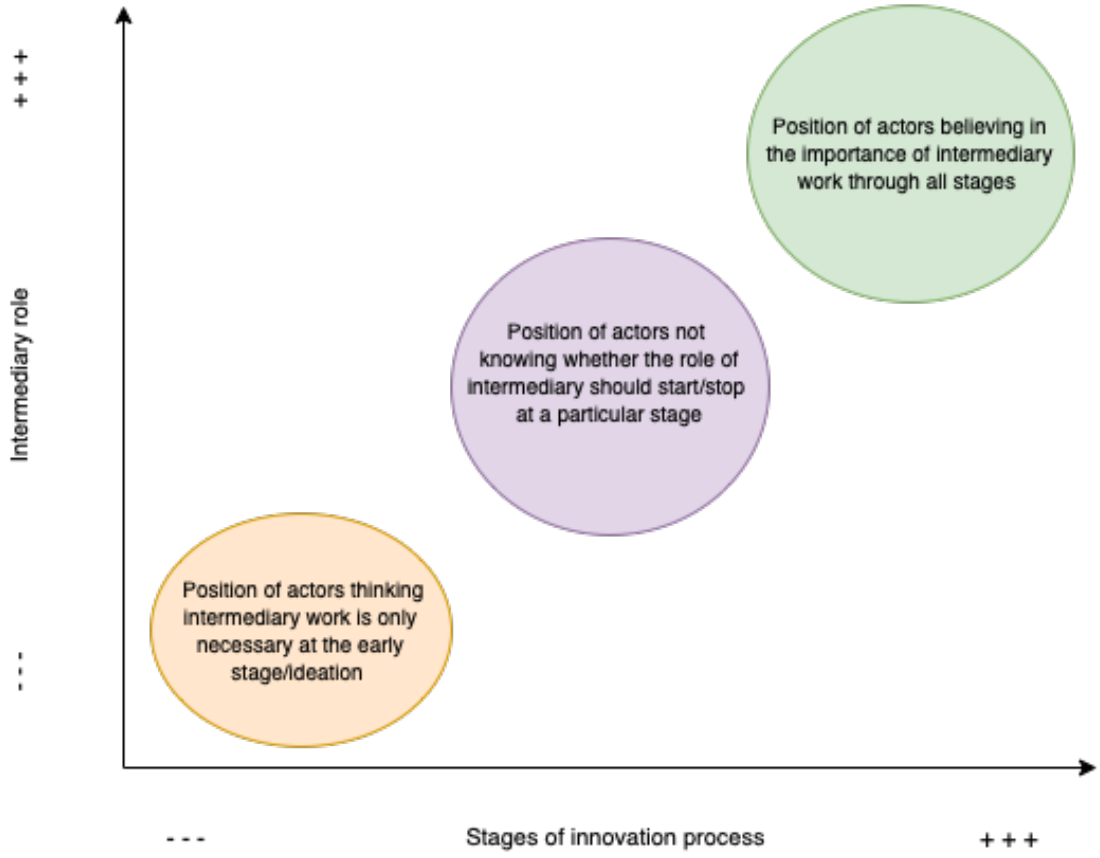

Figure 4.10 Positional map. Actors' position on intermediary role.

In summary, the three types of situational maps examine the same data using different types of questions in relation to the situation under study. Situational analysis allows a better understanding of a situation, by pointing at the complexities of social processes, which Clarke (2005) has argued as being missing in grounded theory. As an analytic exercise, undertaking situational analysis constituted an on-going research (Clarke & Friese, 2007), which helped provoke the researcher to more deeply analyse and capture reality not as static but rather a continuously changing and evolving process.

4.9 Research evaluation

Qualitative research is an interpretative research that often involves the researcher being thoroughly involved with the participants and their experiences, which introduces a range of issues and consequences (Locke, Spirduso & Silverman, 2007). With these issues in mind, the researcher is expected to show reflexivity and "reflect about their biases, values, and personal background […] and how this background shapes their interpretations formed during a study" (Creswell & Creswell, 2018, p.334). Reflexivity is thus concerned with how the researcher's background may influence the direction of the study and its outcomes (Creswell & Creswell, 2018; Saunders et al., 2019). Most grounded theorists do not believe that researchers should be tabula rasa in terms of prior knowledge of the research area (Rachel et al., 2020). In this research, the researcher was aware of the Quadruple Helix framework beforehand. This knowledge, however, helped stimulate thinking and enhance theoretical sensitivity (Glaser & Strauss, 1967). The researcher was also extensively engaged in constant comparative analysis and drafting memos, to ensure the grounding of data and that emerging categories were supported by the data collected. The reflective memo writing further helped ensure that the data was not subjected to the researcher's predetermined ideas or beliefs (Corbin & Strauss, 2015).

According to Bourke (2014, p.1), "examining the research process in the context of [researcher's] positionality can be described, at least in part, as reflexivity". A researcher is no longer regarded as "a passive, neutral observer" (Bryant & Charmaz, 2019, p.175), but actively involved, and "their positioning, beliefs, and values do play a central role in shaping the research process" (Bryant & Charmaz, 2019, p.473). According to Charmaz (2014), "situating grounded theories in their social, historical, local, and interactional contexts strengthens them and supports making nuanced comparisons between data and among different studies" (p.322). Clarke (2005) more strongly stressed the involvement and positionality of researchers. She

emphasised examining the researcher's social locations (Charmaz, 2017), whereby the researcher should rely on his/her own personal interests in doing research instead of reflecting only on the application of prior knowledge and research contexts (Clarke, 2005).

Research, according to Bourke (2014), represents "a shared space, shaped by both researcher and participants. As such, the identities of both researcher and participants have the potential to impact the research process" (p.1). The researcher's experiences working in academia ultimately led to an interest in carrying out research to investigate the experiences of academia working with industry partners to fulfil the gap in terms of mismatched needs. The expectation was that the researcher's position as an academic would aid in connecting with the participants, especially the academic participants in this study. Such expectations would seem reasonable, particularly with the logic that "that people tend to gravitate toward those with whom they share some level of commonality" (Bourke, 2014, p.4). The researcher's interviews were carried out mostly with academic participants with whom the researcher shared similar beliefs and values. This could have influenced how the research was carried out, and the researcher's expertise, biases and interests may have influenced subsequent data collection.

To avoid misunderstandings among the respondents, details on the researcher's professional background were provided to the respondents, revealing as much as was needed without exerting any influence on the respondents, which could render the data unreliable and invalid. The perceptions of the researcher's status further influenced the level of access granted to the researcher by the gatekeepers. Being in a position of power in terms of deciding what information to relay to the researcher, the role of gatekeepers and key informants in gaining access was critical. Sharing a professional background was an important factor in gaining access as well as retaining informants' trust and cooperation, especially in terms of the organisation of an interview programme in the various departments within academia and the regulatory institutions. The researcher was aware of participants' endeavours to present an

ideal reality that differed from the one generated as a result of the researcher's own personal experiences, particularly with academia. The researcher took the initiative to probe for in-depth information with several other different participants representing the same institution or organisation. Rather than attempting to eliminate bias from the research process, the researcher attempted to achieve bias balance, and accommodate the perspectives of all participants, including her own reflective voice and perceptions.

In addition to reflexivity and positionality, social research is evaluated based on its validity and reliability (Bryman, 2012). On the one hand, validity here refers to the "means that the researcher checks for the accuracy of the findings by employing certain procedures" (Creswell & Creswell, 2018, p.334). Following the essential elements and key principles of grounded theory, it is worth noting that constant comparison and the iterative process of data analyses encompassed several repetitive cycles, and thus they were "not intended to be distinct and linear" (Heath & Cowley, 2004, 146). Reliability, on the other hand, is concerned here with "issues of consistency of measures" (Bryman, 2012, p.168). In terms of methodological consistency, grounded theory was adopted with the intention to add rigour to the theory development process (Clarke & Friese, 2007). It was also important for the researcher to bring a self-reflexive component, as mentioned earlier, by consistently interrogating her own standpoint (Clarke et al., 2017), screening any preconceptions that tended to bias the researcher's interpretations in reflective memo writing. According to Clarke et al. (2017), the inherent bias in qualitative research meant that qualitative samples should follow a purposeful selection rather than random selection. The researcher thus invited participants based on their knowledge about the topic under study, and in terms of how they potentially complemented the researcher's existing knowledge of the topic.

Alternative quality criteria involved assessing the "credibility, transferability, dependability, and confirmability" of the research (Guba & Lincoln, 1982, p.246). According

to Guba and Lincoln (1982), credibility refers to the correspondence between the data and the phenomena the data represent. Although achieving correspondence can be challenging, one way to establish credibility was to develop a thorough analysis, through line-by-line and constant comparative analysis, to understand participants' perceptions of the situation. Peer review as proposed by Lincoln and Guba (1985) was another way to improve the research's credibility. In that regard, the researcher attended supervisory meetings to communicate and discuss the methodological steps and receive advice about the analysed data. To evaluate the credibility of research, particularly in grounded theory, Glaser and Strauss (1967) provided several criteria. These involved providing sufficient description about the context, the participants, and the conclusions made. This is demonstrated in this chapter by adhering to the Clarkeian version of grounded theory and presenting the procedures followed in situational analysis. Other criteria involved a multiple comparison group, where heterogenous groups of actors can help capture participants' diverse perspectives. In that respect, the research involved five groups of actors or participants: academia; regulators; industry; public; and intermediaries.

Transferability, according to Guba and Lincoln (1982), is "demonstrated by showing that the data have been collected from a sample that is in some way (randomized, stratified, etc.) representative of the population to which generalization is sought" (p.246-247). Guba and Lincoln (1982) stated that transferability was possible under certain circumstances, where "enough 'thick description' is available about both 'sending' and 'receiving' contexts to make a reasoned judgment about the degree of transferability possible" (p.247). The researcher provided a description of the background and context, findings and interpretations, and thus readers were granted the opportunity to assess the study's transferability to other contexts of research (Saunders et al., 2019).

Similar to reliability, dependability refers to "recording all of the changes to produce a reliable/dependable account of the emerging research focus that may be understood and

evaluated by others" (Saunders et al., 2019. p.127). Guba and Lincoln (1982) proposed the use of a dependability audit trail to record all the activities carried out, including researcher's raw data, transcripts of interviews, diagrams and memos.

Confirmability is also related to rigorous auditing where "data speak for themselves" (Guba & Lincoln, 1982, p.251). Although Guba and Lincoln (1982) recognised the difficulty inherent in isolating the researcher from human beings as data sources, the researcher must try and minimise the influence of "personal values or theoretical inclinations manifestly to sway the conduct of the research and the findings deriving from it" (Bryman, 2012, p.392-393). To establish confirmability the systematic approach of situational analysis through mapping and engaging in reflective memo writing was followed.

4.10 Ethical considerations

Most researchers are required to anticipate potential ethical concerns that may arise in relation to gaining access to data (Robson, 2002). According to Creswell and Creswell (2018) "attention needs to be directed toward ethical issues prior to conducting the study; beginning a study; during data collection and data analysis; and in reporting, sharing, and storing the data" (p.146). The University of Sheffield's ethics review procedures were followed in this study "Ethics Policy Governing Research Involving Human Participants, Personal Data and Human Tissue". The university's 'Research Ethics Committee' granted ethical approval for this study (see Appendix 3).

Participants' permission was obtained prior to conducting the semi-structured interviews. To establish credibility before gaining access, it was important to send an introductory email outlining the purpose of the research to the reference contacts, who could influence the consent given by the intended participants (Saunders et al., 2019). Access was negotiated with the relevant management to approve engaging with the intended informants. Once the study started, the participants were contacted and informed of the research purpose, and that it was

voluntary (Creswell & Creswell, 2018). Any aspects that were expected to influence the willingness of individuals to participate were communicated with full transparency, therefore, they were aware of "what they are consenting to and when their involvement will begin and end" (Broom, 2006, p.153). Informed consent was obtained in accordance with the requirements of the 'General Data Protection Regulation' (GDPR) ("Data Protection Policy.," n.d.). An information sheet was distributed to participants (see Appendix 4), which included essential information with regards to the research purpose, anonymity and confidentiality (Creswell & Creswell, 2018). Moreover, a consent form was used (see Appendix 5), to further ensure that all participants understood the information sheet. Participants were informed that they could refuse to answer any of the questions because their participation was voluntary, and that they could leave the interview at any time after signing the consent form. Both the researcher and the participant signed the consent form, and a copy was kept.

Notably, this research posed a low risk to participants given that the research did not involve sensitive topics, nor did it recruit vulnerable participants. Moreover, the research neither exercised any interference in the lives of the research participants nor exposed them to unnecessary levels of risk. Confidentiality was ensured as follows: personal data was only disclosed with the participants' consent (Saunders et al., 2019); and the collected data was kept secured and anonymised, and erased when no longer needed (Creswell & Creswell, 2018). Although the contextual descriptions may possibly associate certain responses with specific participants, the researcher ensured that the quotes were selected carefully and checked for integrity-sensitive information without compromising the research findings.

4.11 Summary

This chapter described the study's research design and methodology. To explore the gaps and tensions underpinning interorganisational interactions in a Quadruple Helix configuration

a qualitative research approach was chosen. The Clarkeian version of grounded theory was selected as an analytical tool, as it helped provoke new ideas and elucidate marginalised perspectives in relation to the researcher's inquiry. Furthermore, to examine participants' various experiences and perceptions of their collaborations, the data collecting instruments employed were semi-structured interviews with document analysis. In conclusion, the chapter presented the role of the research to ensure research quality, in addition to the ethical considerations governing this study.

Following a more in-depth examination of the data through situational analysis and the creation of analytical maps, the findings of this study can be presented in an orderly manner. In addition, the discussion of findings will be structured around the categories and elements in the relational map (see Section 4.8.1.3).

5. Research findings

5.1 Introduction

The aim of this chapter is to present the research findings from the data analysis discussed in Chapter Four. The framework for presenting findings in this chapter is based on the social world/arenas map presented in the Methodology Chapter (see Figure 4.8), and with reference to the financial services interactions arena. The financial services interactions arena represents several interconnected social worlds, including academia, industry, regulators, the public and intermediaries. The main discourse is collaboration in order to develop innovative financial solutions, with the goal of encouraging wider community inclusion.

Three core categories emerged from the rigorous analysis, utilising three mapping strategies as mentioned in the Methodology Chapter (see Section 4.8): "situational and relational, social worlds/arenas, and positional maps" (Clarke et al., 2017, p.171). A framework was provided that brought together the main categories using an integrative diagram, to show their

interrelationship (Figure 5.1). Using integrative diagrams is one of the techniques of Situational Analysis. Diagrams, according to Corbin and Strauss (2015), must flow logically to show how categories are related to one another. This chapter is therefore structured around: *Gaps; tensions; and intermediaries.* In the following description of Figure 5.1, for ease of reference, the diagram's keywords have been italicised.

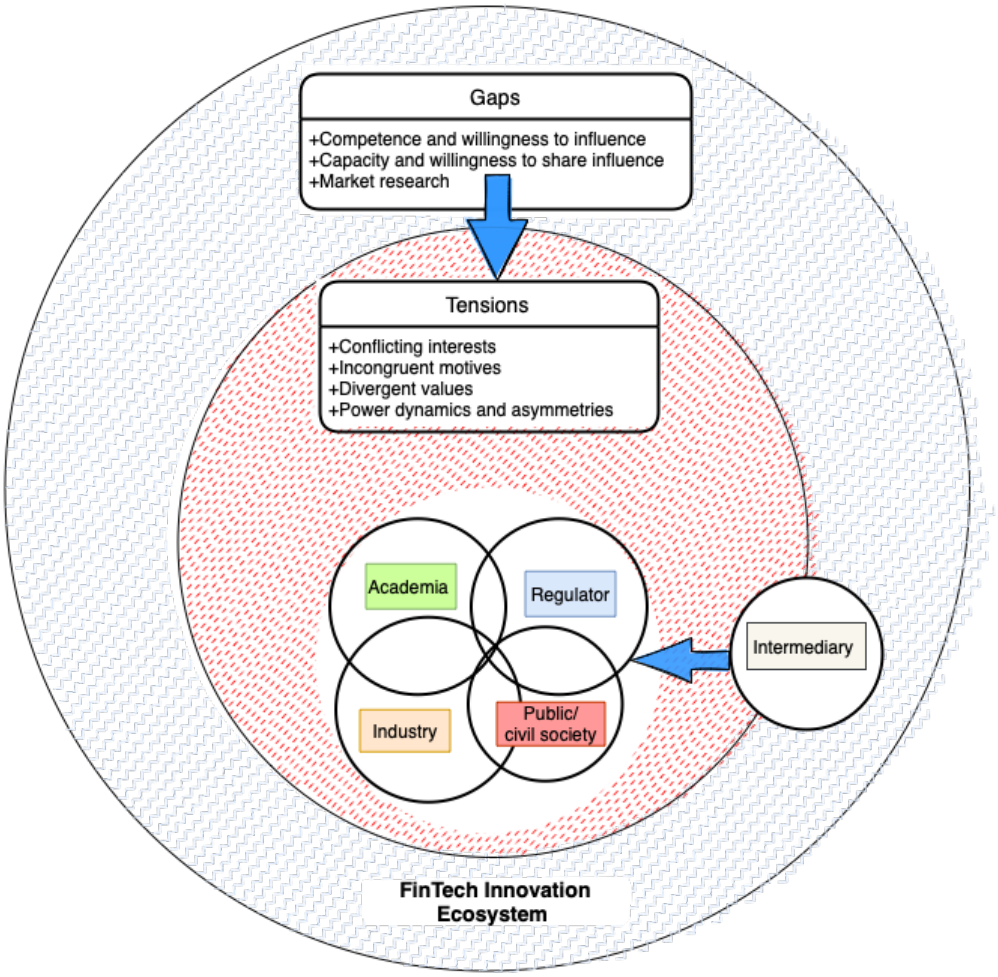

Figure 5.1 The integrative diagram.

5.2 Gaps

Despite political discourses to setup inclusive consolidated networks that emphasise bringing in a group of stakeholders who are usually absent from the collaborative arrangements and decision-making processes, the networks were assessed with a number of gaps.

The findings presented in this section portray a Quadruple Helix structure, and the aim is to look at the gaps identified in relation to the insufficient capability of academia, regulator, and industry to involve public members, in their collaborative and transdisciplinary innovation processes. Therefore, understanding what gaps exist in adapting this inherently participatory model and why these gaps exist, are all questions that surround such collaborations. A central question is how to integrate the fourth helix into existing trilateral innovation networks, and what challenges are encountered in doing so.

As such, this section addresses the question by highlighting who comprises the fourth helix, why they should be integrated, how they are recruited, and to which degrees have the innovations been inclusive. Further, delimiting who falls within the framework of the fourth helix revealed the challenges associated with how public members should be engaged. This section next highlights the gaps in terms of lack of competencies, capacities, and characteristics of inclusion that actors needed to develop. This required further inquiry on the role that actors play in the mobilisation of the networks and facilitating its interactions. The section concludes with gaps with respect to the mutual knowledge the actors have of one another, especially those of the fourth helix, and with regard to their respective incentives, interests and needs.

Guided by the relationships established between categories from the theoretical coding stage, *Gaps* emerged as the first core category from the data analysis. Using situational analysis (Clarke, 2005), with its distinct mapping tools, the messy situational map (see Figure 4.5) was used to create the relational map below (see Figure 5.2).

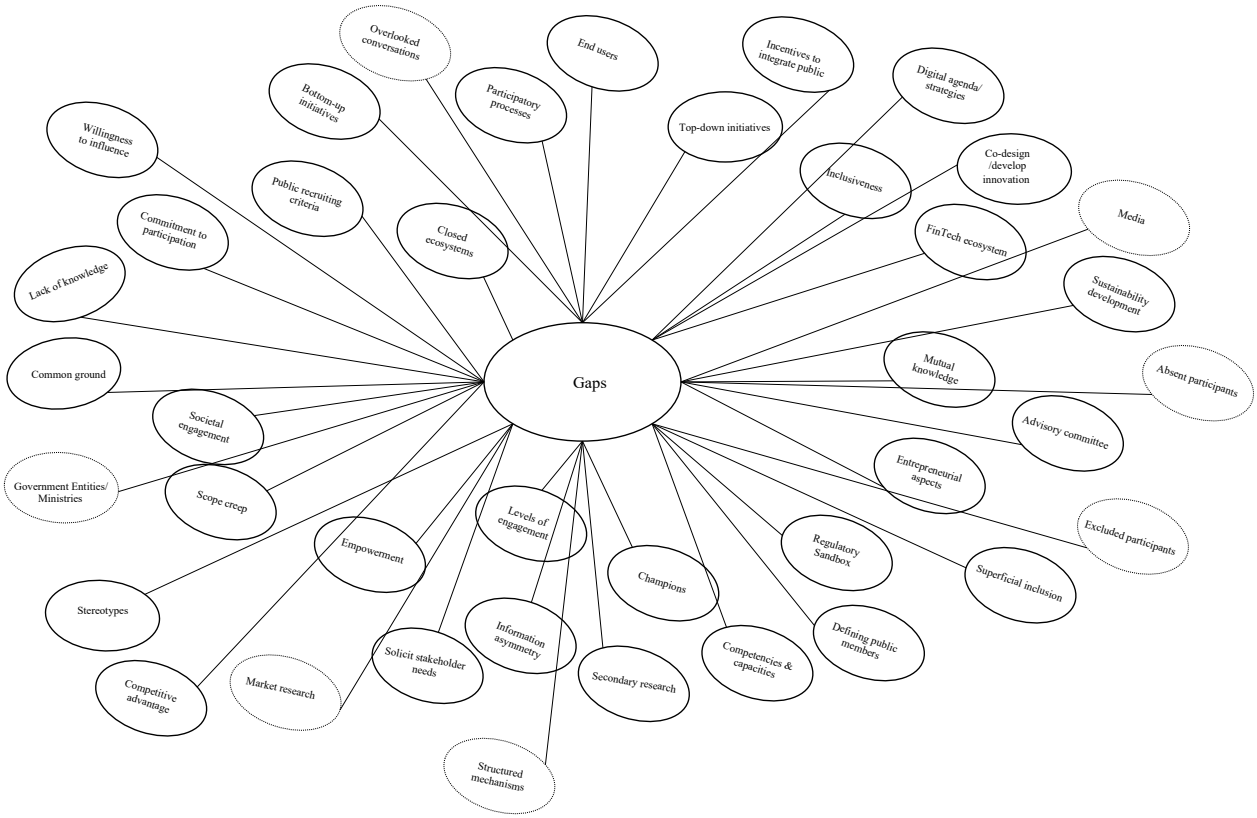

Figure 5.2 Relational maps – Gaps.

The relational map shows the core category put in focus, *Gaps*, displaying all of its relationships to other open codes (via the connecting lines). The map served as "a useful tool to reflect the researcher's knowledge and assumptions on the relations, positions and importance of several elements" (Glück, 2018, p.51). Table 5.1 illustrates the relationships found between the core category, *Gaps*, and other open codes (Figure 5.2). This should be read as an example of the relationships, and not as an exhaustive list. The table helped to create the section's subsections and narrative, and the map helped raise several new questions, such as which actors have been silenced through the participatory narratives, and which group of actors lacked the capacity to enact or shape action.

Type of relationship with category – Gaps in public integration	**Open codes**
Defining public members: (Who constitutes the public? Why integrate public members? How are they recruited?)	End users. Digital agenda/strategies. Entrepreneurial aspect. Scope creep. The regulatory sandbox. Inclusiveness. Champions. Closed ecosystems. FinTech ecosystem. Competencies and capacities. Mutual knowledge Advisory committee. Commitment to participation. Competitive advantage. Societal engagement. Public recruiting criteria.
Public interactions and engagements: (Degrees of involvement, Empowering and less empowering engagements, Top-down and bottom-up participatory processes)	Levels of engagement. Co-design/develop innovation. Top-down initiatives. Bottom-up initiatives. Participatory processes. Empowerment.
Public integration gaps: (Public capacities, Other actors' inclusion capacities, Market research)	Willingness to influence. Lack of knowledge. Common ground. Information asymmetry. Marginalised actors. Stereotypes. Solicit stakeholder needs. Secondary research. Market research.

Table 5.1 Types of relations found within a relational map – Gaps.

The section is thus divided into three subsections for the purposes of analysis: (1) The fourth helix: this section starts with the rationales behind the interests to integrating the public sphere and who comprises this fourth helix. (2) Public integration: this section discusses current efforts of building public involvement as a partner in co-design and co-development activities. The various degrees and by which public members can participate will be highlighted, indicating that there is no single dominant approach to gauge or represent public participation. This section concludes with examples on whether the undertaken initiatives are more top down, bottom up or hybrid. (3) Public integration gaps: this section subdivides the gaps into three different dimensions in terms of how they may impact the potential of realising a Quadruple Helix. These include the gaps in terms of the four actors' capacities and willingness to undertake and share influence. This section concludes with discussing the gaps with respect to market research and the advanced knowledge of actors' unique needs.

5.2.1 The fourth helix

This section starts with looking at the rationales and motivations behind the interests to recruiting the fourth helix, and delimiting who falls within the framework of the public sphere.

Public participants' requests to advance dialogue and cooperation for initiatives that promote entrepreneurship and innovation are a major point of convergence between the public and industry social worlds. Participants outlined their expectations concerning policies transitioning from narrowly focused innovations and closed ecosystems, to more inclusive frameworks. This is in line with new national initiatives to drive sustainability by focusing on the private sector and reducing dependency on government support, as stated by intermediary participant No. 4:

> *"Bahrain started some sort of a sustainable model that does not depend on government interference and support" (INT4, 0:10).*

The public actor was found to be specifically connected to a recent market reform initiative that embraced diversification and innovation. According to participants, there was a need for a partnership approach between academia, industry, and policymakers, concentrating on societal participation in knowledge and innovation. Within this new framework, directions were laid out to ensure participation by all parties concerned.

With the financial services sector standing as one of the sectoral priorities, financial regulators, according to one representative, have been pushed to be more responsive, encouraging financial institutions to innovate and develop digital strategies that realise the importance of FinTech and innovation. Therefore, involving members of the public, according to intermediary No.3, was part of the participatory collaborative nature of these FinTechs:

> *"We have engaged with international regulators, alongside with our regulators to come up and sort of cement this concept of co-working that's*

in incubation The models of Bahrain FinTech Bay have been quite collaborative, because it's based on the partnership model" (INT3, 7:02).

These collaborative models have further evolved, as explained by public participant No.3, from being closed ecosystems to being more open and user oriented:

"Before it was a closed ecosystem, now we are seeing the opening up of the financial services sector to offer and deliver better services to the end customers" (P3, 0:18).

The rising importance of public engagement was motivated by two reasons. One reason, as put by the academic participant No.2 below, was operating in a very competitive market, where integrating the fourth helix into their innovation processes was found to secure a competitive advantage over other actors:

"Competition encourages institutions to get to know what users want and need" (A2, 3:00).

This required actors to withhold their image with respect to largely serving public expectations and declaring commitment to participation, as put by public participant No.1:

"At the end of the day they are a business, and they have an image to uphold" (P1, 19:22).

A second reason that motivated public inclusion was the new regulatory requirements entailing a provision for stakeholders' input, whereby actors demonstrated a commitment to engage with the wider community to inform their strategic direction, as stated by academic participants No.2 and No.6:

"Regulators encourage the same through review frameworks" (A2, 3:00).

"There's a certain checklist of the regulating body of how an involvement of your stakeholder should be to solicit stakeholders' feedback and input […] because at the end they are the consumer and users of the final product" (A6, 8:16).

The findings however showed a lack of consensus with respect to defining public members and in terms of who comprises this fourth helix. Delimiting who falls within the framework of public members was challenging, considering the different views regarding the role of this fourth subsystem. According to participants, the role was undertaken by students/learners, fresh graduates, employers, employees, government entities, ministries, entrepreneurs, start-ups, partners, external consultants and auditors, clients, customers/consumers, and end users.

The terms 'public participants' or 'members of the public' are used throughout this section to distinguish individuals who have been involved in public engagement activities in their capacity as general public when referring to the wider public (e.g. volunteered customers, clients, end users), and sometimes in their professional role (e.g. government entities, partners, employees, students/learners, young entrepreneurs).

Regarding what concerned their capacity as wider public, participants mentioned customers as one of their important stakeholders. Interchangeably used with consumers, academic participant No.6 referred to them as the end users of the developed products:

"At the end they are the consumer and users of the final product" (A6, 16:14).

According to regulator representative No.4, public members were represented by the younger population. These were viewed as core to the success of the FinTech ecosystem, and thus their demands for innovation and changing expectations were placed at the heart of financial institutions' visions and strategy development:

> *"FinTech lies on a very important notion which is putting the customer at the heart and the core of every financial institution […] We have a huge young population which is forcing existing financial institutions to innovate to meet their changing needs and expectations" (R4, 0:21).*

Customers were found to be the most important and central group in the industry's social world, as well as the actors in the arena of financial services interactions. Their location and proximity to the groups contained within an arena are determined by their importance in the social world. Without customers, there is no arena or social world; their existence is unnecessary.

With regards to public members in their professional role, regulator representative No.4 mentioned entrepreneurs and start-ups who can be admitted to the regulatory sandbox as another participatory framework:

> *"So, our sandbox is open to anybody, whether it's an existing financial institution, whether it's a start-up or a person with an idea, so that person can apply to the sandbox to develop and innovate ideas and solutions" (R4, 18:18).*

Other examples involved learners who were mostly employed professionals, and represented through alumni groups, board of studies and advisory committees. According to academic representative No.8, learners were seen as the medium for transferring knowledge and thus informing future collaborations:

> *"So, most of them we count on them to help in terms of networking" (A8, 19:40).*

Something that emerged quite strongly in the interviews was the changing roles representing public participation. In other words, the roles played by public members can vary over time, and the fourth helix can have multiple roles. This further contributed to the difficulty that actors faced with delimiting the fourth helix. One example, given by academic participant No.6, was that of students initially involved as a public participant, co-developing programmes together with the other three actors; the role subsequently evolved into a relationship, particularly post-graduation, with an affiliated industry partner, assuming other key roles with the other actors:

> *"For example [learner's name] was engaged as a learner, and he provided feedback as a learner, as he progressed in his career, now he's giving feedback as a representative of the industry in the advisory committee" (A6, 39:33).*

Similarly, and in such respect, public members were designated fundamental roles during capacity building workshops, playing the roles of academic regulators or reviewers to the developed programmes, as described by regulator representative No.3:

> *"So, we select people who are interested to serve as reviewers for us, so we bring them and train them on how to conduct interviews with the stakeholders" (R3, 6:35).*

Consumers, for example, particularly end users, as indicated by academic participant No.4, were found belonging among any of the other three actors: regulator; industry; and academia. As a result, users can be companies, organisations, societies, and a variety of other entities, as provided in the following examples:

"So, our clients, the representatives of the banking and financial sector, and hence we design our programmes according to their needs and provide them solutions" (A4, 19:46).

"We do work with [Academia], when it comes for junior developmental programmes, which contains 3-4 days of training and development, and mainly tackling some aspects of soft skills […] those programmes are based on contracts because they have been designed for the [Regulator]" (R1, 7:26).

This suggests that public members as the fourth helix under a Quadruple Helix framework can be defined in a number of different ways depending at times on the collaborative contexts and the purpose of consultation, as indicated by both academic participant No3 and regulator representative No.3:

"So, it depends on how you define public entities, because we work very closely with the [Regulator], ministry of labour, ministry of foreign affairs" (A3, 1:12).

"In drafting the module related to training and competency, the final draft goes to the market for public consultation, so it's open even for we call them external consultants, external auditors, whoever thinks he's part of or a stakeholder of this, and all licensees" (R2, 12:40).

In summary, delimiting who fell within the framework of public members was found to be challenging. According to the findings, there is no consensus on what constitutes the fourth helix. In other words, the fourth helix can undertake multiple roles which may also vary over time. This shows multitude of helices in which the fourth helix can be justly placed. The

differences regarding how they were defined, was subsequently found to be important in identifying the basis of recruiting public members in the various participatory activities. Accordingly, achieving public integration was problematic and interactions involving public members varied. This will be explained further in the section that follows.

5.2.2 Public integration

In addition to the fact that there were several definitions regarding what comprised the fourth helix, there were also numerous ways and degrees by which the participating public members were integrated. This came into sharper focus as participants reflected back on the co-design and co-development processes and how there were no clear direction on the various degrees and the levels by which public members could participate as the fourth helix. This section thus highlights to which degree the innovations have been inclusive and the various approaches by which actors co-designed and co-developed innovations with their public partners (see Chapter 4, Figure 4.14). The findings have shown that not all identified public participants were actively engaged throughout the collaboration activities, indicating a gap in the collaboration strategy.

Participants indicated that the innovation activities often depended on diverse and hybrid initiatives, where bottom-up initiatives were supported by top-down interventions. An interesting aspect was how the need for these innovation ecosystems originated. Regulator representative No.4 compared jurisdictions undertaking bottom-up initiatives, particularly where public members, typically from the younger generations, assumed an active role, demanding and pushing for new innovative solutions to be designed and delivered by industry:

> *"We also have a huge young population which is forcing existing financial institutions to innovate to meet their changing needs and expectations. So, all these changes from one end and changing consumer behaviour from another end has really caused financial regulators around the world to start*

to be more responsive to this change and start encouraging more innovation within the financial services sector" (R4, 0:21).

The representative described how local strategies, in contrast, were often conceived by the regulator, to be cascaded down to the industry for implementation:

"In Bahrain the financial regulator has taken the first steps, we have been proactive, we have taken the first steps towards basing FinTech and innovation by launching the first regulatory sandbox in the MENA region. We have been the first movers in whole region to come up with new regulations to foster more innovation within the financial services sector as well" (R4, 0:21).

Although the initial directions were pushed by the regulator, directions often shifted, becoming run and operated with a bottom-up approach, as stated by intermediary participant No.5:

"The initial trigger or catalyst that happened was by the government, but it is largely now very much driven by private sector. If you look at other accelerators or incubators that exist, they are very heavily backed by the government. For us we are thankfully moving away from that" (INT5, 20:19).

Intermediary No. 6, for example, believed that these regulations, although imposed, were necessary to facilitate and support many of the bottom-up entrepreneurial initiatives such as start-ups:

"I think a lot of rules and regulations are put nowadays that are for the benefit of the ecosystem, you have the new bankruptcy law, the new data

protection laws, and all these laws that support the creation of new businesses and start-ups" (INT6, 26:30).

As explained by regulator representative No.4, FinTechs exist because of the active participation of entrepreneurs and start-ups, backed up by a top-down initiative:

"The financial regulator has taken the first steps towards encouraging our existing financial institutions to innovate, to have in place digital strategies to reach the changing expectations of consumers" (R4, 18:18).

According to intermediary participant No.5, having a conducive regulatory environment was important for operating the FinTech ecosystem, and the top-down approaches were necessary to trigger change, and to motivate both embracement of the digital agenda and new directions for innovation:

"We need that catalyst to make that change right, and if that regulation or mandates didn't come forward, people wouldn't have taken that step, because you have to keep in mind that banks are happy with the current status quo" (INT5, 40:26).

According to industry participant No.3, the regulator plays a determinant role in bridging the gap between practice and policy, given the misaligned incentives of the different actors in the ecosystem:

"I think the government policy is a huge determinant for sure, and government support is very important, […] we need better government policies and programmes to solve this mismatch" (IND3, 54:11).

The development of mechanisms allowing public integration, however, raised several issues, as recognised by industry participant No.3, with regards to developing coordination and

incorporating the competing needs of participants. The top-down versus bottom-up dichotomy was found to be a source of crippling policy constraint, despite the general discourse that called for creativity, innovation, and entrepreneurship:

> *"I think it is promising [intuitional frameworks for entrepreneurship] but still not sufficient to carry us to a sustainable economy […] the conclusion I reached was that no matter how successful the entrepreneurship frameworks are seen or the programmes you put, as long as we have these structural factors, it's not gonna be sufficient to carry us through" (IND3, 11:34).*

The inability to conduct successful participation and collaboration was attributed to a number of structural challenges, including lack of coordination, education, skills and capital. Participants mentioned that there was a contradiction between the initiatives which largely embraced a top-down style, and the various attempts to decentralise decision making processes. In terms of innovation readiness, the planning and implementation processes, for instance, were insufficiently coordinated, and as a result, boundaries developed to separate some of the actors.

Industry participant No.3 believed that openness for innovation depended on how conducive the public discourse was in terms of innovation:

> *"Innovation requires the freedom to innovate, so we feel like our public spheres discourses are not conducive for that freedom, and that will definitely have an impact. So, there's this discourse that speaks of encouraging creativity and innovation but at the same time and from the real experience, it is difficult sometimes to have that space" (IND3, 26:26).*

Although the frameworks may look inclusive, industry representative No.3 mentioned that some of these networks may create exclusion, in terms of class, income or language barriers:

"Official discourses and statements by officials and the business community have shown so much emphasis on entrepreneurship. There was this promotion of the idea of young graduates, and we want them to open their own business. I'm very sceptical of efforts like this. You can notice that after a while and pay a close attention to the different entrepreneurships and start-up events, a lot of these spaces are not accessible to low-income families or students. Another point is that most of these programmes are in English, I don't recall many conferences on entrepreneurship in Arabic, and I think this creates a class barrier" (IND3, 46:00).

The opportunities to work and innovate were therefore not available to everyone, suggesting that public actors may be underrepresented. According to intermediary participant No.5, candidates appeared to be recruited through referrals and personal contacts. Therefore, there was a limitation for some to access the FinTech ecosystem:

"There are different means by which they can reach us. One is through referrals" (INT6, 2:30).

According to intermediary participant No.5, limitations of access were often associated with the lack of access to capital:

"The fact that the barriers of entry for FinTechs are very high. the requirements to be in compliance are very high, and very painful in terms of funding required to back these projects" (INT5, 41:56).

Access to capital was found to be important, according to industry participant No.3, provided that start-ups needed to expand regionally and scale up:

"I think a lot of times access to capital is a huge problem. There's the problem of scaling up. You open a business, and you reach a growth stage where you want to expand your market, but what really happens that they don't have access to this extra funding. It Is important that as an entrepreneur you think at the scale of the region's wide network" (IND3, 46:00).

In addition to capital inadequacy, the distribution models were often found, according to industry participant No.3, and intermediary No. 7, irrational, and not in line with the aim of creating disruptive job opportunities:

"Even with the co-space incubators, not all of them got the advantages of the Covid19 package or the economic support package, the distribution scheme for these packages doesn't make since at times. So, I think the government policy is a huge determinant for sure […] So, these management issues need to be looked at" (IND3, 54:11).

"A lot of people using these grant or subsidies are not even competent in running a business, it's just all gone to waste pretty much […] you have to control the quality of the actual people that you're investing in, bringing in kind of new disruptive companies, and hope they grow into creating proper job" (INT7, 5:20).

Industry participant No. 3 explained that the goal of workforce nationalisation contrasted with the goal of becoming a FinTech hub, given the lack of talent and lack of investments in the education necessary to boost the new FinTech agenda. Consequently, a tension existed between the two goals:

> *"There are these structural barriers that will not be conducive for young entrepreneurs to achieve what they want, I think we know the gaps in terms of education, in terms of developing skills, providing capital, the political well to actually achieve that […] So that is why we have this tension. As long as we don't have Bahrainis or nationals in the country that have this expertise then automatically it means we will bring it from outside" (IND3, 39:16).*

According to intermediary participant No.8, there is a gap between the discourse of creating a business-friendly environment for start-ups, and current practices. For example, registering start-ups commercially and establishing their banks accounts:

> *"So, they say it is business friendly, but it actually isn't. There is lack of facilitation, the process takes so long, and we can't give them money unless they are commercially registered. Also, it takes a long time to process everything and open their bank account here, and any delay in the transactions hugely impact these start-ups because they need the money to prototype and hire people" (INT8, 43:40).*

Other gaps with regards to bottom-up initiatives, were related to the regulatory efforts to accommodate innovation, as stated by intermediary participant No.8:

> *"There's a missing link here. I don't think the regulator here knows about these people. If they don't find the right door to knock and pitch their idea, the idea remains as an idea if no effort is put into implementing it" (INT8, 15:28).*

And how much knowledge public members have of the kinds of support available to support their ideas, as put by industry participant No.3:

> *"I did a quick exercise to map out the institutes where entrepreneurs can refer to and seek help, advice and financial support, loans, advisory services, co-working spaces. So, what I found was a very thriving and lively ecosystem for entrepreneurship. One challenge was that I don't know how many people know about this, so that's maybe considered as a communication gap maybe, because these programmes do exist" (IND3, 3:45).*

Participants therefore suggested identifying and addressing potential coordination failures, and monitoring and reassessing the degree to which a shared strategic vision was being realised, as stated by intermediary participant No.7:

> *"For me there needs to be a radical shift, check and monitor the social impact caused by initiatives, we don't do that" (INT7, 49:04).*

The findings have shown numerous ways and degrees by which public members were integrated in the various innovation activities. The different levels of integration formed varied understandings of what was meant by public integration. These ranged from more empowering to fewer empowering roles, direct to very indirect ways of participation. Further, it depended on whether the innovations were developed for, with, or by the public members themselves.

Public integration was found to focus on the role of public members as mere consumers of services, without relating to any concrete activity often assumed by decision makers. This meant that their needs were articulated without any changes in the position or the power that the participants held. These indirect integration examples further illustrated integrations whereby solutions were developed on behalf of the public participant. According to intermediary participant No.2, this often existed in situations where direct involvement may

not be possible, and where systematic mechanisms such as surveys and evaluation forms proved useful:

> *"The feedback loop tends to go through the HR departments so they will often seek feedback from the staff that they've sent and then we tend to get the feedback from them. It's not very often we get it directly from them, I recently asked if I could contact them directly for a survey and I was told no you have to go through HR, so we genuinely go through HR to access those" (INT2, 27:55).*

Alternatively, public members were assigned clearer decision-making roles, and empowered by the opportunity to provide direct input, extending their choices and giving them the means to complain. Public members were directly involved in the design and development work of new solutions together with the other actors. In the regulatory sandbox, for example, public participants were directly integrated into the exercises of testing the developed solutions. Participants viewed the integration activity as an opportunity to look into how concerned public members adopted and used the innovation outputs. This required a developed solution or concrete goods and services for public participants to test. According to intermediary participant No.4, the development approach focused on the public's needs and requirements, whereby various solutions were demonstrated to perceive public participants' reactions and feedback. This indicated that public members, besides choosing between the different solutions, were also offered the opportunity to communicate their feedback:

> *"We call it the consultation session, we show them our plans and we listen to their feedback to adjust to their needs" (INT4, 16:14).*

As an example, the regulator extended the role of public members to consultants; together with other stakeholders from industry and academia, they could share feedback regarding new

regulatory policies and regulations. Feedback areas included amending existing regulations, employment requirements for key positions in the industry, and professional training competencies. As explained by regulator representative No.4:

> *"Whenever we issue a new regulation, or amend existing regulations, we issue industry consultation, and we receive feedback, discuss the feedback and take them into consideration" (R4, 20:33).*

Moreover, public participants, young professionals and youth were invited into hackathons, to develop solutions and share ideas over extremely short timeframes, as stated by intermediary participant No.5. Hackathons provided participants with an opportunity to convert ideas into solutions, which may later grow into start-ups. This illustrated an example whereby public participants were treated like the true developers of the solutions:

> *"So, around incubation or ideation we run hackathons, we bring a large number of young professionals, students and so on. And put them through quick weekend scenarios where they need to come up with different ideas, to pursue and build forward […] basically you're taking the raw talent that is available in the market and you're converting their talent into ideas" (INT5, 0:10).*

In general, direct forms of integration were often viewed more positively in terms of impact. The impact was understood in terms of empowerment, job creation, enhanced income and capabilities. This further allowed, according to public participant No.3, a reliable evaluation of the market, and a significant reduction of the associated technical and business risks:

> *"In the regulatory sandbox, and as a company if you want your product to succeed you need to test it out on users to see how their experience is. So,*

there are signs of usability testing to see any red flags that we need to fix at that point" (P3, 15:58).

In summary, the collaborative frameworks were found to be unbalanced given their need for a strong bottom-up push and a greater emphasis on the role of public participants in addition to top-down interventions. In general, participants believed that innovations originated with a top-down initiative and identified gaps in terms of coordinating and accommodating the various efforts to innovate.

5.2.3 Public integration gaps

A number of transcending gaps were identified when exploring how much of the public integration is actually realised, and whether or not it sufficiently includes public members. Many gaps existed in the ability to integrate and make use of public engagement. These included the lack of public competence, experience and time to engage with public dialogue activities, the deficit of mutual trust between the three actors, support provided to engage effectively with public members, understanding and appreciation of impacts of public engagement, and the knowledge to make informed decisions.

Three subsections have therefore been established for the purposes of the analysis and to show that the gaps are three-dimensional. On the one hand, the first dimension is associated with the participating members of public, their particular competencies and how much influence they are willing to undertake (see Chapter 4, Figure 4.13). The second dimension, on the other hand, is associated with the three actors' inclusion characteristics and the various efforts to increase their capacity to engage with the public, and how willing they are to share influence (see Chapter 4, Figure 4.13). The third dimension is concerned with the lack of market research and the advanced knowledge of actors' unique needs and expectations.

5.2.3.1 The participating members of public: competencies and willingness to influence

Regarding the first dimension, participants voiced concerns that public participants may be lacking the information required to fully comprehend the subject under study. Hence, members of the public were largely seen as implementers rather than co-designers, as they did not have sufficient knowledge to participate in a meaningful way in terms of influencing the design and the development of innovations. As a result, the collaborations reflected a gap in terms of excluding rather than including public participants.

According to public participant No.3, there was a clear gap in terms of the financial literacy expected for one to significantly contribute. This was, however, attributed to the limited information public members were offered, regarding the innovative solutions conceived by the other actors. Public members, for example, found formulating an issue and performing a thorough analysis of it very challenging, particularly when the subject under study was new. The gap between actors' knowledge and that of public members indicated an information asymmetry, which further introduced new difficulties in terms of how public members successfully collaborated. Engaging public members, therefore, according to public participant No.3, required sufficient learning to overcome this asymmetry:

> *"In terms of consumers, when it comes to financial literacy there's a clear gap, and it's not people are not interested in it, or people just don't understand it, it's more toward the availability of information […] The truth is customers, especially if it's a new topic, they wouldn't be able to make very solid suggestions, they don't know how to start or how to frame their suggestions" (P3, 18:15).*

Participants understanding of subjects like public engagement and innovation for example differed. There was a conceptual confusion around these terms, and they were frequently used

without being properly defined, nor questioned. A lot of effort was therefore needed with regards to creating common ground and simplifying conversations. This also had an interesting implication with regards to how the co-design discourse depended on resourceful public participants, in terms of their competencies and the issues they are better placed to address. Participants realised this issue, and to help public members navigate and define their own role within the participatory frameworks, participants suggested educating stakeholders and providing various forms of support. Formats involved arranged meetings with cross-industry subject specialists, training workshops, group discussions, events, committees, panels and other activities. According to intermediary participant No.7, these various fora helped provide networking opportunities with a wide range of industry practitioners, resulting in the formation of a repository of knowledge and experience for public members to draw on:

> *"One of our biggest roles has been raising a huge amount of awareness, and we invited other start-ups in the ecosystem as well so. So, this kind of exposure can lead to potential investments and educate the community" (INT7, 8:51).*

Some of these forums, however, were often found as an opportunity to teach the public about what the other actors did, rather than a form of joint collaboration, according to intermediary participant No.3:

> *"So, what we do is we do workshops and through surveys we invite the relevant people and we you know share with them our wide thinking" (INT3, 7:02).*

Narrowing down the gap of public inclusion also depended on public participants' willingness to assume influence and responsibility. While public members or youth, as put by

industry participant No.3, may accept responsibility with enthusiasm, barriers, as previously mentioned (see Section 5.2.2), may inhibit creating a favourable environment for them:

> *"So, the gaps are there we need the political well, Bahraini youth showed consistently that they are willing to work hard they are willing to embrace this entrepreneurial spirit, but at the same time there are these structural barriers that will not be conducive for them to achieve what they want. So yes, in general there is a problem despite how welling the Bahraini individual is" (IND3, 59:58).*

The findings have also shown that public members may not be keen on undertaking a role due to the lack of willingness to take responsibility, which was described by public participant No.2, as an intrinsic motivation:

> *"It needs people who have the motivation, it's something that comes from the inside" (P2, 13:57).*

According to public participant No.1, the workload may be challenging and intimidating for actors who lacked the necessary level of initiative, passion, and responsibility:

> *"It's a tough role, you know. So, I feel that is a really big responsibility, and people don't want that responsibility. I can see how intimidating that position can be" (P1, 29:50).*

Public participants may also show no interest, as put by public representative No.1, revealing scepticism about their capacity to bring change or influence decisions:

> *"There will be recommendations brought up, but to change the way they have been operating for years, I doubt that happening" (P1, 15:42).*

Alternatively, public members may show interest to join the collaborative activities, and seek not only to share their considerations, but to see their thoughts addressed, welcomed, and positively desired by the other actors. Further, they regarded clear descriptions of the ways by which their input is fed into the decision-making processes as a major motive to collaborate.

Participants, however, complained about miscommunication. A communication gap appeared, as recognised by intermediary participant No.2, as a result of participants being less active with respect to communicating the outcomes of their meetings and establishing the necessary mechanisms to ensure that public concerns are fed into their decision-making processes:

> *"We didn't give or send them a summary of the meeting, we didn't send them an action list, we didn't send them any outcome from the meeting, so there is a communication gap there between us and them […] agreement might happen, but no action comes from it" (INT2, 9:18).*

According to public participant No.3 below, many of the ideas presented were initially unrealisable, due to the lack of regulatory frameworks and support to establish the infrastructures for instance for open banking opportunities:

> *"In terms of our journey as a company, it was just an idea to create a personal financial management tool, the [regulator] did not announce the regulatory sandbox yet, and there were no regulations for open banking, and there was no infrastructure to support it from a financial services sector" (P3, 0:18).*

For example, the participant added that after graduating the regulatory sandbox, participants or FinTechs needed to interact with other actors who did not necessarily cater to their distinct

needs. This suggested that not all actors are actively engaged throughout the innovation activities, indicating another gap in the collaboration strategy:

> *"Your interaction with them is only focused on before the licensing. Once you're licensed you start dealing with the other departments and obviously there is that gap where other departments do not really cater to our needs. Even with the forms that we receive, we don't find them catering to FinTechs that's the challenge with the regulator" (P3, 33:11).*

In return this has largely impacted participants' motivation and overall interest to join the collaborative projects. Although collaborations were viewed as the venue by which group voice can be empowering, as claimed by academic participant No.2:

> *"The fact that I have issues with the rules and regulations and the legal framework is a challenge, because I am different […] I think trying to voice our opinion getting there by is one way, another way is to see more collaborative relationships, because we all have the same pain, we just need to actually make a point that it is not a single institution's problem, there is power in number, there is power in collaboration as well" (A2, 40:32).*

Several members expressed disappointment regarding the collaborations as being less intrinsically interesting for reaching their goals, as stated by intermediary participant No.2 below. Including public members was therefore not sufficient to ensure effective collaboration, given the risk that their voices will simply be outweighed:

> *"I think one of the main things this what I've heard, they are waste of time, we gave our advice, and nothing changes […] one in particular said I have*

gone every year and I have made extensive contribution; I've seen it as important, first of all my colleagues don't see it as important" (INT2, 5:53).

Participants were therefore expected, as stated by academic representative No.8, to pay consideration to whether public members viewed these activities as worth their time and effort:

"Actually, people who are more inclined are those who would see this more beneficial to them" (A8, 8:07).

Public support for these collaborations was often found to be crucially dependent on how they perceived quality in terms of their own preferences. According to public participant No.2, this included the prospects of gaining something from the experience, such as meeting people from industry, and the experience of engaging in dialogue rather than just feeding or being fed information. Public representative No.2 seemed more engaged in participating in innovation activities, and intrinsically motivated by peer recognition to present their professional and personal competences in advisory committee meetings:

"So, this was an opportunity to meet people from the industry […] it was ok, they were welcoming, I'm new at the industry, not like them, they're all experts with more than ten years of experience, but they never underestimated be for being a new guy with little experience. They take my ideas, and they have their own, so we like complement each other" (P2, 3:09).

The experiences of interaction and dialogue further created a new appreciation of the roles played by the other three actors (academia, regulator, and industry), and how their work featured in the lives of public members.

5.2.3.2 Actors capacities and willingness to share influence

Regarding the second dimension, a number of gaps were identified in relation to actors' readiness and capability to integrate public members into their participatory networks, and in terms of their willingness to share influence. The willingness to collaborate and share influence in the innovation networks have been depicted in positional map Figure 4.9 (see Chapter 4).

Despite the rhetoric about decentralisation, collaborations were challenged by top-down power structures which influenced attempts for bottom-up initiatives. Participants believed that poor incentives may contribute to the effectiveness of the collaborations, particularly in terms of how these engagements added to the workloads of the various actors. Participants, therefore, believed they needed to have solid incentives in-order to be part of these initiatives. Participants also believed that bottom-up approaches to innovation may help to better adapt to the local context needs, however, there were concerns whether regulators' ambitious economic targets could be achieved. According to industry participant No.3, in practice these targets were often not carried out effectively. The various networks and the resulting innovations thus reflected a more top-down approach. As a result, the collaborations were found to reinforce the gaps in terms of the capacity to establish an inclusive approach, (see Section 5.2.2).

Concerning actors' capacities, few examples were provided on how the three actors increased their capacity to overcome the difficulties with regards to public integration. The introduction of new disruptive business realities, for example, as described by intermediary participant No.5, generated a significant number of challenges for the regulator in particular, having to regulate a new industry and new activities, given the lack of previous relevant learning available:

> *"The main challenge is that the regulators are being asked to regulate an industry or an area which no body has been operating in, in this region in*

the past, so it becomes very difficult as a regulator to figure out what are the questions that we need to ask, and how do we want to regulate this industry" (INT5, 41:56).

Actors have therefore been looking into the development opportunities available to better articulate and assess the development needs of their partners. To be able to do that, according to public participant No.2, members were required to have a minimum knowledge of the subject at hand:

"Members should have some knowledge, they don't have to go for full technical knowledge, they need some fair knowledge" (P2, 8:16).

Another important concern for the three actors was how willing they were to share influence with their public partners. An interesting common theme throughout the interviews was the limited interactions that involved public participants. Compared to the other three actors (regulator, industry, and academia), who enjoy a long tradition of collaborations, public members were seen to be moderately engaged with the other participants and only remote institutional mechanisms existed via which they could have a meaningful say. In other words, the interactions were incorporated, leading to public members being observers rather than true participants. As partners, public members were thus found to lack the decision-making power of academia, the authority of the regulator, and the economic power of industry.

One reason was the time and commitment required to solicit and integrate their distinct requirements. Another reason, as put by intermediary participant No.2 and by regulator representative No.2, was how irrelevant contributions may be with respect to their offerings. The nature and the purpose of the collaboration therefore played a big role in how active the different actors were in engaging with public participants:

"I don't think there's anything that includes the student, I think there maybe is for the academic programmes, but not for the corporate trainings" (INT2, 27:55).

"We in drafting the module related to training and competency, we are consulting with [Academia]. I'm not sure if we will get other government ministries involved in this because more about training and competency module, the draft talks more about the professional qualifications, and talks about people who get approved by the [Regulator], so, the parties interested are more to do with the institutions providing the professional qualification and the industry themselves" (R2, 12:40).

Recruiting public participants was found to be difficult and strictly dependent on the issues at hand and the different types of knowledge these networks needed to facilitate the co-design and co-development activities. Participants found considering the aims and types of output expected in the various phases of the collaboration to be important in securing the right kind of public contribution. Securing the right kind of public contribution appeared to be further associated with defining the boundaries of their responsibilities. Participants, therefore, were expected to provide information on substantive aspects, such as stating the explicit roles beforehand, the time and commitment required and what participation could imply for both public participants and the other three actors, as put by intermediary No.1:

"They want to know the objective, what is the aim, who are you doing it for, why are you doing it, what's the level of it, what's the expectation for this? So how do we tackle this? We have the direct stakeholders communicating. That helps a lot" (INT1, 8:40).

Another main concern was the purpose of involvement. Participants were less willing to share influence if the aim was to discuss technical matters. According to public participant No.3, public participants were likely to find these topics challenging, as they potentially required higher levels of support and knowledge in order to take part:

> *"People working on that project don't necessarily get what open banking is, or what it has to do" (P3, 24:33).*

Similarly, when the aim was to let public participants lead discussions, participants were also found to be less willing to share influence, driven by the fear that the findings may not be considered meaningful or needed a high degree of interpretation and analysis before being recognised as such. As stated by intermediary participant No.2:

> *"Very often what they actually want is quite looks different to what actually they said they wanted" (INT2, 23:33).*

Therefore, not all public contributions were explicitly considered to fit into the networks' agenda. Industry actors, as stated by representative No.1, were generally less persuaded that relationships with public members could lead to innovation. As a result, they were more hesitant to participate in active collaboration projects. The participant further voiced concerns over public members providing fragmented, irrelevant and sometimes insignificant input:

> *"The challenge has been the same for quite a time, we get fragmented and often conflicting feedback. Feedback is more generic it doesn't go necessarily into specifics. Also, it is difficult to judge the integrity of the feedback, it may not necessarily add value" (IND1, 10:53).*

To ensure public members were not marginalised, there was a need to make their concerns heard, advocating for a strong culture of public involvement. The challenge was to provide

public members with a sufficient number of channels and tools to ensure active participation and contribution. According to public participant No.3, participants were expected to come together to help create multidisciplinary knowledge and teams instead of working separately:

> *"There needs to be more transfer of knowledge. And that's something we want to tackle in terms of having multi-disciplinary teams, not departments working in silos" (P3, 24:33).*

According to regulator representative No.1, this also involved bridging the gap between participants' diverse expectations and involving public members in the early stages of problem definition where stakeholders can have an input into setting clear goals, creating value between all participants, and identifying the means to overcome clashes:

> *"We do take their opinion when it comes to any developments or designing that fit their requirements. If they have any concerns they have to raise in the very beginning of the process, so, we try to react quickly to bridge the gap" (R1, 14:49).*

The various actors, according to regulator representative No.3, were further expected to develop a set of skills, involving being receptive to the diverse perspectives:

> *"So, we try to be as accommodating and as understanding as possible, we take their feedback into consideration, and we make changes accordingly and we inform them of these changes, and this makes them feel they are as important as we are" (R3, 15:39).*

Other concerns identified were that participants did not want their core innovation model being disrupted and found no sense in which direct members of the public were anything other than consumers. Despite the initiatives to engage with the wider community, participants

showed concerns, as stated by academic participant No.6 below, over integrating public members which can create scope creep and mismanaged collaborations:

> *"Overall, there is an involvement, originally that involvement was considered sufficient […] I have to be honest, sometimes you end up with a scope creep, getting things out of control, doing too much without the need for doing it" (A6, 6:41).*

Similarly, an industry representative, participant No.2, expressed that there were no pressing needs to include public participants, given how representative the collaborating members currently were, and their unexplored potentiality in terms of what they could offer. Adding new members was thus seen to harm how focused the collaborating groups were with what they currently offered:

> *"I don't feel there is a pressing need for it almost immediately, because I feel that the existing members in the committee, they still have a lot to offer. If you want to keep it more focused maybe continue with this for a little longer" (IND2, 22:10).*

Moreover, the willingness of the three actors to share influence with their public participants was also found to be closely related to the deficit of public competence, and mistrust in the public's ability to understand and contribute meaningfully to the issues at hand. The frustration was that public members lacked the strategic insight and the holistic perspective that enabled them to add value to the collaborative meetings, as observed by intermediary No.2:

> *"So, my observation of that, to some extent they had the wrong people […] to add value in that meeting you need to have a holistic perspective, you*

know you've got to have some higher-level insight to really be able to contribute and help" (INT2, 6:50).

Attitudes towards two-way engagement were mostly found to be influenced by stereotypical attitudes towards public contributions. Moreover, these stereotypes had a negative impact on how industry perceived the value of public engagement, according to intermediary participant No.2:

"Lack of faith that the industry had in the ability of the students. Because they have very low expectations of students" (INT2, 11:00).

Few participants clearly articulated the types of characteristics that qualified or disqualified people from joining the collaborative exercises. According to public participant No.3, public participants were recruited in the past on the basis of their demographic characteristics. To be able to join and access the FinTech ecosystem, however, recruiting was mostly based on participants' financial and investment behaviours:

"When you're choosing demographics a lot of the way people segment the demographics, is gender, but when we are talking about money it's even more important to think about the money mindset, than just their gender […] we did a bunch of research on people's investment behaviour" (P3, 19:16).

Moreover, recruited participants were expected to be active and display a willingness to take the initiative and undertake responsibility, in addition to exhibiting good communication skills in order to facilitate the conversations, as stated by industry participant No.2:

"I think they were selected very carefully, that even the personalities are quite pleasant, they are all very expressive and vocal about what they think,

but they have good communication skills, so it's all facilitating" (IND2, 19:15).

Those perceived as having no opinions were seen to stand in sharp contrast to participatory approaches and were eventually excluded from the process. Vocal candidates, for example, were chosen over quiet members, as stated by academic participant No.8:

"We faced difficulty, identifying people who are a little more outspoken, who can articulate on behalf of the entire group" (A8, 8:07).

Mistrust in public contribution has, therefore, and according to regulator representative No.1, resulted in excluding individuals who may have the knowledge and capacities with regards to the subject matter. In turn, this was found to impede the process of aligning the gaps and matching the needs of key partners:

"Without involving them, we are not aligning and bridging the gap of what we need" (R1, 12:42).

Stereotypes thus remained despite the mutual benefits of past collaborations and knowledge exchanges, where public engagements were proved to positively impact productivity at work, as stated by intermediary participant No.2:

"What was really interesting about the process after years of having done it, I realised looking back, when I did some research with the supervisors from industry, the students have impacted them as much as they impacted the students. So, by having the students around with a proper project management approach and a structured methodical outputs focused work process they were challenging the productivity in the office […] because they

were doing things better, so that was a really interesting finding and that knowledge exchange you wouldn't realise" (INT2, 11:00).

This demonstrated that mutual understanding does not happen automatically. Participants therefore suggested that considerable time and commitment was required, in addition to face-to-face contact and reciprocity to overcome these initial assumptions and stereotypes.

5.2.3.3 Market research; actors unique needs and expectations

To enable public integration, market research was required, considering the interdependencies between the various actors and the iterative nature of the ongoing communications to articulate their needs. Concerning the third dimension, this will be discussed in terms of lack of market research and the mutual knowledge the actors have of one another, especially those of the fourth helix, and with regard to their respective incentives, interests and needs. Participants highlighted the importance of setting clear goals and taking a clear stance on which objectives were being prioritised. However, participants recognised a clear lack of knowledge in terms of industry data that allowed informed decision making and strategising, as put by intermediary participant No.5. Actors need different types of knowledge from different knowledge sources that may not necessarily be internal to their own sector, but distributed instead across a range of actors and industries:

"Because what we found there was a clear lack of data and it is difficult to make decision without any data, so we tried to bring a lot of that inhouse because we couldn't find it outside. We take parts of information that is available from different sectors and bring them together" (INT5, 0:10).

Market research, according to participants, involved gathering an advanced knowledge of actors' unique needs and expectations to harness existing opportunities in the market. Conducting market research was viewed as part of a labour market reform that started with

fully fledged research in the past, and in response to the point that working in isolation was not ideal if the different actors wanted to keep pace with the changing market. Recent investments in market research, however, as put by intermediary participant No.4, were mostly conducted for internal purposes, to meet individual agendas:

> *"We are talking about different sectors and industries. It is almost impossible to create some sort of knowledge internally […] We have not produced anything on a public level basis, the way we work is we create studies for internal purposes rather than a full fledge" (INT4, 21:34).*

Actors were found to be less active in synthesising the knowledge they produced for application and action, primarily for two reasons. One, as recognised by intermediary participant No.2, market research was always seen as an academic endeavour. There was a fundamental, entrenched and two-sided lack of understanding in terms of how market research can help industry, and how industry in turn can facilitate this kind of research:

> *"So, there seems to be a fundamental lack of understanding how research helps industry, how the industry can help research, that still seems to be for both sides a gap" (INT2, 31:47).*

Two, according to industry participant No.1, the lack of formal processes that enabled conducting market research on an institutional level. The participant added that the market may sometimes be less active with respect to providing the necessary input and feedback actors needed to develop solutions. As a result, the processes to conduct market research were less stable and less structured:

> *"In terms of running market research we don't have a real formal process […] sometimes we might get more input from the market but the next two*

quarters we might get more internal feedback, so it tends to be a bit of a dynamic process rather than a very strict and structured process" (IND1, 5:36).

Although participants did not produce a public, fully fledged market research to scope and analyse labour market needs, internal approaches were followed instead where stakeholders communicated their needs based on their individual market observations. Almost all actors relied on secondary approaches to collect data. These involved developing a detailed business case to establish the feasibility for new offerings, all backed by secondary studies and secondary analyses of market gaps. Other alternatives to solicit market needs involved advisory committee meetings and meetings with training managers, whereby the four actors engaged in playing an advisory role, and bringing the different worlds of thought together to identify the gaps in the market, as described by academic participant No.3:

"So, we have different methodologies to identify the gap, we have a board of advisors which includes a group of very senior people from the banks, we have training managers meetings, as well, so there are different ways of collecting that data, of what the gap is" (A3, 6:37).

One issue with using secondary market research, as put by public participant No.3, was the presumptions underlying them, namely that they may applied to different contexts. On the other hand, these types of market research are context-specific and have limited representativeness:

"What was really interesting comparing the research to how things are being done here is cookie cut approaches, this worked in the US so this will work here, and the numbers do not support that at all. People's behaviour is completely different and that is not taken into consideration here" (P3, 22:25).

To summarise, delimiting who falls within the framework of public members was found to be challenging and primarily depended on the context of the collaborations. The findings have shown that there was no single dominant approach to representing public participation, and thus different understandings existed regarding the way(s) in which public members can participate. This further indicated another challenge in relation to the successful recruitment and securing the right contribution from public members, indicating at times insufficient involvement. Although the collaborations were described as hybrid, they were found to be unbalanced given the gaps and structural challenges in terms of accommodating bottom-up initiatives. Some of these efforts in fact reinforced existing structures of exclusion.

Gaps were seen as the insufficient capability of actors to enable public integration into the co-design and development of innovations. Embracing participatory thinking suggested that public integration could threaten participants existing power structures, via requiring the relinquishment of control that, in turn, could be given to public participants. Actors were found to hold a genuine fear of loss of quality of decisions. Without diminishing the responsibility of the various actors, public contributions were found to not explicitly fit into their agendas due to the public's incompetence, information asymmetry and lack of available learning opportunities. This has further caused mistrust between the various actors, resulting in people being excluded from the participatory activities, and as a result served to impede matchmaking between the diverse needs.

On the one hand, the mismatches highlighted the importance of setting clear goals and the importance of actors having mutual knowledge of one another. On the other hand, the findings have shown a fundamental lack of market research that fell short of having a clear impact in terms of synthesising knowledge for application and action. Participants described the gap as entrenched and two sided, given the fundamental lack of understanding of how actors can collectively facilitate research for innovation.

The development of mechanisms allowing public integration raised several issues with regard to developing coordination, aligning diverse interests and motives, and incorporating the competing needs of participants. This will be explained in more detail in the next section.

5.3 Tensions

The findings presented in this section focus on the second core category that emerged from the analysed data: *tensions*. The section examines how various groups of actors can collaborate across distinct and, at times, contradictory positions. The extension of the trilateral interactions between academia, regulator and industry to incorporate more classes of actors via the participation of the public, was found to create new tensions that transcended the innovation process. While most participants held an espoused discourse of collaboration and collegiality, their descriptions of de facto instances exposed tensions that were in practice recognised by them. It was not easy for actors to participate in innovation processes, as actors frequently achieved coherence in response to a struggle with other network actors. As such, the collaborations did not necessarily allow all actors to contribute productively. This section explores the nature of these tensions, the reasons they arise, and the strategies deployed by the different organisational actors to address them.

Using situational analysis (Clarke, 2005) with its distinct mapping tools, a relational map was created (Figure 5.3) from the messy situational map (see Figure 4.5), where Collaborative *tensions* as the core category was put in focus, and where arrows were used to illustrate all of its relations to the open codes. The map served as "a useful tool to reflect the researcher's knowledge and assumptions on the relations, positions and importance of several elements" (Glück, 2018, p.51).

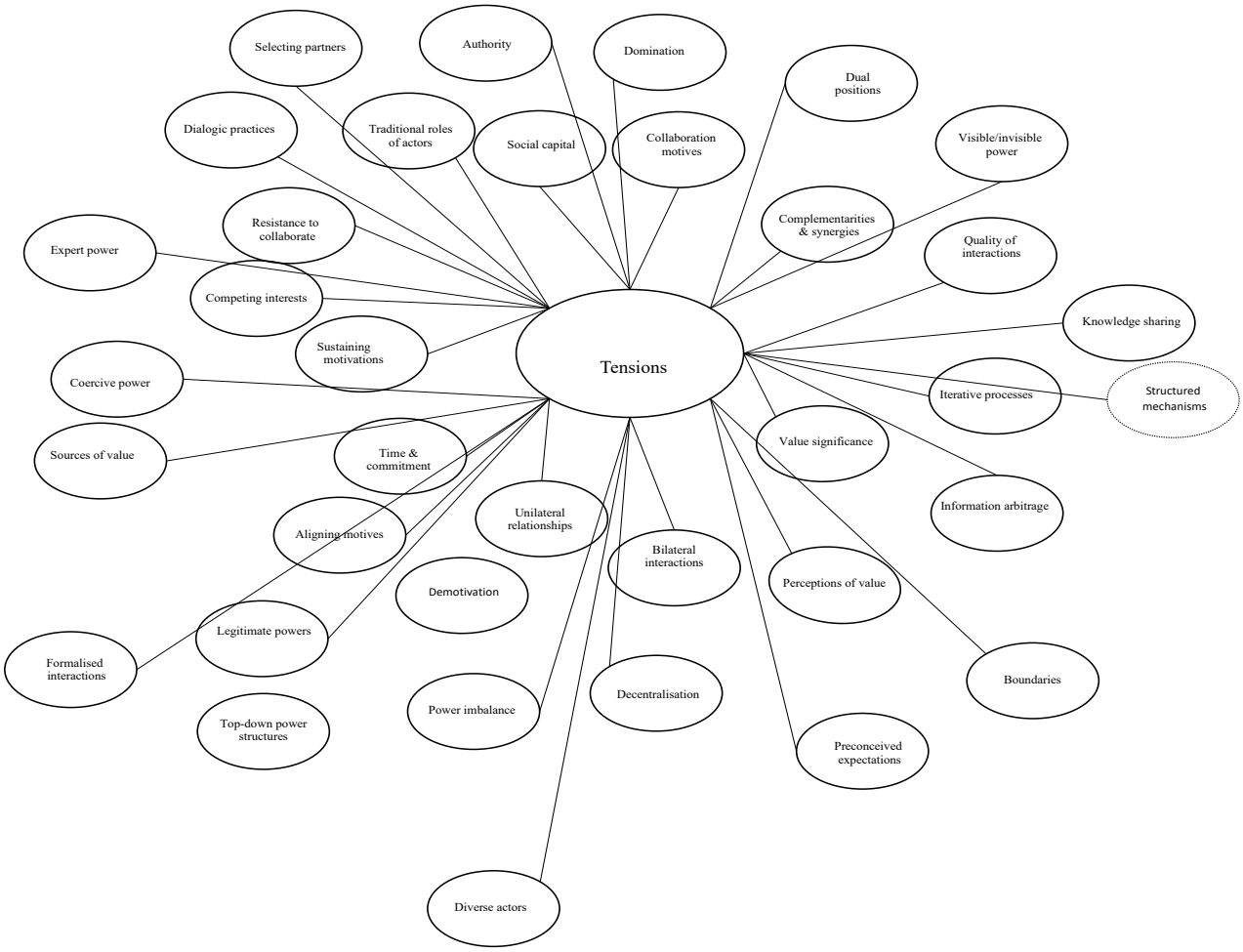

Figure 5.3 Relational Maps – Tensions.

To gain more insight into these relationships, Table. 5.2 presents a list of these relationships. This should be read as an example of the relationships, and not as an exhaustive list. The table later aided in the creation of the section's subsections and narrative.

Type of relationship with open codes – Collaborative tensions	**Open codes**
Conflicting interests	Traditional roles of actors. Resistance to collaborate. Formalised interactions. Diverse actors. Actors' dual positions. Competing interests. Complementarities and synergies.
Incongruent collaboration motives	Time and commitment. Sustaining the motivations. Demotivation. Bilateral interactions. Aligning motives.
Divergent perceptions of collaborative value	Information arbitrage. Perceptions of value. Preconceived expectations. Value significance. Boundaries. Sources of value.
Power dynamics and asymmetries	Power imbalance. Legitimate powers. Visible/hidden/invisible power. Domination. Top-down power structures. Authority. Expert power. Decentralisation. Coercive power.

Table 5.2 Types of relations found within a relational map –Tensions.

Four distinct tensions were identified. Therefore, four subsections were established for the purpose of the analysis: (1) Conflicting interests; (2) Incongruent collaboration motives; (3) Divergent perceptions of the collaboration's value; and (4) Power dynamics and asymmetries. Each of these subsections are structured to identify the nature of the four individual tensions, why they arise, and the strategies deployed by the various actors to proactively manage the experienced tension.

5.3.1 Conflicting interests

Concerning the first tension, *conflicting interests*, this tension was mainly attributed to the organisational diversity of the actors involved, specifically: (1) their dual positions, and (2) the boundaries entrenched in the actors' diverse worlds and systems.

Collaborative initiatives brought together actors with different backgrounds and agendas, with a mandate to work together to co-design and co-develop innovative solutions. According to intermediary participant No.1, gathering heterogeneous actors entailed the opportunity of bringing together different knowledge and perspectives, but also the risk of disagreements and possible conflicts in terms of prioritising key issues:

> *"But nobody will have the same interest because the industry has a different focus, a different objective" (INT1, 8:40).*

The experiences of the participants illuminated a number of tensions that often stemmed from their dual position. An inherent tension was identified between individual interests or collaborators' obligations and accountability to their institutions, and collective interests or their obligations to the collaboration project. The extent to which an individual actor is representative of their organisation or what is being represented was unclear and, according to industry participant No.2, actors may come to collaborative groups representing their individual or personal views:

"I honestly believe, it is not only who you are representing but also, it's a personal thing. Like I said, because everybody is representing one segment of the industry and we all work together, we are all interrelated but also separated, so that kind of interconnection from a business point of view is actually translating in our discussions" (IND2, 12:01).

A regulatory participant, for example, as stated by representative No.2 and academic participant No.6, may often express views which are beyond their constituents. Therefore, other collaborators may find it difficult to assess how representative the various points of view and contributions are:

"I think my input is more into giving advice and guidance, instead of compelling requirements, so, my participation was more into giving advice and guidance" (R2, 16:50).

"So, the regulator's representative being in the advisory committee for input not the regulator's authorisation, and we have to be careful, if I said other than that then I'm exaggerating his contribution" (A6, 19:04).

The challenge with regards to representation further intensified given that the innovation process is iterative. As part of the collaboration networks, participating members were tasked to undertake new roles, creating further tensions in terms of making responsibility for particular tasks unclear. According to participants, the regulator, for example, was found taking up financing, the provision of which is traditionally for industry to undertake. Likewise, academia, besides their teaching and training tasks, was engaged in supporting start-ups, encouraging new business ventures, and therefore undertaking some of industry's traditional functions. Industry was taking on academia's training role in developing oriented educational programmes for start-ups.

Actors from academia and industry were furthermore found to assume the role of the validator, traditionally a role of the regulator. Participants mentioned that the regulator sought support from academia and industry to validate the regulatory frameworks developed in the area of innovation and disruptive financial technologies. This involved, as put by regulator representative No.4, seeking a seal of approval and confirming their adherence to the key competences required by FinTech start-ups and their founders:

> *"Consultation yes, so whenever we issue a new regulation, or also amend existing regulations, we issue industry consultation, and we receive feedback from the financial services industry and discuss the feedback and take them into consideration" (R4, 20:33).*

In contrast, students and young entrepreneurs, who represented members of the public, constituted a significant source of knowledge in the examined networks of collaboration in terms of developing new knowledge, a function always reserved for academia. This was emphasised by intermediary participant No.5:

> *"So, we run hackathons where we bring a large number of young professionals, students and so on, and put them through quick weekend scenarios, from very early stages of ideation" (INT5, 0:10).*

The conflict between individual and collective interests further resulted in creating boundaries, often described as entrenched in the collaborators' diverse worlds and mindsets. According to public participant No.2:

> *"They are in like in education more than in industry, but we see it a different angle and a different perspective" (P2, 8:16).*

Regarding the relationships between banks and FinTechs and the opportunities for open banking, considerable challenges were experienced, according to public participant No.3, in terms of the increased competition between the two, and finding opportunities to form alliances and integrate FinTechs with banks:

> *"Another layer of complication is why you want to work with the banks? Now one of our main values is the collaboration aspect. Here in Bahrain because it's a very small market, we did not want to fragment the market even further, we didn't want to compete against banks, […] I'm not going to lie, there was like a pushback, even in terms of we are huge well established banks, […] even though they are egos, people are also understanding that they need to understand this whole set of new changes, and how they can adapt […] I think the ecosystem is understanding that this is a shift in the financial services sector. Banks have huge legacy systems, so it's much harder for them to innovate, and FinTechs would help them to accelerate innovation […] in the beginning there was this fear of this bringing competition to them, but now I think they really that this could introduce new revenues to them" (P3, 0:18).*

Although acknowledging these boundaries might have helped minimise inefficiencies by formalising interactions and identifying responsibilities in the process, tensions were nonetheless recognised, as these formalised processes hindered the free flow of participation and contribution. One common symptom of an over formalised collaboration was competition and a lack of willingness to exchange information. Centralised rather than fragmented individual efforts were therefore suggested by academic participant No.2:

> *"I think the current structure encourages competition rather than collaboration. How much are they motivated to exchange information? I think the way it is structured is wrong, it should be centralised" (A2, 44:09).*

The same concern was echoed by intermediary participant No.5, who recognised a tension between the need to share and exchange information and keeping everyone (i.e., banks and FinTechs) informed, and between sharing information that could be perceived as commercially sensitive and strategically useful in an increasingly competitive market:

> *"We have transparency on what conversations are happening between FinTechs and the financial institutions. FinTechs and the financial institutions, each one of those are kind of pigeonholed into their kind of area […] Obviously, these banks are competing against each other, so, you don't want your competitors to understand your strategy" (INT5, 30:11).*

The contrasting interests have further increased the complexity of the relationships, and at the same time increased the probability of actors not cooperating or showing reluctance to act on other's suggestions. Particularly in relation to benchmarking exercises, as recognised by regulator representative No.3, whereby actors were overly protective of their knowledge:

> *"I think the main struggle is benchmarking, it's much easier for [academic institutions] to benchmark against international institutions or programmes than it is to benchmark to local, and the reason for this is that in some cases there are some universities that look upon themselves that they're better than others, and it's like if everyone is afraid of sharing the information, sharing their documents or practices" (R3, 22:33).*

Academic participant No.6, attributed this to their core rigidities, which inhibited actors from considering drastic changes:

> *"So, why we were like this, because we had an existing model, it was working good enough that we did not have a benchmark or any other body considered better than us" (A6, 0:21).*

Participants were mostly challenged to develop the capacity to simultaneously meet the requirements of functionally similar actors and redundant requirements (i.e. two regulators). As stated by regulator representative No.3, tensions arose as actors strived to manage and balance the time between the requirements of the different regulators:

> *"So, they are doing like similar work for us, for our reviews, and they are doing similar work for the [another regulator]. So that's maybe the pressure on the institutions that they sometimes complain about, but we understand that they are busy, they probably have a point, which is now being worked on really, to reduce this redundancy" (R3, 12:33).*

Participants attributed this particular tension to a failure to apprehend actors' specific roles, which can sometimes result in resistance to collaboration leading to non-cooperation. According to participants, resistance was associated with the fact that participatory team members may not have share a relationship over time, did not know each other in advance and thus shared no learning history. This drew attention to the importance of building a strong social capital in terms of aggregate ties and connections, as described by academic participant No. 2:

> *"With the industry these are not formal these are more relational, contextual, driven by history, you need to address history, this relationship is a result of*

generation after generation, it's more of an accumulative strong relation" (A2, 15:25).

Further, this was regarded as an important prerequisite to developing a sense of trust and mutuality, as put by intermediary participant No.8:

"We always target longer term partnerships so we can have better impact, set mutual goals" (INT8, 11:30).

Intermediary No.8 also recognised that non-cooperation was also attributed to collaborations not being part of actors' mandates. Actors were therefore less motivated to take ownership and foster collaborative initiatives:

"At the end of the day if it is not in their mandate why would they support you? So yes, there is a missing link" (INT8, 20:50).

While a mandate or being associated with a particular issue may be sufficient to bring the various actors together in forums to collaborate, the findings have shown that there was no assurance of a collective action that necessarily identified with the various participants. The challenge was to identify participants' willingness to compromise in favour of developing joint solutions. According to intermediary No.7 and No.2, with so many participants coming from various sectors, the responsibility for particular tasks was often found to be unclear; thus, there was a struggle with those responsible for taking ownership and action:

"I know that the conversations are happening, and everyone is getting the feedbacks from stakeholders, but for some reason no action is being actually taken quickly enough" (INT7, 40:30).

"So, I have been in these forums where you've got lots of people from lots of different industries with different perspectives, and it's very difficult to get

meaningful consensus, the consensus is always yeah we need to change this, but anything beyond that becomes quite difficult because nobody wants to own it. It's more talk than solution, so, I think its lack of ownership […] it just feels like the action element to these forums, you know agreement might happen, but no action comes from it" (INT2, 9:18).

The challenge here was to embrace the tensions and sustain conversations despite the diversity in backgrounds and agendas. As suggested by intermediary participant No.3, the different actors needed to acknowledge that a tension existed, and that the various actors should take a clear stance on which objective to be prioritised to meet the various needs:

"Another challenge is we have to be conscious, not everything can actually be implemented, and you have to pick and choose what makes sense" (INT3, 11:27).

Collaborations were thus found to involve an ongoing tension between the conversations that emphasised the willingness of actors to listen and engage with each other's interest, and the conversations where actors insisted on articulating their own interests and positions. Participants were found to either show too much interest and contribution to the collaboration. According to industry participant No. 2, this might suggest that the actors primarily catered to the collectivity, jeopardising the obligation they held towards their individual organisations. The collaboration in this case risked not drawing on the differences among the various actors:

"We had some heated discussions; different points of views are there. So, for instance I want something that in my opinion is absolutely fantastic and this is what we need, but then they come with a completely different thing. Okay, but then what does it translate to me? is it adding value to us?" (IND2, 9:49).

In other examples, little interest was put into the collaborations and in consequence, little was done to integrate the efforts of the diverse actors. Academic participant No.6 described how work was previously carried out autonomously in a non-participatory framework without considering actors' individual requirements, and developing what is claimed to be an ideal solution or programme, or a 'Lexus', as termed by the participant. The autonomous nature of these development activities was found to stand in contradiction to participatory frameworks, or 'Corella and Camry' designs, which ensure incorporating actors' collective contributions and experiences:

> *"I can close the door of room on myself and create that fancy training programme that has absolutely no flaws, it's like we created this Lexus, and we are forcing everybody to buy this Lexus, whether they can afford or want it or not […] These local programmes are extremely competent and efficient Corella and Camry, So, we listen, we felt the frustration" (A6, 16:14).*

Participants, therefore, stressed the importance of engaging in more dialogic practices to articulate the needs of the various actors, having structured plans with a timeframe, and a focused list of objectives to ensure that emerging actions balanced actors' varied interests. According to academic participant No.5, increased efforts were needed to ensure that everyone understood the objectives in terms of what the collaboration aimed to achieve. Participants found this helpful in decreasing the likelihood of any misunderstandings, and in helping to subsequently avoid any divergent expectations and friction as the collaboration progressed:

> *"So, the interaction is basically to maintain those relationships, mostly having discussions, meetings, continuous dialogue you know that's important for us to understand them" (A5, 4:25).*

In summary, and considering that individual actors work together as a group while remaining connected to the organisations in which they work, participating members struggled with regards to juggling responsibilities between the collaboration and their organisations. Tensions further emerged as a result of the boundaries imbedded in the collaborators' diverse worlds and mindsets, impacting their overall willingness to collaborate and exchange knowledge. Building social capital and engaging in dialogic exercises to prioritise objectives were some of the strategies deployed to balance these dual interests.

5.3.2 Incongruent collaboration motives

The dual position of actors and their conflicting interests were found to compel a second type of collaborative tension, *Incongruent collaboration motives*. Sustaining an effective collaboration may not only be challenged by the incompatible interest of participants, but also due to differences in the motivations of the various actors. This section will first highlight the different motives to join the participatory frameworks, and second, underline some of the strategies deployed by the various actors to align these incongruent motives, and where attention may be directed at creating synergies and complementarities.

The relationships between the four different Quadruple Helix subsystems were found to be guided and underpinned by varying motivations, with respect to: (1) The individual actors or social worlds (see Section 4.8.2); and (2) The collective innovation process. Making these distinctions was important to show how the different actors are being compelled, which kind of motivations should be generated to attract participants and mitigate hindrances to effective participation.

Concerning the individual motives, the regulatory subsystem was generally motivated by the need to strengthen the financial industry position, ensure financial sustainability, and develop regulations that fostered the new digital innovation agenda. According to participants, this involved working on policy challenges, and encouraging financial institutions to meet the

changing expectations of their stakeholders. On the one hand, public participants were motivated by opportunities to express their entrepreneurial ideas, seeing more bottom-up approaches to participation and being on equal terms for co-developing solutions with the other three actors. Academia, on the other hand, was motivated by providing quality education across all major business disciplines and creating a skilled labour force for the financial services sector. This involved, offering tailor-made training solutions to the financial and corporate markets. Instead, industry participants disclosed clear instances of maximising their economic advantage or making profit. According to intermediary No.2, the relationships were often driven by making a commercial exchange rather than sharing knowledge or establishing long lasting collaborations:

> *"The purpose of the exchange is more for sales than it is for knowledge sharing" (INT2, 16:55).*

With respect to the collective motives, these were generally associated with social influence, exchange of information and social capital. As recognised by intermediary participant No.2, participants were generally driven by the appeal to collaborate as it was either politically advantageous or associated with the image and reputation that the actors held, which was also key in endorsing most of the collaborations. Very few participants, however, were driven by altruistic motives to the common effort of sharing a quality experience and maximising collective interest:

> *"A lot of people work with us because its politically good to work with us, we will go with [Academia] because our chairman is on your board or something like that" (INT2, 11:00).*

As recognised by intermediary participant No.7, the different motives were often misaligned:

"There is such a huge misalignment of incentives" (INT7, 8:51).

As such, actors were thus challenged to overcome their dissimilarities and create adequate conditions for knowledge sharing and innovation. Aligning the incongruent motives was found to be challenging, as was teaming up the different actors and ensuring their full commitment. One source of tension, according to academic participant No.6, was that of actors not being equally incentivised to join the collaboration meetings:

"It's impossible to have a 100% involvement of everybody and sometimes it could be lack of interest" (A6, 39:33).

Academia is positioned in the financial services interactions arena (see Figure 4.8) due to their critical role in meeting the demand for specialised skills and knowledge to stay ahead of financial disruption, as described in the Methodology Chapter (see Section 4.8.2.1). Depending on the nature of exchange, actors in academia's social world and those in industry's social world can be multifaceted. For example, actors in academia were found to be segmented into two groups, academic and corporate, and each of these two groups tended to have different relationships with different actors within the industry social world. Members of the academic group, for instance, were found to be more engaged with public members, and less engaged with industry and regulatory actors, compared to the corporate group members who were less engaged with public members, but heavily engaged in common endeavours with industry members. Actors responsible for corporate training had more contact with industry actors (i.e., banks) than members of academic group for two reasons: first, corporate trainers visit banks and other financial institutions more frequently, and second, they require more frequent communication to align training programmes with their needs. This provided a useful understanding of the nature of exchange relationships formed between the different pair of

actors. Compared to bilateral interactions, exchange relationships that were unilateral did not create intrinsic significance for all actors, as described by academic participant No.2:

> *"It is unidirectional, we are more in need for information from them than they are in need for information from us […] considering the nature of my offerings, how strong is my bond with banks, I think it's not as strong as the bond that other centres have with banks, it's a different niche of the market" (A2, 30:14).*

A second reason why tension arose was the time and commitment required to align the different motives of different disciplines with different timescales. The task was found to be difficult due to the significant difference between how industry and academic actors understood time, and how the goals and motivations of academia were not always aligned with the realities of industry. As highlighted by intermediary participant No.2, academia lacked the catering and the level of service needed to meet industry's expectations in a timely manner. The industry's focus was on the short term, while academic actors were challenged by the substantial and time-consuming planning needed to address the gap and integrate actors' requirements:

> *"You have to understand the needs in timelines of industry, there's a really big gap specially the timelines, academia tends to move a lot slower than industry, I think you need to be a lot more client oriented specially when you're dealing with the banking sector, they have the expectation from their clients you know they want something to be delivered tomorrow […] this is a cultural shift within [academia] as well, we are not used to having that level of catering service" (INT2, 23:33).*

A third reason for the emerging tensions was that of sustaining the motivations of the different actors and engaging them actively in the innovation processes. Very often,

commitments towards the collaboration did not last the entire process, and thus actors were challenged by the discontinued nature of interactions. According to academic participant No.6, industry was not always active, and their involvement was often less structured and less predictable:

> *"There will be fluctuations in these relationships, going up and down, in terms soliciting their input. They become active and involved, then the relationship goes into hibernation, and then it goes back" (A6, 39:33).*

Part of the challenge was finding participants who could commit to the role, and ensuring their consistent attendance at the collaborative meetings, especially when participation required an investment of time sometimes without financial compensation. Participants believed that the significance of their own commitment and extra efforts was not recognised by other actors, which decreased their motivation to participate in the future collaboration projects. As put by intermediary participant No.2, not all actors viewed these meetings as equally important. For some, sharing knowledge was worth the effort only if colleagues viewed it similarly. The consequences were often expressed with disagreement or withdrawal from the meetings:

> *"One manager in particular deliberately didn't go to the meeting this year and she said to me because I have gone every year and I have made extensive contribution, I've seen it as important, my colleagues don't see it as important. [academia] doesn't listen anyway, why should I come?" (INT2, 6:50).*

Nevertheless, participants found a good opportunity to synergise the various incentives and motives to attract efforts coherent with the innovation framework. As noted by academic participant No.4, to help sustain the motivations of the various collaborators, participants

suggested establishing mechanisms by which actors could communicate their concerns early in the process of innovation:

> *"For the design and approval stage, the mechanism is to involve external subject matter specialists from the field, learners, and employers, to see if people are happy with it, needs tweaking and what action we need to advise. So, by this mechanism we also make sure that it is looked at by different people" (A4, 12:37).*

To avoid unnecessary tensions, participants were in agreement that it is critical to be upfront about what is expected to be gained from the collaboration. As a result, establishing a common baseline for collaboration was critical. According to academic participant No.2, this required discussing the inconsistencies in institutional logics and timelines, linking strategies and aligning aims that incorporated an appropriate time frame, alongside creating mutual interests:

> *"By aligning aims, by aligning objectives, there is a shared interest at the end of the day […] identifying shared grounds in each relationship is very important" (A2, 35:20).*

According to participants, for participants to work together collaborative conversations must provide strong incentives to compromise their individual interests and identify with collectivity. A misalignment or misunderstanding of motivations, on the other hand, could result in conflict and hamper collaboration efforts.

5.3.3 Divergent perceptions of collaborative value

The incongruent motives further affected how value was perceived by the various actors, creating competing perceptions and incompatible expectations. As a result, a third theme of tensions appeared in terms of *divergent perceptions of collaborative value*.

Value creation processes, according to industry participant No.3, usually involved formal mechanisms typically triggered by the regulator, who outlined the entire process including the end outcomes being sought:

> *"The Regulator can draw the policy line or the direction of how the activities can better match national priorities" (IND3, 54:11).*

Actors, however, often came with preconceived expectations regarding collaboration outcomes and objectives. As stated by intermediary participant No.8, these expectations frequently may be equivalent; the type of value generated by industry members and start-ups, for example, are often similar in terms of economic value:

> *"So, I'm giving them money to solve a problem and at the same time I have shares in these companies, like another revenue stream, you know what I mean. It's a win-win situation at the end of the day" (INT8, 22:10).*

The findings suggested that the relationships were viewed as a network of interdependent relationships, indicating that innovation did not occur in isolation. The interdependencies were often discussed in terms of creating value, and as the primary reason for various actors to collaborate. Actors were found to individually formulate their expectations. As stated by intermediary participant No.3, the chances of finding a mutually agreeable shared value was generally not that simple, requiring the collective efforts of all actors in the ecosystem:

> *"We all work together towards one common goal, so, but we cannot function without the rest of the ecosystem playing together" (INT3, 5:25).*

Three subsections have been developed for the purpose of analysing the tensions in terms of divergent value perceptions: (1) Sources of collaborative value; (2) Value significance; and (3) Tensions associated with divergent perceptions of value.

The findings have identified several sources of value in the collaborations. The first source of value was the complementarity of resources among the four actors. The multitude of differences between actors in terms of value was found to be an impediment to collaboration, whereas organisational complementarity was found to help capitalise on the differences, as stated by industry participant No.2:

> *"There are really different opinions which I think makes it even more valuable to, you know, for the purpose of the meeting. So, complementing each other is absolutely there" (IND2, 9:49).*

Collaborating actors were therefore found to seek tangible resources such as funding, co-working space and other capabilities to compete in a changing market, in addition to intangibles values such as seeking specific knowledge, skills, capabilities, connections, communication coordination and legal advice. The findings further suggested that actors can contribute to the collaboration either with generic resources (i.e. resources that any of the other actors may have such as capital and funding) or mobilise and leverage more actor specific resources. According to academic participant No.6, one source was the associational value and enhanced corporate image or reputation derived from working with key actor groups, which often added credibility and legitimacy to their work:

> *"We are a strong brand name, an extremely respected institution, highly associated with important stakeholders. To be associated with us is a good thing. Normally these people have the endorsement of their CEO's" (A6, 22:26).*

A second source of value was associated with the directionality and the deployment of resources. The findings have shown two different flows. One that can be largely unilateral, initiated primarily by one of the actors, and the other characterised as bilateral or with

reciprocal exchange. Unilateral exchanges can create value, but with bilateral and adjoined combinations of resources, as put by regulator representative No.1, actors were better able to create new values that neither actor could have accomplished alone:

> *"We cannot work alone, we have to work with them, without them we cannot reach our objectives, so we work with them closely to make sure that they understand what we need. So, everybody has their contribution to develop and to add" (R1, 15:38).*

Bilateral exchanges further helped recognise the existence of a third source of value in terms of linked interests, by making a strong effort to understand each other's perceptions of value, as described by industry participant No.2:

> *"We have to bring that down and say, where do I need to stop to make it more appealing and suitable, so when we talk all about this, we listen to their view as well, so it's definitely complementing each other" (IND2, 13:30).*

In summary, sources of value can be associated with the nature of the resource, whether tangible or not, and the nature of the relationship, either unilateral or bilateral.

Another important aspect associated with collaborative value was the significance of the value created. According to participants, the significance of the value depended on the nature of the resources transferred and how they were used. On the one hand, as pointed out by intermediary participant No.8, some resources were more durable than others, for example, funding, investments, or grants may be used up:

> *"Another challenge is associated with finding another round of investments, if they didn't get enough funding to prototype and manufacture" (INT8, 49:30).*

On the other hand, a new skill learned through mentorship is more durable as it becomes an ongoing improvement in capability, as discussed by intermediary participant No.8:

> *"So, they receive a free mentorship for a whole year, so they can come to us, and we allocate the time to help them and support them in different fields if they need mentors, we can they guide them" (INT8, 1:00).*

According to intermediary No.7, although FinTechs are disruptive to bank operations, they were found to create value in terms of more job opportunities, and generating returns and profits:

> *"So, you're bringing in kind of new disruptive companies, and hope they grow into creating proper job, proper high skilled technical skills for technical jobs for the next generation, and at the same time they hit their economic goals and make profit" (INT7, 5:20).*

In either case, once a resource is transferred, for it to remain an attractive ongoing value proposition, participants needed to repeat the transfer of more or different resources perceived as valuable by other receiving actors. Intermediary participant No.8 described the value creation processes as iterative:

> *"We meet early in the year, sit mutual goals for the entire year, so we always go and iterate to make sure we are in line […] because people's mentality and people's expectations have been changed throughout the year" (INT8, 11:30).*

According to industry representative No.2, this also meant consulting extensively with an established group of concerned stakeholders during annual meetings, brainstorming sessions, and fora to prioritise the different objectives, and assess how they affected the different actors:

> *"There are periodic meetings, the very first was more like brainstorming to pour our ideas, and what we expect to achieve, and then the following ones were more structured, actually built on the ideas prioritised because there were a lot, and then we see if they are in a different world thinking of it, also how do we see that affecting us, where do I need to stop to make it more appealing and suitable for those not just only one kind of vanilla kind of a course" (IND2, 5:03).*

The participant added that this kind of structuring permitted the achievement of the various objectives without the need to compromise, which was healthier in terms of minimising conflicts:

> *"So, maybe we selected one thing we worked on it completely and put everything else on hold, so now maybe we should structure it in a way that ok after this we are picking those two items, let's put a timeframe to it, let's put the periodic meetings, let's take time to do it, then we will move on to the next phase which was healthy enough" (IND2, 20:29).*

Value significance, then, whether durable or not, largely depended on collaborating actors' continuous efforts and common currency to assess and renew values and to ensure collaborative longevity.

In terms of tensions, the findings suggested that these can emerge for several reasons, including a lack of consensus of what value is, the changing nature of values over time, the mismatch of values, a lack of structured mechanism to assess and align objectives, comparing individual contributions, and language barriers.

The findings have shown that participants hardly have a commonly accepted definition of what value is. Naturally, for industry this centred on making profits, whereas for government

it was economic growth. For academia, in contrast, value centred on recognition, typically based on the quality of their programme offerings. Public members' value centred around quality and risk. According to industry participant No.1, this meant that for them value was measured by individual actors depending on their collaboration motives. Tensions were most likely to occur when anticipated values went unrealised by one or all actors:

> *"Bridging this gap between what we offer and their expectations, they are looking at it from the perspective of driving revenue with new products rather than meeting the specific needs of the customer" (IND1, 13:07).*

Tension also appeared as a result of changes in value over time. Participants attributed this to changes in market demand, which is mostly tied to general expectations, technological advancements, or regulatory requirements, as explained by regulator participant No.4:

> *"So, over the past few years the movement towards FinTech started to pick up, and the digital revolution and technology having a big role in reshaping the way that the financial markets are operating. From another end, we also have a huge young population which is forcing existing financial institutions to innovate to meet their changing needs and expectations" (R4, 0:21).*

One example, as described by academic participant No.6, was when the individual values for industry had to change, as a result of changes in priorities and directions:

> *"If priorities change in these companies, like the management changes or the directions, there will be a retraction" (A6, 19:04).*

Another tension was closely related to the mismatch of actors' diverse expectations. As intermediary participant No.4 put it, mismatches were expected to remain, and as a result, collaboration outcomes might not be satisfactory to all actors:

"We do have gaps and that's normal, we don't sell ice cream, so they might not be always happy with what we provide, so there will always be some sort of lack or gap in matching the needs" (INT4, 19:18).

Participants attributed this mainly to the absence of a structured mechanism to assess and align objectives in the most systematic manner possible. The findings have shown, as described by academic participant No.4, a lack of established consensus regarding the direction of the collaboration and with keeping individual actors in line with some set of joint goals:

"We didn't have a structured mechanism, don't have a robust mechanism to make sure that to what extent we are in line, and how far we need to improve" (A4, 16:34).

Tension further appeared between participants comparing their contribution to other actors' fulfilment of responsibilities. Actors tended to work together if they perceived that the cooperation brought value. According to intermediary participant No.2, however, often many were not persuaded with the benefits:

"I've seen it as important; my colleagues don't see it as important" (INT2, 6:50).

Another challenge that threatened collaborative value creation was the need to maintain a dialogue with the different actors, define the problems at hand together, and avoid incorrect assumptions. One way of capturing the tension here, as observed by intermediary participant No.2, was the language barrier created by actors who tended to speak different technical and professional languages. In turn, this was found to inhibit the ability of actors to construct shared meanings or engage in meaningful conversations. Very often, there was a miscommunication, and what was actually sought was far removed from what was actually wanted:

"You've got lots of people from lots of different industries with different perspectives. Very often what they actually want is quite looks different to what actually they said they wanted. So, it happened many times, there are certain conversations where the academic person uses a whole lot of jargon that the other person doesn't understand or vice versa" (INT2, 18:50).

Actors' lack of technical knowledge also led to actors acting on their individual goals ahead of their collaborating partners, as put by intermediary participant No.7:

"We have quite a lack in technical skilled people so a lot of the times they have to outsource, and when they are outsourcing there is such a huge information arbitrage between the entrepreneur and the development company […] that's where almost everyone goes wrong" (INT7, 8:51).

Very often the various actors were found involved in discussion, regarding how contributions translated in terms of value. In some meetings, participants were challenged convincing the various actors of the value to work together, given that the actors demonstrated little receptor capacities and limited uptake for new ideas, as put by intermediary participant No.3:

"We do a lot of lobbying to get the buy-in from the relevant players" (INT3, 9:17).

According to participants, to carry decisions forward key actors were required to establish a systemic structured process, one that established a clear set of requirements early on in the collaboration, given how misaligned the two worlds were, according to intermediary participant No.7:

"We've seen a huge difference, where it really didn't align; the real-world business scenario compared to the simulated programmes that they are doing in universities" (INT7, 8:51).

For example, actors have been allocating trainers and specialists from the start, in order to capture and make explicit to others the tacit knowledge that represents a single thought world. Part of this, according to academic participant No.1, involved identifying and validating the problem at hand, and analysing communications to validate the various needs:

"So, because problem structuring is not a simple exercise, it takes a lot of effort you know, because there are many, so having an arena to collect all their views is difficult. So, we look at all the communications, we analyse all the communications going back and forth […] we take the expert as well, there is a lot in terms the tacit knowledge" (A1, 12:55).

Participants believed that several factors influenced the realisation of full collaboration outcomes. These included the provisions underlying the collaborations, and the overall collaborative environment. Participants, like industry participant No.2, believed that team attributes such as diversity, structural and functional composition played a key role in determining the quality of collaborations. Collaborative environments where the different segments can work and diverse members interconnect, were less likely to experience discomfort, and the collective efforts of the collaborators were found to be complementary:

"Looking at the makeup of the committee, because their idea was to have diversified members, I did feel that yes this is a positive thing and it's not gonna waste my time, actually it's going to be something positive for them, as well as us […] I think it's the atmosphere that they have created plus the people. I don't think I ever felt discomfort in general" (IND2, 13:30).

In general, aligning the different perceptions of value can be complex, as actors often come with preconceived expectations regarding the outcomes of collaboration. The complexity is further intensified given the continuous value renewal efforts that actors need to uphold for value proposition to remain attractive. The mismatch of actors' diverse expectations has further inhibited the ability to construct shared meanings, leading actors to acting on their individual goals ahead of their collaborating partners, and thus presenting power relationships.

5.3.4 Power dynamics and asymmetries

The multi-sector initiatives under the innovation networks were designed to bring a mix of diverse actors together to take action with regards to a common problem (see Figure 4.8). The interactions between the four actors were found to offer valuable insights into the power relations, presenting a fourth collaborative tension in terms of *power dynamics and asymmetries*. The section below looks into how power dynamics influenced the innovation processes and the nature of interactions between the diverse actors.

This section describes the power relations within the potential arenas of participation and action, focusing on the: (1) Participation spaces; and (2) Forms of power within these spaces.

The participation spaces were described by participants as fora for action and decision making. These spaces were shaped by power relations and were examined in terms of who created them, who was invited to take part, and who had control of the space. Power relations in turn shape the boundaries of participation that often require specific skills, capacities and experiences in order for actors to span them. Thus, some of these spaces were described as closed giving less freedom for outsiders to influence, while other spaces were more open to including outsiders. The findings here highlighted examples for both.

In what concerns a closed space, public participant No.3 described how these spaces, particularly under open banking, were less inviting and limited as they were controlled by a particular group of actors (i.e. banks):

"When we are talking about open banking, before it was a closed ecosystem, where it's just the relationship you have with the banks and that's it" (P3, 0:18).

Although participatory networks in the financial services sector may have established invited spaces for participation and influence, they were however operated within strict boundaries created by more influential actors. Inviting spaces, such as those inside the regulatory sandbox, for example aimed at attracting participating members of the public, as end users, to test financial solutions and provide their feedback in an environment mainly controlled and supervised by the regulator. The controls, as put by regulatory representative No. 4, were mainly driven by the regulator's concern regarding customer protection:

"As the regulator our role is to ensure that like number one is investors and customers protection and financial sustainability, right, so this is our main concern. We ensure that any innovative financial solutions that is being introduced either by FinTechs or by banks or existing financial institutions has to have a clear value to the end customer or the economy in Bahrain, and the benefits must outweigh the associated risks in order for us to welcome such solution. Otherwise, we will not approve that solution" (R4, 11:30).

According to public participant No.3, these boundaries disabled the ability to connect to the real environment of the industry, and thus banks were found to be less cooperative with FinTechs. According to the participant, dummy data were used to test the financial solutions developed inside the regulatory sandbox:

"Banks must become open banking compliant, but they are not. In the sense they are supposed to publish certain information through what they call

APIs, for us to plug in like a socket. […] To show that your solution actually works, dummy data was used not real transactions that people make, because we are not connected to the real production environment of the banks" (P3, 13:23).

As put by intermediary participant No.5, the regulator was discovered to use their power to influence how interactions should proceed, increasing entry requirements in terms of required compliance and investments:

"You know the [Regulator] has been progressive in some areas as we mentioned opening up in terms of regulations and so on, but I mean yes, there is obviously a balance issue […] The barriers of entry for FinTechs are very high, the requirements to be in compliance are very high, and very painful in terms of the funding required to back these projects" (INT5, 41:56).

Other requirements were reflected in the number of procedures and the audit paperwork that licensed FinTechs and start-ups had to comply with, as stated by public participant No.3:

"In the regulatory sandbox what happens basically it's a proof of case, an exercise where you need to show the regulator that your solution is actually working and once you show that to the regulator […] there is a lot of other procedures for you to be licenced. As a licensed entity to the [Regulator], there are set of compliance, and audits that you have to go through as well from a finance perspective you need to have a certain amount as a personal guarantee or something to the start-ups as well" (P3, 0:18).

Besides entry requirements, to successfully exit the regulatory sandbox, the admitted company, as noted by regulatory representative No.4, must submit self-generated and independent assessment reports to verify their capacity to run such technical solutions:

> *"Once the company concludes its testing in the regulatory sandbox and is ready to graduate or exit the sandbox, that company is required to submit a self-assessment on how customer demand has been met, whether they have been successful with onboarding the required customers, and whether the finders have the right cyber security in place to mitigate risks" (R4, 13:51).*

With respect to the agendas pursued, participants were often found to have limited understanding of the concepts driving most of these fora and participatory networks, as put by public participant No.3 below:

> *"Another layer of complication was the fact that financial literacy is very low" (P3, 0:18).*

This shortcoming was attributed to participants framing their needs in terms of their limited knowledge, and to the fact that conversations were largely framed from the perspective of those actors better equipped in terms of knowledge. The various understandings suggested that actors may interpret the aims in various ways, presenting an opportunity for influential participants to pursue their agendas and achieve their goals, and influence the direction of conversations in order to capitalise on the expertise of their actors. One challenge was that of participants' reluctance to express adverse views, particularly in meetings infused with challenging and entrenched mind-sets. Intermediary participant No.7 criticised these meetings in which members were forced to internalise a narrative that may be presented by incompetent decision makers. Accordingly, members accepted their position in the network as unchangeable, and due to the fact that the struggle over power was firmly rooted:

"I have even seen them trying to interrupt the higher-ranking people in the ministry, they tried to listen to what they are saying to understand what they are trying to communicate […] I think in terms of people, we have like the highest skilled, but they are not the ones with power to make the change" (INT7, 20:00).

Moreover, actors responsible for initial network facilitation and meetings often had more control over the participatory frameworks. For instance, in the case of academic initiatives the organisers, typically academia, undertook a significant role in making judgments about membership, in terms of who was included or excluded from the innovation processes, particularly with recruiting public representatives. Although the composition of members may fluctuate over time, representatives from the regulator, academia and industry often dominated and persisted throughout. This illustrates that less powerful actors can face friction via being part of an already existing power structure. The findings have shown that selected representatives were invited to the participatory networks not for the sake of who they represented, but rather because they were expected to be supportive of particular agendas, as outlined by intermediary participant No.7:

"One negative thing that I see in these meetings having a lot of people who always say positive things and not acknowledging anything that is wrong" (INT7, 49:04).

Over time and depending on how actors deployed their power, the dominance of these participatory networks was found to change to subsequently guide how the innovation processes unfolded:

"There has been an internal shift to the [Government ministry] taking that role again of leading economic initiatives, as the decision maker and

economic policy makers Now I don't know there may be like an internal barrier where the [Intermediary No.3] is not openly bringing the Ministry of Finance into their circles because they might be that issue of shifting power between those entities" (INT7, 43:10).

Exploring the spaces for participation helped identify the different power dynamics, making them more visible. This has further outlined different forms of power, both visible and invisible.

Visible forms of power were those often observed within the decision-making processes. Many examples of power were related to developing communication between the various actors and arranging the meetings. Actors who undertook the role to chair these meetings or facilitate their timing and location, for example, were often found to be more influential compared to other members. Intermediary organisations and academic actors often used their power to involve and influence participation by organising fora, providing co-working space and inviting key regulatory and industry actors. Other forms of visible power were expressed and found in how actors influenced the prioritisation of key issues. This in turn reflected a top-down approach for innovation and reinforced the tension from conflicting interests. This form of power was also observed in the form of policy mandates, as discussed by regulator representative No.3. As a result, participants were largely seen as implementers rather than co-designers or co-developers of the innovations:

"Actually, this is a mandate they have to endorse them […] This is a governmental mandate, so they cannot say no, they cannot refuse" (R3, 12:33).

Another visible form of power was expressed in terms of the resources that the diverse actors withheld. One resource was particularly associated with actors' financial resources. For

example, actors established patterns of financial dependencies that generated power struggles, as noted by academic participants No.3 and 2:

> *"[Intermediary No.4] is a government fund which support entrepreneurs […] [Academia] has dependency on [Intermediary No.4], they play a big part in our funding" (A3, 13:05).*

> *"[Intermediary No.4] is playing the role of an intermediary; however, the fact that "[Intermediary No.4] holds the power of finance makes it less of an intermediary, more of a party in the power struggle" (A2, 2:00).*

Power imbalances were further visible in terms of actors' knowledge, expertise and competencies. This type of power was limited to particular actors, and the findings identified industry practitioners as those who mostly demonstrated this type of power. As noted by intermediary participant No.3, invited actors were expected to show sufficient knowledge of the sector to contribute meaningfully to the developmental activities. Without having this particular knowledge and expertise, industry partners may be less willing to collaborate:

> *"Each segment has like its expertise in the market and sectoral knowledge […] but definitely people in industry are very aware you need to speak their language, like if you can't speak their language you can't get through them" (INT3, 17:53).*

Concerning the second form of power, invisible forms of power, the dynamics here operated to exclude less influential actors and diminish their concerns. These were observable in the reactions to powerful actors influencing the decision-making process with regard to prioritising objectives, as mentioned above, and influencing the agenda for discussion in terms of what was put on the agenda. Actors often complained about public representatives' ignorance of key

issues, and highlighted a lack of insight, strategic vision and limited knowledge as some of their main shortcomings. These perceptions undermined self-confidence among some actors, which led many of them, as mentioned earlier, to internalising the narratives and reinforcing the perceptions presented by the networks' powerful actors. This served to keep important issues out of decision-making arenas by influencing how individuals perceive their role as collaborators in comparison to the other actors; academia, industry, and regulator.

In response to this type of power, the findings illustrated that even seemingly less powerful actors may resist innovations through non-engagement, as recognised by intermediary representative No.2:

> *"One manager in particular deliberately didn't go this year and she said to me […] [Academia] doesn't listen anyway, why should I come, there's been no changes" (INT2, 6:07).*

Analysing power relationships in multi-stakeholder collaborative settings was difficult due to the complexity and evolution of these settings, as participants and processes were found to change. Academia for example as put by representative No.2 below, described the power relationships as balanced. This was explained in terms of how power circulates between the three actors; industry, regulator and academia, and with regards to academia's financial dependency on the levy industry is mandated to pay by regulation, and in relation to how academia's board is governed by the regulator itself and top CEOs from the financial services industry:

> *"We lived a year without levy, and we survived, so paying levy should give [the industry] power, but in fact I think it has an adverse impact, because they have to pay the levy, their relationship with their own regulator makes them have no choice they have to pay, so that makes the relationship*

interesting, and looking at the structure of our board also gives us power, we are part of the regulator of the financial services sector, so this also gives us power. So, although we need them, they cannot dominate us, so I think the relationship is much more balanced" (A2, 37:26).

The interdependencies between actors suggested that power cannot be entirely unilateral, and at the minimal level, any actor can resort to the threat of withdrawal or non-collaboration. Power relations were thus found to shape the boundaries of spaces, in terms of who created these spaces, whose agenda was pursued, and who controlled members' representation. One implication is that the decisions with regards to inclusion and exclusion may indicate false diversity and thus risk disrupting the innovation process and the decisions undertaken by the network. Another implication is that because participants often had limited power over network composition, and some did not want to disrupt the process, it was thus easier to emulate the discourse of actors in power.

In summary, this section has provided insights into the complex interactions between the four Quadruple Helix actors, as well as the implications of their distinct interests, motives, values and power relations. This chapter further explored the nature of these tensions (i.e. some with a paradoxical nature), the reasons why they arose, how they frame the conversations as well as the direction of the discussions, and some of the strategies employed by the various actors to address them. With so many potentially diverse participants, and the ambiguity in early stages of collaboration, individual responsibility and ownership for specific tasks were unclear. Participants expressed the need to structure the initiatives and guide actors' individual pursuits. The next section focuses on the role of intermediaries as an opportunity to help manage the various tensions by bridging opposing interests, motives, values and power asymmetries.

5.4 Intermediaries

Collaborations were found to bring together stakeholders from various interest groups, specialties, industries, and organisations, and the notion of intermediary was seen as a range of roles by which these diverse interests are coordinated. Within the complex Quadruple Helix configurations, a set of actors emerged who participants broadly termed as *Intermediaries,* and have variously been described as internal intermediaries, external intermediaries and third parties. This section aims to understand who the intermediaries are, what role they play, and the extent of their engagement in the different stages of the collaboration. Furthermore, this section looks at the challenges encountered by intermediaries and how these are managed to effectively balance the stakeholders' various objectives and facilitate the collaboration experience.

Using situational analysis (Clarke, 2005), with its distinct mapping tools, a relational map was created (Figure 5.4) where *Intermediaries* as the core category is put in focus; arrows were used to illustrate all of its relations to the other open codes. The map served as "a useful tool to reflect the researcher's knowledge and assumptions on the relations, positions and importance of several elements" (Glück, 2018, p.51).

The relational map further helped raise several new questions, as shown in Table 5.3. The questions helped provide insight into the relations found between the core category *intermediaries* and other open codes of the map. This should be read as an example of the relationships, and not as an exhaustive list. Table 5.3 further aided in the creation of the section's subsections and narrative. To analyse intermediaries and the roles they play under the participatory frameworks of a Quadruple Helix, four subthemes were identified: (1) Defining intermediaries; (2) Intermediary roles; (3) Intermediation challenges; and (4) Intermediary mechanisms in bridging and managing challenges.

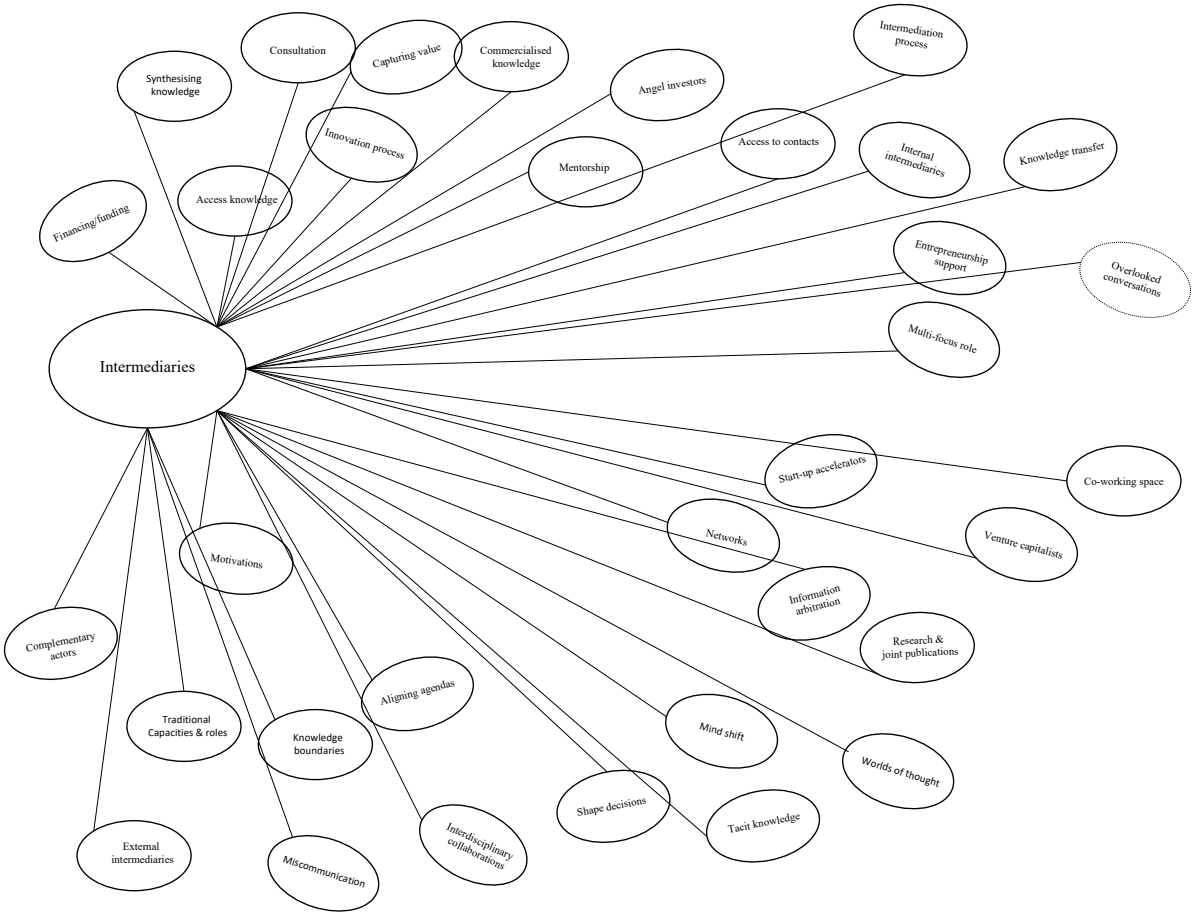

Figure 5.4 Relational maps - Intermediaries.

Type of relationship with core category – Intermediaries	**Relationship with open codes**
Who are these intermediaries?	Internal intermediaries, external intermediaries, venture capitalists, angel investors, start-up accelerators
What roles do they play?	Accessing knowledge, scanning information, complementing actors work, facilitating innovation process, translating tacit knowledge, minimising information arbitration
What challenges are found around them?	Lack of trust, non-traditional role, maintaining congruence, miscommunication gap, knowledge boundaries, synthesising knowledge
How do they manage these challenges?	Long-term alliances, value-added services, aligning agendas, capturing value, shaping decisions

Table 5.3 Types of relations found within a relational map – Intermediaries.

5.4.1 Defining intermediaries

This section aims to define and distinguish intermediaries, whether internal or external, on the basis of their purpose rather than their roles. This approach was adopted for two reasons. First, it makes it possible to limit the class of actors that play the role, given that the findings have shown several actors undertaking the intermediary role. Second, very often intermediaries were found to undertake several roles beside their traditional role of acting as brokers or agents between two or more parties.

The intermediary was identified as a social world (see Section 4.8.2.5). According to this study, this world was found to be significant to actors from other social worlds in the arena of financial services interactions, and influential in promoting innovation by providing grants, co-working space, and mentorship to FinTech start-ups. As shown in Table 5.4 the findings identified eight different intermediaries, two of which were internal, and six who were external to the four Quadruple Helix actors.

The first type of intermediary roles identified were internal, and were often enacted by actors from academia. These were found to serve as mediators with the aim to enable both intra- and interorganisational networking between key actors from industry, the regulatory system and public members, as described by academic representative No.2:

> *"Each centre in [Academia] has a business development let's say officer and we have the senior manager who makes sure that there is interaction and exchange of information across these centres […] their job is to go to the sector and come back with information regarding what is needed. What courses we should have, they facilitate the business, they facilitate the contractual relationships we have with banks for projects and so on. They initiate deals and close deals" (A2, 42:36).*

Academia, according to intermediary participant No. 2, was therefore found to serve as a platform that provided access to opportunities for interdisciplinary collaboration to exploit and commercialise knowledge:

> *"The way [Academia] treats it, it's unilateral, we go to them with sales, or they come to us with a request, we address the request, we don't necessarily offer more, it's a commercial knowledge exchange" (INT2, 4:15).*

These intermediary roles were thus established either as business development teams or task forces, as termed by the participants, and thus no third-party intermediaries were recruited. According to participant No.3 from academia, the internal liaison points developed by academia proved effective for primarily helping to maintain their close, direct and long-term alliances with relevant stakeholders, thus eliminating the need for recruiting third-party or external intermediaries:

> *"We have good contact with the industry […] we reach out and we come to an understanding, so I don't think from that perspective we do have or do require in my opinion third-party intermediaries" (A3, 15:02).*

According to intermediary No.1, being governed by the regulator placed academia in a unique and powerful position in terms of gaining the trust of the industry, being their training arm, and having the advantage of direct stakeholders communicating:

> *"Being under the [Regulator] gives us this weight of knowing what the market requires and what the [Regulator] requires. We market ourselves as non-profit to gain their trust and we make sure we are catering to what they want, so we must make sure we know the objective, what's the expectation,*

we have the direct stakeholders communicating, and that helps a lot" (INT1, 8:40).

These internal intermediary roles were often motivated, according to intermediary No.1, by building a reputation for solving their stakeholders' problems, and at the same time making the money needed to fund their programmes:

"The thing is, because it's a win-win relationship they also want something from us, at the end I'm doing them a favour, by giving them what they want because at the end you will shine in the organisation, because you will come across as the person who found the solution to their problem. Of course, we are making money, but this money is injected into the quality of these courses, they are our bread and butter" (INT1, 17:07).

External intermediary roles were identified as the second type of intermediary role. These, on the other hand, were frequently undertaken by organisations and agencies that did not belong to any of the four actors: academia, regulators, industry, or public. External intermediaries were described by participants, for example academic representative No.3, as third-party agencies who provided outsourced intermediation work in terms of complementary competencies and the development of links with other actors:

"It really depends on the project and the technical capabilities of our team, it really depends on what role the third-party intermediary is playing" (A3, 15:02).

According to intermediary No.5, Not all intermediaries were given an official or formal mandate to perform the function, some were, in fact, informal and spontaneously arose to mediate the relationship between actors and decision makers:

"You can consider us as an intermediary, but there is no like formal position that puts us into that, we have taken that role because that's where we think we can add a lot of value, but it's not like we've been mandated by the government to become responsible for this. We are a private company that has undertaken this role to support the cause" (INT5, 24:48).

The first three examples under the external intermediary category in Table 5.4 were of institutional intermediary agencies, some public and some private, established with the aim to offer incentives to facilitate knowledge transfer and interactions among regulatory, academic, industrial and public actors. The last three examples were of financial intermediaries, angel investors, start-up accelerators, and venture capitalists. These were found to assist start-ups and entrepreneurship, and frequently provided the managerial know-how and access to contacts, in addition to assessment skills.

The first example identified in the interviews was of an external intermediary, and a public agency, tasked with supporting companies through guidance, and facilitation, which provided access to grants and ongoing support for business expansion. As described by a representative, intermediary No. 3, communities of common interest were often brought together via utilising the intermediary's networking tools and facilitated contacts to help stimulate innovation and create more jobs in the market. In addition, the agency hosted events, workshops and educational campaigns, which provided basic facilitation for innovation:

"We are mandated to attract investments into the country, that will ultimately be looking to create jobs […] So, our role is pretty much we have to be in agreement with the and the ecosystem of the financial services sector in general, we are in constant dialogue with approximately the majority of the licensees and the [Regulator] […] We have done a lot of lobbying with the

industry to ensure that are all up to speed in terms of the innovation agenda […] So, when we host an event, we try to tailor the audience as well the topics of discussion towards that whole knowledge sharing of, you know, educate our local players in terms of what's happening, and how we can collaborate to achieve more synergy and more efficiency" (INT3, 0:18).

The intermediary here, according to representative No.3, had the power and the advantage of holding authorities or the regulator to issue or to amend certain legislation in order to facilitate the collaborative ecosystem:

"We have engaged with international regulators alongside with our regulators to come up and sort of cement this concept of co-working that's in incubation. We have this seamless kind of continuous dialogue of how we can feed in information to the relevant authorities, and how you know implement policies or push for certain legislations, or certain amendments in the regulations, that will help facilitate the collaborative ecosystem and FinTechs" (INT3, 0:18).

Nevertheless, this intermediary did not interact directly with public participants. According to intermediary representative No.3, support was provided indirectly through workshops and sponsorships:

"We don't interact directly with the public. We support them through sponsorship or speaking slots or through presentations about who we are, and what we are trying to achieve" (INT3, 17:00).

A second intermediary role was undertaken by a semi-governmental public authority, tasked, as put by intermediary representative No.4 with facilitating private sector growth, as

the primary driver of economic development. This intermediary differed from the previous example in terms of providing a number of funding programmes through which it could subsidise businesses that want to upskill their employees:

> *"So, we are a national labour fund. So, what we do is provide support programmes for both the companies and the private sector, and Bahraini individuals, to better utilise that money in terms of development and improvement and at the same time for Bahrainis to uplift their opportunities in the labour market" (INT4, 0:10).*

According to intermediary representative No.8, and compared to the account by intermediary representative No.3, the intermediary here did not have the authority to sway the decisions of the regulator:

> *"[Intermediary No.4] don't have the power to influence ministry decisions" (INT8, 55:25).*

A third example, described by representative intermediary No.5, undertook the role of a FinTech hub and a co-working space, established to provide customised advisory services and assist companies with building their business plans. The participant mentioned they were catalysts in terms of establishing the innovation hub. The intermediary was also found working with companies on research projects and joint publications in FinTech related areas:

> *"We work with the local financial ecosystem to help build and better prepare for the potential disruption of FinTech ecosystem. So, we were established as a physical hub, what we consider as ecosystem builder. So currently our main focuses are around incubations and accelerations […] leadership and research, conferences and events, primarily built to increase the amount of*

awareness within the ecosystem. Another kind of key area that we are looking at is education, which basically aims to develop the human capital side" (INT5, 0:10).

Similar to the previous intermediary (No.4), this intermediary did not have the capacity to push the regulator to amend existing regulations, as stated by representative No.5:

"It is really important to kind of understand that we are a private entity, and we don't have any weight or bearing or push on the [Regulator] to make any changes or take decisions. We can only suggest that the industry is asking for this or that through our round table discussions and through the communication that we have with our partners. But in ourselves we don't have that kind of capability, and it is not part of our mandate to give the regulator that kind of feedback" (INT5, 23:18).

A fourth intermediary role was undertaken by an angel investor. According to representative intermediary No.6, the angel investor aimed to support only local start-ups with seed funding in exchange for equity shares, in addition to mentorship and co-working space to incubate start-ups:

"We are an investment company, aims at investing in start-ups mainly. Other than that, we create investors' educational programmes to teach investors on how to invest in start-ups. Recently, we launched a co working space and incubator for start-ups and investors, so, it's like a collective approach or a collaboration between start-ups and investors" (INT6, 0:12).

A fifth example, described by representative intermediary No.7, was that of a regional start-up accelerator that fostered and invested in entrepreneurs. Similar to the previous example, the

accelerator provided seed funding for equity, mentorship and entrepreneurship-focused business training, workspace, and networking. However, the accelerator differed for investing in international start-ups in addition to local start-ups:

> *"We are venture capitalists. We all have similar models, but are little different, the rest only invest in local start-ups ecosystems, whereas us because of the market size, we do local and international, and bring the start-ups into the country to operate. We provide capital, networks, and business development. I forgot to also mention mentorship" (INT7, 1:18).*

Similar to the previous example, the sixth example was also a venture capitalist and an international accelerator firm that provided co-working space, mentorship and funding in exchange for equity. This intermediary was distinguished from the previous two examples by investing primarily in innovations that consisted of hardware devices with software or internet connectivity, or the Internet of Things (IoT), as put by representative intermediary No.8:

> *"We are an international accelerator, established with the aim to ease manufacturing processes for start-ups in the area of internet of things or IoT, as our main niche market. We take start-ups from all around the world, we give them funding and get equity in exchange […] We also have that working space where start-ups even students can rent a desk, and they can work" (INT8, 1:00).*

Because the majority of intermediary work is multi-faceted, the findings have indicated a clear overlap between the six groupings of external intermediary category, in terms of activities and common interests. This is shown in Table 5.4 and as stated by intermediary participant No.6:

"So, we are part of the start-up Bahrain ecosystem, so with [Intermediary No.4] we are partners in a lot of initiatives, we did in investors' education programme, we actually gave seed funding to a start-up this year, so we are doing a lot. [Intermediary No.3] is also a very important partner with us. So, they are not managing the whole ecosystem, but they are like facilitating, connecting us, they bring a lot of business deals toward us as well, be it they connect us with international accelerators, they connect us with start-ups, so they do help us. So, we work with all accelerators" (INT6, 8:50).

Intermediary category	**Intermediary type**	**Purpose**
Internal	Academic institution (INT No.1 and INT No.2)	Established with the mandate of creating skilled labour force for the financial services sector and is funded by a 1% levy on the annual payrolls of financial institutions.
External	Public agency (INT No.3)	Attracting foreign investment and supporting economic growth.
	Semi-governmental agency (INT No.4)	Facilitating private sector growth by providing training programmes to the national workforce, and funding entrepreneurs.
	FinTech hub (INT No.5)	A co-working space for FinTechs, provides advisory services for companies to build their business plans and help accelerate growth and expand in different regions.
	Angel investor (INT No.6)	A business angel syndicate invests in local business start-up.
	Start-up accelerator (INT No.7)	A regional start-up accelerator that targets local and international entrepreneurs.
	Venture Capitalist (VCs) (INT No.8)	A venture capital and accelerator firm that funds tech start-ups that are mainly in the area of Internet of Things (IoT).

Table 5.4 Examples of institutional intermediaries distinguished by purpose.

5.4.2 Intermediary roles

Participants, such as intermediary representative No.8, emphasised the need for specific entities to facilitate the identification of ecosystem participants from the wider ecosystem community. This entity was expected to be as a source of opportunity and potentially provide actors with access to information, funding, contacts, and improved entry opportunities:

"There should be an entity that takes responsibility for the start-ups, to help them with the funding, to help them with connections with other ministries and investors. There are many investors that do not announce themselves, there are angel investors that we know about, but how to get them we need someone centralised to help arrange these meetings" (INT8, 55:25).

This section will explore the roles, taking intermediation as a process into consideration, and the functions of accessing and transferring knowledge in the respective network.

Concerning the access dimension, this involves the sources of knowledge, contacts and solution proposals accessed by the intermediary. The findings have shown that intermediaries were frequently involved in searching for network related information. This included information on the actors, activities, processes, trends, emerging technologies, changing regulations, and potential partners and competitors. The findings have also shown that a group of intermediaries, such as participant No.8, actively searched for the knowledge sources that best fitted their clients' needs. Mentors were reached from a network of mentors in several areas, for which the intermediary retained a database. Intermediaries in this example have shown that they know how to diagnose the market, gain a comprehensive view of industry, understand what knowledge is required, and hence were able to directly access such sources of knowledge:

"We have a mentor network that they sign up with, and we put them in our mentors list whenever we need them. So, we have international expertise, a full-fledged programme with information on marketing, finance, business development, strategy, innovation, technical, manufacturing. So, we go and try to find experts in that field to help them" (INT8, 1:00).

In contrast, another group of intermediaries, such as intermediary participants No.5, often started from the needs of their clients by asking a community of entrepreneurs in an organised hackathon to propose solutions to a given problem, in-order to attract as many different solutions as possible. The intermediary here did not know in advance who had the right competencies, or the relevant knowledge to solve the problem at hand, but they had the capacity to seek and access knowledge from the various experts in their network. The participant added that ideas were submitted and screened, and the developer of the winning solution was awarded with seed funding:

> *"We run hackathons, around a theme which is set out by the private sector partner […] they need to come up with different ideas […] from that programme, the winners received seed capital to start building working on the project" (INT5, 0:10).*

Concerning the transfer dimension, participants interpreted knowledge either in the form of contacts or solutions transferred by the various intermediaries. The findings have shown examples where a group of intermediaries, such as intermediary No.3, may help clients with identifying the appropriate sources of knowledge within their broad network. Thus, they provided contacts instead of solutions, and in doing so they often favoured potential contacts:

> *"We tend to be like a coordinating body, we are in touch with a lot of international players who have specific know-how of the let's say technologies, right, so, what we initially started doing is introducing them on one-to-one basis with relevant authorities or parties, regulator and industry players as well" (INT3, 7:02).*

Therefore, clients were expected to be clear when transferring their expectations and needs regarding a specific issue to the intermediary, to help identify what sources of knowledge to

tap into. The participant mentioned that consultation with relevant players, representing the regulator and industry, happened by first surveying and bringing the relevant players together in a workshop to share knowledge on potential areas of collaboration and whether they were feasible. The second phase was where the intermediary performed matchmaking by introducing potential players using their wide network, provided that the actors were unable to do this by themselves:

> *"So, what we do is, we do a lot of industry consultation, so what we do is we do workshops and through surveys we invite the relevant people and we you know share with them our wide, so that's the first phase. And then the second phase will be to start to try to do a sort of matchmaking of some sort, they don't actually have the know how internally, we could engage and introduce them to some potential players because of our wide network locally and internationally" (INT3, 9:17).*

Instead, other groups of intermediaries provided their clients with ready to use solutions. As collaborations became more direct and complex, the tacit nature of much of the knowledge emitted by actors, like academia and industry for example, have suggested the need for intermediaries to use their networking position to help transfer these forms of knowledge. According to academic participant No.1:

> *"There is a lot in terms of tacit knowledge, the devil is in the details, so how you capture this, we take the expert" (A1, 12:55).*

The intermediary, as described by intermediary representative No.1, would then collect and recombine the various sources of knowledge before proposing a solution and sharing it with the network members:

"They come to me and they have a gap, or a problem and I have to come up with a solution again with me liaising. So here there's a lot of knowledge transfer […] so we identify opportunity through market research, identify solutions, send proposal to client, and revise based on client needs" (INT1, 17:52).

Because actors had limited access to seed funding networks as well as practical start-up information and support that would assist them in turning their ideas into viable solutions, intermediaries such as participant No.4 had to span multiple markets for sources of knowledge, where service or solution providers were asked to bring in their ready solutions. The participant added that whilst the intermediary provided suggestions about the solutions, the ultimate decision was left to the client. Nevertheless, quality checks and price comparisons were frequently run by the intermediary to reduce the number of solution options to a group so that the best alternative could be more easily identified:

"Instead of us leaving it open to reach out to entities and opening the door to receive proposals from the service providers, what we did is we created a platform, we ask the service providers to come to our platform and add their products, we do a verification of both the quality and whether it is in line with our policies or not, and at the same time we compare the prices to the market averages" (INT4, 7:09).

To summarise all the roles discussed in this section, combining the access and transfer dimensions of the intermediation process, intermediaries were categorised into four groups, as presented in Table 5.5.

Intermediary	Access to knowledge	Transfer contacts/solutions
Intermediary No.3	The intermediary supports clients in the identification of knowledge contacts and sources that may enable their innovations.	The intermediary provides contacts not solutions.
Intermediary No.1 *Intermediary No.2* *Intermediary No.4*	The intermediary establishes the relationship according to a process. Starting with a meeting to disclose the issue at hand. The collaboration process then goes through an alignment activity, providing access to the most appropriate sources of knowledge.	The intermediary spans multiple markets for ready solutions, allowing the transfer of solutions from one sector to another.
Intermediary No.6 *Intermediary No.7* *Intermediary No.8*	The intermediary searches for the appropriate knowledge and thus knows what knowledge is required to address the problem at hand, and thus are able to directly access these sources.	The intermediary transfers the necessary contacts, mentorship and funding, to co-design/develop solutions.
Intermediary No.5	The intermediary does not have the knowledge of who has the appropriate knowledge to address the issue at hand, nevertheless, they are capable of identifying and accessing this type of knowledge.	Separately, entrepreneurs work on an issue and come up with solutions. The proposals that best address the needs are selected.

Table 5.5 Distinguishing intermediaries based on accessing and transferring knowledge.

The table suggests that intermediaries, as a result of their position in the network, differed in terms of how they accessed their network knowledge sources and in transferring the knowledge to the different actors. To help maximise the value of external networking opportunities and manage knowledge transfer challenges, Table 5.5 suggests that firms confronted with an innovation challenges can better understand what capabilities, knowledge and skills are needed to help access, absorb, recombine, and transfer knowledge and select the parties who provide them.

In collaborating with heterogeneous partners, intermediaries may recognise a number of challenges that require increasing their problem-solving capabilities. This is discussed further in the next section.

5.4.3 Intermediation challenges

The heterogeneity between the different actors created an opportunity to access complementary knowledge across organisational boundaries. However, because this type of

knowledge was often external to the actors and differed from their own, transferring knowledge across the dissimilar actors was found to be challenging.

The third subtheme in this section focuses on the complexity of the role that intermediaries play and the challenges they face. The challenges in this section will be discussed in terms of two dimensions: (1) Intermediary capacities and competencies; and (2) Boundary challenges.

5.4.3.1 Intermediary capacities and competencies

The findings highlighted that intermediaries working at the interface between Quadruple Helix actors can undertake considerably more functions than their traditional role, and thus their role cannot be reduced to matchmaking activities drawing heterogeneous actors into new relations. Moreover, intermediary functions can vary over time, and with time their roles must adapt and change to involve new functions, as put by intermediary representative No.3:

> *"You have to be able to put yourself in their shoes, so your role is always changing, it needs to be adapting, adaptable to the different situations you might find yourself in" (INT3, 18:51).*

Intermediary participant No.4 explained that their role focused on bridging the gaps between the different expectations more than matchmaking:

> *"But that's not our role, we were not created to match the needs, so the way it works, they have to have conversations separately, sometimes we try to facilitate that, where we try to bridge the gap between the different stakeholders in the market" (INT4, 24:17).*

According to intermediary No.2, the extended role for intermediaries was viewed as traditionally new, suggesting difficulties in accepting these new roles and thus limiting their capacities as intermediaries:

"So, for example every time I go to the industry, I have the opportunity to hear about whether our programmes are current, whether what we are doing is what they need, you know that sort of I guess industry research and feedback. But it sort of happens because I'm new here I've been asking those questions but traditionally I think I'm the only one does ask but it doesn't happen traditionally at [Academia]" (INT2, 4:15).

According to the participant, intermediaries knew little about their involvement throughout the different collaboration stages, and whether their role started or stopped at a particular stage. Positional map Figure 4.10 (see Chapter 4) depicts actors' different positions with regards to their need for intermediaries in the various stages of the innovation process. The participant believed that intermediaries should be engaged throughout all the stages, from early to final stages, and showed distrust over assigning intermediary responsibilities to the administrative staff inside academia:

"My frustration is they see our role stops as soon as they win the business, then we pass it to somebody else, and they may or may not do a good job, I totally believe my role is relationship management start to finish. So, this debate about whether that's my role or not, hasn't been clarified" (INT2, 21:40).

Intermediary participant No.1 also shared concerns over limiting their intermediation roles and restricting their engagement to certain stages of the innovation process, describing it as overall demotivating, limiting the power they withhold to manage and shape the conversations between the various actors:

"So, I'm never in a position to create detailed knowledge in my position, it stops at the higher level. Here you take a step back because I'm the mediator, this may inhibit my motivation" (INT1, 0:21).

Very often, intermediaries who were not active throughout all stages of the participatory activities faced a challenging task, in terms of retaining the various stakeholders and maintaining network sustainability:

"I know from my previous place that it's very difficult to make people teamed and its quite hard to get industry engaged" (INT2, 5:25).

Limiting intermediary role brought other challenges. According to intermediary No.2, this forced intermediaries to push the relationship to bilateral engagements instead of unilateral, one-way engagements that often required continuous dialogue and extensive consultation with the actors from industry:

"The way [Academia] treats it, it's unilateral. So, I'm pushing people, because I'm looking a level of engagement with industry that we haven't, we've always been a service provider as a one-way relationship, I'm looking for something a little bit more because I'm looking for them to outsource their talent development to us" (INT2, 4:15).

Intermediaries were faced with the challenge of engaging actors with divergent goals. The networks supported by intermediaries, according to intermediary No.3, were typically comprised of different groups of actors that did not share the same understandings and perspectives, and thus maintaining congruence was found to require an ongoing effort:

"Obviously bringing people together has its challenges, and maybe making sure that they are all on the same page […] So, the spectrum of

understanding is quite difficult. So, that sorts of requires a lot of effort" (INT3, 11:27).

Having to structure a collaborative relationship between the various actors, each with their own interests and incentives, intermediary participants, therefore, acknowledged the need to demonstrate a number of competencies, to be trusted with influencing a collectively shared insight, as put by intermediary participant No.5:

"Our involvement is more of catalysts to start those conversations. And we obviously have good insights of what is happening between all the different players […] So, having these insights helps us direct FinTechs" (INT5, 32:12).

The role further required conducting consultations and gaining the skills of defining the scope of the project, as explained by intermediary participant No.2:

"You need to have consultancy skills, the ability to ask questions to define the scope of a project" (INT2, 9:18).

An important competency was that of possessing a good understanding of the topics at hand, and the ability to identify the value motives of the different actors in an effective manner. This involved, as stated by intermediary participant No.3, a breadth of sectoral knowledge and the ability to identify those who provided them:

"The way we work is like each segment has like its expertise in the market […] and it's very healthy that you do have sectoral knowledge" (INT3, 17:53).

Quite often the different actors tended to speak using different professional terminologies; according to intermediary No.2, this meant that miscommunications were very likely:

"So, it happened many times, there are certain conversations where the academic person uses a whole lot of jargon that the other person doesn't understand or vice versa, so it's very common I think" (INT2, 18:50).

Intermediaries were expected to speak the professional and technical languages of the various actors, industry and academia in particular. According to intermediary No.2, third space professionals with both academic and industry backgrounds, may be crucial in these institutional settings or frameworks:

"So, that is very much my role, and I know from my previous jobs overseas they call it 'third space professionals'; people who work in between academia and industry, are necessary, and is often because of the gap between how academia sees the world and how the industry sees the world […] I was brought on board, because I understand that language" (INT2, 18:50).

The gap between the different thought worlds to which the various actors belonged has created, as put by industry participant No.1, an opportunity for intermediaries who can speak from the perspectives of diverse actors, synthesise their knowledge, translate the different perceptions, and transfer a shared vision:

"If there could be someone like for example who is an expert to translate the technical terms that we use, so, if they speak the language or understand the language that we speak, if they can transfer it back that will be useful" (IND1, 13:07).

Intermediaries were challenged to bridge differences and translate the network's collaborative efforts into concrete and consensual-based solutions of clear value to all actors.

The capabilities and skills with this regard involved the ability to listen, a task that explicitly involved helping the actors to reinterpret what it was they wanted. As put by intermediary No.2, it was helpful to ask the questions that defined the scope of the project, as to what the outcomes were and how to achieve them. Moreover, much of the knowledge is tacit and originates from some actors such as industry and academia suggested that it is possible that intermediaries with specific expertise will be required to communicate this knowledge. This is where the intermediary usually undertakes the task of translating:

> *"Based on the conversation I've heard from both academia and industry I need to understand what the academic person is seeking; I need to translate what I'm hearing the industry person needs and try to match the two and write the proposal […] So, you need to have consultancy skills, the ability to scope out needs and flesh them out to the point where you can put them on paper and say what I think you need is this and this, and this is how we are going to do them" (INT2, 23:33).*

According to intermediary participant No.3, intermediaries may have to simplify the conversations to sometimes reach a common ground. Participants expected the tacit knowledge from one actor to be made explicit to others:

> *"So, you have to sometimes dumb down your conversations or find a common scene, a common ground for people to understand, so that sorts of requires a lot of effort" (INT3, 11:27).*

Intermediaries recognised that the existence of misunderstandings created additional challenges in terms of synthesising actors' diverse needs and shaping the different interpretations. One of the concerns was how intermediaries past experiences may adversely

impact the judgments made in this regard. According to intermediary No.1, this may lead to overlooking important aspects and ultimately a miscommunication gap:

> *"Other challenges, I would say the miscommunication, and there are times where being from a training and development background may cloud my judgement into thinking I know it all" (INT1, 12:35).*

> *"Now where is the problem, at some areas I am not technically knowledgeable enough to comprehend the requirements properly so there could be some miscommunication caused by me" (INT1, 0:21).*

Thus, synthesising these diverse sources of knowledge and shaping the various interpretations was not straightforward. According to intermediary participant No.2, the intermediary was expected to help bring together and recombine various sources of knowledge to shape how public participants ultimately benefitted. One of the challenges was to directly access the value motives for public participants, as end-users, as the intermediary was reliant instead on the information received from other actors:

> *"So, that can go around in circles for quite a long time before the person actually gets pinned down […] The feedback loop tends to go through Human Resources departments, it's not very often we get it directly" (INT2, 27:55).*

Another important capability that intermediaries needed to develop, as recognised by intermediary participant No.2, was understanding industry's timeline in order to be more client oriented. Intermediaries were often confronted with opposing time-perspective concepts, and, therefore, were required to maintain relevancy to industry with other actors who did not share the same objectives:

"You have to understand the needs in timelines of industry, there's a really big gap […] you need to be a lot more client oriented specially when you're dealing with the banking sector, so the expectation we have is to figure out the schedules" (INT2, 23:33).

The exchanges between the diverse actors were further identified with high uncertainties and distrust, according to intermediary No.5, in relation to the ability to attract the right talent:

"To be able to attract the right talent to an early-stage start-up there are a lot of challenges involved. And how welling people are to take the risk to work in a FinTech, those are big obstacle" (INT5, 41:56).

And ideas transitioning to Small, Medium Enterprises (SMEs) that generate revenues, according to public participant No.3:

"We were initially funded by [Intermediary 4] like any other start-up, and I think plans like these or subsidies like these would help any start-ups in Bahrain, […] the challenge could be in that transition period, from a start-up to an SME, here's is a bit of a challenge where a lot of Bahraini companies are finding it difficult to cross over that chasm" (P3, 31:25).

According to intermediary participant No.5, investors' need to be able to measure start-ups market attractiveness, which often associated with the funding they receive:

"People want guaranteed funding which means that the product has to have launched. We need some level of attraction in the market. If you don't have that then it becomes very difficult to raise. So, the FinTechs that are successful are typically the ones that had loads of funding pushed their way to enable that to happen" (INT5, 41:56).

Distrust was also associated with the risks that transferred solutions may not necessarily match the needs of the different actors. This was attributed to misaligned incentives, and what intermediary No.7 described as information arbitrage, whereby actors may utilise their knowledge to adversely affect their partners:

> *"We have quite a lack in technical skilled people so a lot of the times […] there is such a huge information arbitrage between the entrepreneur and the development company" (INT7, 8:51).*

Intermediary participant No.6 described how in that respect they had to undertake an additional role of bargaining and raising awareness:

> *"We need to create this shift within businessmen and people with money, to invest in start-ups and believe in the risk, and put in money support all these start-ups that one day can be bigger. So, that is why we create that awareness to shift the mindsets of these individuals" (INT6, 17:05).*

In summary, intermediary roles were frequently regarded as traditionally novel. Intermediaries were found to push for undertaking extended roles and seeking involvement through all stages of the collaboration. Limiting their capacities in that regard caused challenges, in terms of maintaining network sustainability, aligning the divergent goals, reducing uncertainties and creating trust. To bridge the gaps, balance the diverse incentives and structure a collaborative relationship, intermediaries need to develop a number of competencies and skills in relation to establishing extensive sectoral knowledge, synthesise their knowledge, translate the different perceptions, establish trust and balance the different timelines to create relevancy.

5.4.3.2 Boundary challenges

In terms of the second dimension, the findings identified several boundaries that were pronounced in relation to the earlier discussed gaps and tensions (see Sections 5.2 and 5.3). The first of these boundaries was established around participant's capacity and their willingness to share influence with public partners, and public participants' competencies to make significant contributions (see Section 5.2.3.1 and 5.2.3.2). A second boundary was associated with actors' dual positions, their conflicting interests, incongruent motives, and divergent values (see Section 5.3.1, 5.3.2 and 5.3.3). Distinctions appeared in terms of participants' representation and attachment to the collaborative network, and whether they identify with the collective group (shared/collective interests, motives and values), or their individual constitutes (individual/competing interests, motives and values). The last boundary identified emerged in association with the power dynamics that governed the collaboration networks and the distinctions made in terms of how the potential arenas for participation are open or closed, in terms of inclusion/exclusion patterns, and how outsiders can contribute their views to decision-making (see Section 5.3.4).

Regarding the first boundary, the willingness of the three actors; academia, industry, and regulator, to share influence and include a provision for public input was associated with public's competence to contribute meaningfully to the issues at hand. This further resulted in members being excluded from the knowledge that the rest of the members may have held. This meant, according to intermediary No.3, that discussions and knowledge exchange were difficult at times, as actors lacked the necessary understanding or applied different meanings to the same concepts:

"This is something that we have seen, so you could be talking about innovation, but people's understanding of innovation is completely different. So, the spectrum of understanding is quite difficult" (INT3, 11:27).

In relation to the second boundary, actors were found to be oriented towards different institutional or individual motives, through which they interpreted and shaped their actions. The collaborations evoked a number of conflicting interests and considerable amount of resistance among the different actors as described in an earlier section (see Section 5.3.1), and as put by academic participant No.2 below, in relation to adapting to change, and the tension between abolishing the past to construct the future:

"As an institute, [academia] has been around for [no.] of years, that's good and bad, it's good because we are more experienced in what we do, but mature institutes tend to do things in a particular way, and it's very difficult to do things in another way. We have been doing this for years and years, and I think we should think of ways for doing it differently" (A2, 27:23).

In what concerns power boundaries, one problematic scenario arose when less powerful actors were found constrained in terms of expressing their ideas to other actors in the ecosystem. Without the development of an adequate common knowledge, mismatches occurred, as described by intermediary No.7:

"The biggest barrier I found is not wanting to listen, jumping to conclusions, without listening. So that can get really frustrating, I mean you can observe this in the meetings clearly, they never paused or tried to listen to what they are saying so you understand what they are trying to communicate, instead they try to dictate what they think they know" (INT7, 20:00).

Intermediaries therefore encountered friction in their relationship building activities, having to overcome the challenges associated with facilitating negotiations across the various boundaries. The next section explores how some of these challenges are managed, shedding light on the extent and the levels of intermediary engagement in the different stages of the collaboration.

5.4.4 Intermediary mechanisms in bridging and managing challenges

This section provides examples of some of the mechanisms used by the various intermediaries to bridge the gaps and resolve the collaborative tensions, without disintegrating public members. The mechanisms were applied through the different stages of the innovation process, creating several values for the networking actors, as described later in Table 5.6. Participants believed that intermediary work is valued based on their efforts to shape actors' strategic directions, converge their diverse interests and reduce the potential for disagreements and misunderstandings, alongside power imbalances.

To construct the analysis of how and when intermediaries are perceived as being beneficial, the analysis here will start by first outlining examples of the organisational structures of the four influential actors operating under the Quadruple Helix innovation model, and how intermediaries meet their individual motives. Second, by demonstrating the intermediary roles to meet the collective interests as per each stage of the innovation process.

In what concerns the first aspect of the analysis, actors were found to be oriented towards different institutional or individual motives, through which they interpreted and shaped their actions. These incongruent motives helped intermediaries identify the opportunities to create synergies and generate complementarities. Academia, for example, found intermediary work specifically beneficial in terms of networking and bridging the gap with industry players. Having increased profits as their main motive, industry participants evaluated intermediary networking activities on the basis of transferring specialised knowledge and lobbying activities.

Participants, such as industry participant No.1, therefore viewed the opportunity to include an intermediary as promising, given the difficulty of reaching a larger market, and bridging the gap between the diverse expectations:

> *"So, bridging this gap between what we offer and their expectations, that could be an opportunity for the mediator that we are speaking about […] So, that might be a useful exercise, there might be an interesting opportunity for it" (IND1, 13:07).*

Regulatory actors found intermediary engagements beneficial, as put by intermediary participant No.5, especially with the emergence of new FinTechs ecosystems around disruptive innovations, and their need to regulate a new industry, amid a lack of previous learning opportunities:

> *"The main challenge is that regulators are being asked to regulate an industry or an area which no body has been operated in, in this region in the past, so, it becomes very difficult as regulator to figure out what are the questions that we need to ask, and how do we want to regulate this industry" (INT5, 41:56).*

Regarding the second aspect of analysis, and the intermediary roles in the various stage of the innovation process as shown in Table 5.6, intermediaries were found to be involved in various points of the innovation process, providing a wide range of value-added services (see Chapter 4, Figure 4.10). This section provides examples of the mechanisms, presented in italicised font, as used by the various intermediaries to bridge the gaps, manage the various collaborative tensions, and span the different boundaries.

According to intermediary representatives No.5 and 8, respectively, five stages were identified typical to an innovation process: (1) Early-stage or ideation; (2) Mid-stage, growth

stage or product development; (3) Design sprints; (4) Testing and modifying; and (5) Late-stage or production stage:

> *"Ideation, mid stage, and late-stage" (INT5, 0:10).*

> *"Going through the ideation process, going through business modelling, prototyping, and the pitching competition, where they have to pitch their ideas, design sprints, and pilot project to develop their product or give them the money to go an experiment and manufacture" (INT8, 1:00).*

Concerning the first stage of the innovation process, termed by participants as the early stage or ideation, intermediaries were found directly involved in the construction and development of the networks, influencing the network's selection mechanism and structural characteristics by encouraging certain network norms such as the modes and frequency of interaction with the respective parties. As described by representative No. 5, the intermediary was found to be both the liaison and venue to initiate and conduct meetings as the relationships became more direct:

> *"We created a partnership network that recruits financial institutions, along with some technology partners and insurance companies […] We had weekly or bi-weekly workshops to increase the amount of awareness within the ecosystem […] Fintalks is basically an initiative to keep up engagements with local community […] we look at is conferences and events. So, these include the ones around regulations and the most recent one was planned to be on open banking" (INT5, 0:10).*

According to participants many ideas could remain dormant in academia and far too many students/academics lacked the entrepreneurial know-how and contacts to enter the industry. As explained by intermediary participant No.5 below, this situation created a new capacity for

intermediaries, who assisted by structuring the interactions in terms of providing the co-working space for collaboration, bridging ties and interfaces with relevant players, and combining their knowledge to be later incorporated into the development of the solution:

> *"So, primarily it is about the incubation space that we offer, with meeting rooms and access to these kinds of things, but also what these companies kind of get is they become part of the FinTech community, which is a community where FinTechs can talk to each other and express different things. We had a lot of workshops and so on in our office space so they would be involved with networking and so on […] we do a lot of support to make those initial connections between the FinTechs. And starting that kind of communication" (INT5, 28:50).*

According to intermediary participants, the collaborative meetings with the presence of the intermediary has helped actors through *confrontation* to create bilateral dependencies, thereby exposing the participating members to new tensions. Intermediaries were challenged to transform the agendas of actors reluctant to adapt to the new changes caused by the financial disruption. As put by intermediary No.5, this sometimes required compromises in terms of giving up the traditional ways of doing business. In the example below, participants were exposed to a tension between simultaneously needing to transform old to new in order to move forward. The intermediary was further challenged to push for policy changes that supported the interests of the various actors:

> *"Making sure that the incumbent financial institutions understand that they need to step up and implement some of these FinTechs technologies. Because eventually they will become in the back step […] and obviously there were a set of regulations that had to change for that to be possible […] We need*

that catalyst to make that change right, and if that regulation or mandate comes forward, then people wouldn't have taken that step because banks are happy with the current status quo, they don't want to change that, cos that has been a good stable model in the last 20-30 years" (INT5, 40:36).

Intermediaries were expected to bridge the gap between fundamentally different interest groups. A key challenge was related to the successful involvement of public members and finding the right and capable representatives, as stressed by academic participant No.1:

"You need trusted people and capable people to go and find the problem and find the solution, if we want to move forward and support the financial sector we need as many people as possible that understand the situation there, so they are basically supporting me" (A1, 31:34).

Conflicting interests and power tensions were mediated primarily through empowering public participants. Intermediary participant No.3 suggested a need to *identify champions,* who were identified individuals who can advocate on behalf of their individual organisational spheres and be active mediators from within. The participant believed that champions could be the communication channel by which the organisations could accept change. Especially that a lot of lobbying was needed to push for certain laws, and make sure they do not disfunction the collaborations:

"At every organisation there needs to be that champion that you need to serve and warm up your relationship with. Once we have someone that can advocate on your behalf, then you're almost halfway through. Finding those champions is a challenge. But once you have your advocate on the inside the they can ensure that there's a cultural change that can happen, but they need to be empowered in order to do that cultural change […] and then we would

lobby to get the buy-in from the relevant players, so we can't talk about introducing a new set of laws that may be actually crippling to the industry" (INT3, 12:50).

Intermediaries were found helpful in terms of offering public participants some formal tasks in the industry, while maintaining structure and adhering to the collaboration rules, as noted in section 5.4.2, *through temporary roles to predefined themes*. This involved providing participants with the opportunity to join hackathons, and encourage them to be creative and innovative, as put by intermediary No.8:

"We do a lot of community engagement, we do summer camps, hackathons, so we have this agenda to help youth, and empowering youth to start their own business" (INT8, 1:00).

To avoid integration issues that may result from public members fragmented and sometimes insignificant input contributions, intermediaries helped with inviting public participants with promising and innovative ideas, as put by intermediary participant No.6:

"We invest after start-ups go through the acceleration programme or we head hunt, so we look for those who fit our criteria and then we approach them" (INT6, 2:30).

To further develop these ideas, participants were assigned with formal responsibilities and roles relative to the innovation process. The roles, however, were not permanent, as described by intermediary participant No.5:

"We bring a large number of young professionals, students and so on. And put them through quick weekend scenarios, where they need to come up with

different ideas, and from those some of them chose to go on and pursue their ideas and build it forward" (INT5, 0:10).

Empowering public members have further extended, as recognised by intermediary participant No.2, into putting *emphasis on dual identities* of public members. The findings have shown that emphasis was put on student's professional identity when joining industry to work on collaborative projects. Students were given the power to take decisions, and the freedom to form opinions and communicate their suggestion to industry and academia:

"We actually stopped calling them students we started calling them consultants, there was a big emphasis put on their professional identity, at that stage in the transition from being a student to being in industry […] I realised looking back, having the students around with a proper project management approach, and a structured methodical output focused work process, they were challenging the productivity culture of the organisation because they were doing things better" (INT2, 11:00).

Intermediaries further helped in creating placement opportunities in the financial services industry, according to intermediary No.5:

"We've run in them in the past in partnership with the national FinTech talent programme, there's a placement for interns, so students get the opportunity to get placed into local banks, and the top students get the opportunity to be placed in our partner international banks" (INT5, 0:10).

The intermediary was further involved in mediating between the competing interests of the different actors and those of the public participants. The application process, for example, was

eased in terms of paperwork, whereby intermediaries according to representative No.7, helped structure the information and assist with the legal documentation:

> *"Our process is like, everything for us is as minimal as possible, there isn't a lot of paperwork. So, it's like two things that gets done, the term sheet and the other one is the shareholder agreement. After that we incorporate them, we take care of everything with our own legal team and so they don't need to do anything" (INT7, 22:00).*

In determining the legal status for these start-ups, intermediaries had to use their own networking position and build direct relationships with the regulator, as explained by intermediary No.7, to facilitate the process of incorporation:

> *"There needs to be more action coming from the [Regulator], we face a lot of issue when it comes to commercial registrations, where we bring international start-ups, we thus found it better for us to build our own relationships directly with the Ministry of Commerce and Industry, rather than relying on them anymore" (INT7, 43:10).*

This often involved *increasing the social costs of opportunism*, by protecting stakeholders through a bad leaver clause, as described by intermediary No.7. This was where an agreement was signed to determine how much a shareholder leaving a company was entitled to for their shares, particularly those departing on bad terms following conduct detrimental to the business:

> *"So, there's something called a bad leaver clause, which helps a lot when you have someone shady on your board who may try to close the company and take part in a rival. The clause that specifically says if you did this, you*

are automatically losing all your shares in the company to the other shareholders on the board, so things like that" (INT7, 22:00).

To facilitate intended knowledge exchange while protecting against the leakage of knowledge that could be perceived as commercially and strategically sensitive, intermediary participant No.5 explained how separate conversations had to be held with different partners:

"We obviously have good insights of what is happening between all the different players, but because of our unique situation, sitting in the middle between them, we actually have signed with every bank separately and with every FinTech separately […] even within our teams we make sure that the information or the communications that happened between them does not get passed on to another conversation that's happening" (INT5, 30:11).

Intermediaries however, as put by representative No.5 (see Section 5.3.1), had limited independence given the risk associated with losing commercially sensitive knowledge to competitors, particularly in the case of banks and FinTechs. This further diminished the intermediary's ability to generate internal value through collaboration.

Other safeguarding methods, as put by intermediary No. 8, involved patenting and providing protection against manufacturing infringements:

"We are an incubator as well, and we are global, and we are very close to manufacturing in [country name], and that's a real added value, cause if you don't know who the certified manufacturers are there is a likely chance there steal your idea, so, we do patenting" (INT8, 41:17).

Another important mechanism in this stage was the development of research, acquiring industry-specific knowledge and sharing the knowledge with network partners. Activities were

evaluated based on the ability of the intermediary to influence and shape the decisions, particularly in the absence of reliable information. For this reason, it became critical for the intermediary and the actors, before the collaborations were established, and through *research and early disclosures,* to gain insight into market needs and constraints, reciprocally share knowledge, define the collaboration in terms of shared objectives, and highlight interdependencies. According to intermediary No.8, and intermediary No.7 below, this helped reduce uncertainties by ensuring efficient evaluation of ideas, and encourage private financiers to make seamless investments in the commercialisation of developed solutions:

> *"There is no point of producing something without a market for it, there is no research or there is no problem to solve, so there a huge part that needs to provide market statistics, and they have to prove to us that this will work, or this is needed, and this is required" (INT8, 36:30).*

> *"So, we would prefer those who conducted market research […] we only invest in 2% of people who apply to us. What we really need to see a good definition of the problem they're solving, and how is the solution going to work, and see the effort they are putting into understanding their market, and how to target it" (INT7, 29:30).*

With respect to the second stage of the innovation process, termed by participants as the mid-stage or the growth stage, actors were expected to develop a minimum viable product or a minimum version of the final product, as a prototype. According to intermediary No.5, actors at this stage often undertook mentorship programmes involving a technical developer:

> *"The second type of programmes are more towards the mid stage companies with minimum viable product" (INT5, 0:10).*

Furthermore, developing solutions based on new technologies was often found to be a complicated and risky process. Connecting actors' knowledge and resources to create value and ensure continuous commitment in the subsequent phases, necessitated collaboration across disciplines as well as the intermediary's active participation. According to intermediary participant No. 8, this involved securing a second round of investments in case of scalable projects, mentorship and facilitating the legal aspects of the relationships:

> *"So, after the programme we help them raise more money, and a second round of investments. We connect them with someone to secure pilot projects. And there is a huge legal part here because legal fees are very expensive here, so, we give them the legal advice as well" (INT8, 37:22).*

In this regard, intermediaries either developed the necessary competences, or gave access to third-party sources that can provide them, as indicated by intermediary No.8:

> *"We do have a lot of mentors and we put them in our mentors list whenever we need them, but we do not partner with them. So, for hackathons we might need an innovation and digital transformation mentor, we always try to outsource mentors, we do not do it internally" (INT8, 39:10).*

Intermediaries for example introduced experts in the design and testing stages of the innovation process. Actors with the aid of a technical advisor, as described by intermediary No.7, worked on the design interface, usually followed by a testing stage to assess the performance of the respective technologies. Providing access to technical advisors was viewed as beneficial to balance information asymmetries, particularly between entrepreneurs and developing companies. This indicated that intermediaries may help in *capacity development*, guide public input, reduce uncertainty in the innovation process by reducing opportunistic behaviour:

"So that's where we kind bring these guys to educate them on that aspect, you have to have someone, a technical advisor, to kind of oversee the user interface design so he will give his perspective on the products as well and give them advise if there is major functionality problems or design issues […] So, everyone knows about this inhouse service, but no one understands it. So, we actually had AWS come in and give them run through of exactly how their cloud services work and how a lot of things might not need to be developed into their product, because it is already supported through AWS itself right" (INT7, 8:51).

As explained by public participant No.3, products developed with the support of intermediaries were often better placed in the market, as they were customised to better meet the needs of the various actors in the ecosystem:

"The intermediary does a good job in facilitating the relationship. So, as a company if you want your product to succeed at the end of the day, you need to test it out on users to see how their experience is" (P3, 27:51).

In another example, intermediaries, according to representative No.7, for example, have been helping academia in terms of setting their curriculum, whereby final year projects have been competing and pitching against other start-up ideas:

"We engage with public universities on setting their curriculum. For me I had to bring universities the demands of the modern-day businesses, it used to be very rigid business models, and it really doesn't align, so, they all have like shifted into that mindset now. Now we can see that year four projects are almost in pitch competitions next to other start-ups that are pitching, it is now more realistic" (INT7, 8:51).

Concerning the final stage of the innovation process, termed by participants as the late-stage or production stage, this was the point where actors received the necessary funding or capital to start manufacturing their products. The immediate gain for intermediary engagements, particularly with angel investors, venture capitalists and accelerators, was financial in terms of the revenue streams and equity shares. According to participants, this was expected to result in win-win situations for the various partners. Very often, the competitive advantage of an intermediary was found to depend on both their network position and ability to acquire the knowledge obtained through such a position. Intermediaries, such as participant No.8, for example, were able to create additional value by helping locate certified manufacturers with the lowest production costs possible:

> *"So, we have the expertise in house to know who to go and get the benefit, because if you don't know who the certified manufacturers are there is a likely chance there steal your idea. So, we help them get the lowest price for the highest quality" (INT8, 41:17).*

An important feature, closely attributed to the intermediary role, was linked to their approachability. According to intermediary participant No.1, approachability factored into building quicker relationships, and *informal coordination mechanisms* or connections enabled deeper exchanges of knowledge that would not otherwise be possible:

> *"So, I have to be very approachable. Sometimes clients go on and on about something that has nothing to do with the meeting and I think to myself this is a waste of time for me, but I'm making them feel valued and important" (INT1, 5:49).*

Informal connections, through Fintalks and start-up community led initiatives for example, were found to keep up engagements with local community and bring forward different industry

experts and the subject matters to visualise shared values, as indicated by intermediary participant No.3:

> *"At the end of the day what we all trying to achieve is that we are all moving in the same direction" (INT3, 5:25).*

The findings identified four groups as shown in Table 5.6, whereby the various examples of services provided by the intermediary can fit, and these include: (1) Network-based benefits; (2) Product/solution development capabilities; (3) Market response capabilities; and (4) Lower-cost capabilities.

Involvement stages	**Services provided by intermediary**	**Value added dimension**
Early-stage companies or ideation (planning, business modelling, monetisation and market research)	Networking/bridging functions and meeting arenas. Aligning agendas and timelines. Capacity building (workshops, incubation, awareness raising, mentorship and training). Mobilise resources (e.g. funds and technical competencies).	– Network based benefits – Product/solution development capabilities – Market response capabilities
Mid-stage companies with minimum viable product, product development (pilot project, prototype)	Transfer of specialised knowledge. Provide legal and technical advice. Facilitate financing.	
Design sprints	Technical advice. Help start-ups with prototypes.	
Testing and modifying	Help start-ups test their products. Evaluate test results.	– Network based benefits – Product/solution development capabilities – Market response capabilities – Lower-cost capabilities
Late-stage, Production/manufacture	Approval of design. Help address financial barriers related to scalability.	

Table 5.6 Value-added dimensions of intermediary work.

The various mechanisms used across the various phases of innovation were further summarised in Table 5.7 below. Showing the intermediary's role in bridging and managing some of the challenges across the boundaries of: (1) Competencies, capacity and willingness to share/undertake influence, (2) Dual positions (Individual vs. collective interests, motives and values), and (3) Power dynamics or inclusion/exclusion patterns (Open vs. closed spaces of innovation).

Boundary managed	Example of mechanism	Implications
Competencies, capacity and willingness to share/undertake influence	- Confrontation. - Identify champions. - Temporary roles to predefined themes. - Emphasis on dual identities - Increase social costs of opportunism. - Research and early disclosures. - Capacity development. - Informal coordination mechanisms.	Reduce fragmented contributions and irrelevant input.
Dual positions (Individual vs. collective interests, motives and values)		Surface the conflicting interests/motives/values.
Power dynamics or inclusion/exclusion patterns (Open vs. closed spaces of innovation)		Allow experimentation with new ideas but within current controls.

Table 5.7 Intermediary mechanisms in bridging and managing and implications.

In summary, this section emphasised the role that intermediaries played in a Quadruple Helix configuration, in relation to facilitating innovation processes and knowledge transfer activities. The analysis evolved into exploring who the intermediaries were, what roles they played, what challenges were found around them, and how these challenges were managed. The section helped develop an understanding of intermediary roles and suggested that the roles were twofold, to access and transfer knowledge in the respective networks. This further suggested that intermediaries could offer two distinctive types of knowledge in terms of know who and know how.

The findings suggested that the complexity of the networks required intermediaries to be involved in various points of the innovation process, from early to later-stages of production, to develop several competences, and establish several mechanisms to manage frictions and reduce uncertainty in the various stages. These however did not ensure effective participation from all actors, and thus intermediary intervention was not enough to ensure effective collaboration of the four helix actors.

5.5 Summary

To summarise, it is important to emphasise the key findings presented in this chapter. The findings have suggested that the collaborative ecosystems were characterised by

interdependence among a complex network of actors, representing academia, industry, regulator, and public, whereby actors play critical roles in the development and maintenance of the ecosystem and jointly designing and developing innovative solutions.

With regards to the gaps in relation to integrating public members, in their collaborative and trans-disciplinary innovation processes, the mechanisms to integrate the fourth helix (i.e. public members) varied, and thus the levels of integration that worked for one group did not necessarily work for others. In general, participants believed that innovations originated with a top-down initiative. There appeared to be an imbalance in the skills and roles needed to participate in the FinTech ecosystems, and bottom-up initiatives were often challenged by public participants' lack of competence, knowledge, and limited awareness, which impacted the public's overall interest to join the innovation processes. Limited awareness of the FinTech industry was attributed to the minimal number of FinTech-focused courses or training sessions available to public. Other key actors in the ecosystem were thus expected to increase their capacity and willingness to enhance public contribution and pay consideration to what made it worth their time and effort to join such collaborations. This further highlighted a gap in terms of actors' insufficient capabilities to meet market demands from FinTech start-ups as well as government entities and firms willing to join the ecosystem. As a result, the understandings varied regarding public integration, creating a potential for illusive inclusion. This further indicated an unbalanced Quadruple Helix, given that the model needs to operate with a stronger bottom-up push, in addition to top-down interventions.

In what concerns the tensions, the development of mechanisms allowing public integration further raised several issues with regards to developing coordination, aligning diverse interests, and incorporating the competing needs of participants. Due to the multiplicity of participants, the relationships were both cooperative and competitive, and were found to constitute a number of conflicting interests, incongruent motives, divergent perceptions of value and power

imbalances. Tensions arose as actors tried to articulate a collective response to the issues at hand, and balance the internal dynamics of the collaboration with external individual demands, all without risking collaboration. The tensions were found to be interrelated and shaping the interactions.

Being embedded in a collaborative network, therefore, did not necessarily lead to innovations. Shared goals were often pursued by participants, all of whom also held their own strategic interests that not always aligned with those of the wider network or ecosystem. Two distinct levels of goals were identified within the innovation processes. These involved the individual goals of each actor, and the collective goals of the collaboration. It was therefore ambiguous whether the participants represented the collaborative group, or the organisations they represented. The findings revealed this situation as a continuum. At one extreme the actors took little interest in the collaboration, striving to assert control in order to safeguard their own agenda and influence the agenda of the collaboration. At the other extreme, actors showed full commitment to the collaboration group's aims and objectives. Balancing these two extreme positions was therefore found to be problematic and depended mostly on participants' willingness to compromise on the different agendas for the sake of making progress in the collaborations. Agreeing on a shared aim was thus not simple.

The conflicting interests further compelled incongruent motives for collaboration, whereby relationships were shaped by individual and very few collective motives. Actors were found to participate in a variety of activities at various stages of the process, and thus were not necessarily active at the same time, as some had less reason to be committed to the collaboration than others. So, for actors to work together, participants suggested that the collaborations must provide strong incentives for actors to put aside their individual interests and contribute to the joint interests.

Motives further generated incompatible perspectives of value, and the multitude of divergences was found to be an impediment to the collaborations. Actors often joined the collaborations with preconceived expectations regarding collaborative outcomes, which required upholding continuous value renewal efforts for value propositions to remain attractive. This implied that innovation may be developed jointly, however, its value was frequently appropriated in a competitive manner, and thus considered as an inherently individual action.

The mismatch of expectations, in addition to actors acting on individual goals ahead of those of the collaborating partners, presented another tension in the form of power relations. The network of relations was therefore constantly in tension, and the distribution of power were found to be unequal. The dynamics of power were discovered to be dependent on the type of space in which it was found, the form it took and the structure by which it operated. Failure to address these dynamics were found to jeopardise efforts for bottom-up initiatives. The interdependencies between actors suggested that power cannot be entirely unilateral, and at the minimal level, any actor could resort to the threat of withdrawal or non-collaboration. Many of these tensions arose at a micro level in the collaboration and were not always apparent to those involved. Identifying these power relations and dynamics thus required high levels of awareness on the part of participants.

In terms of the role of the intermediary, the interdependencies and associated tensions further raised questions with respect to how these ecosystems were coordinated, and how the diverse interests and power relations were balanced. The collaborations were therefore found to have the potential to optimise intermediary processes and roles. These were often internal or external, and mostly operated as separate entities. Much of the work with regards to managing the networks in terms of reducing the potential for misunderstandings, creating commonality, balancing power relationships and eliminating the barriers of knowledge transfer, were expected to be undertaken by the intermediary. Intermediaries were thus challenged to push

for undertaking extended roles and to seek involvement throughout the entire innovation process, and were therefore expected to develop a number of competencies and skills to enable synergies and create new opportunities for public participation. A number of mechanisms were applied at various stages of the innovation process; however, these mechanisms were not particularly effective in bridging gaps or reducing the opposing interests.

6. Discussion

6.1 Introduction

The aim of this chapter is to discuss the theoretical contribution of this study in relation to the findings and the literature. As the last stage of the Grounded Theory methodology, the literature is cited in the discussion to discuss the most significant findings from the analysis that emerged from the constant comparison (see Chapter 4, Section 4.7.4). This shows how the findings respond to the research questions in light of the theories that exist in the field, and how they contradict, confirm or extend existing theories (Urquhart, 2012).

As noted in the Literature Review Chapter (see Section 3.3), the concept of entrepreneurial and FinTech ecosystems is gaining academic and policy attention. These ecosystems are frequently assumed to function via Quadruple Helix interactions among various actors from "the public sector, the academic sector, the private sector, and the civil society sector" (Björk, 2014, p.187). The helix model refers to an interconnected set of processes (Carayannis et al., 2021) in which a diverse set of agents is organised into "fluid and heterogeneous innovation networks" (Carayannis & Campbell, 2011, p.342), wherein the stimulation of innovations are envisioned, according to Füzi (2013), via a process of 'co-creation' among the actors. Nonetheless, only a few helix studies have looked at the interactions and events that occur in Quadruple Helix arrangements as a process (Björk, 2014; Lindberg, et al., 2014). Very little was found in the extant literature on how helix studies address the Quadruple Helix

configurations as a process (Björk, 2014; García-Terán & Skoglund, 2019; Lindberg et al., 2014).

The function and civil society participation in innovation systems and larger transformation processes are also poorly understood (Grundel & Dahlström, 2016). As a result, this study focuses on the participants' micro-level interactions (Höglund & Linton, 2018; McAdam, Miller & McAdam, 2018) and the output of these interactions (Cunningham, Menter & O'Kane, 2018; García-Terán & Skoglund, 2019) to elucidate their complexity.

As highlighted in the Literature Review Chapter (see Chapter 3), scholars have advocated that the macro-analytical perspective, mostly focused on the context of regional innovation networks (Caetano, 2017; Cavallini, Soldi, Friedl & Volpe, 2016; Ivanova, 2014; MacGregor, Marques-Gou & Simon-Villar, 2010), that trades in stakeholders' sectors of origin (McAdam & Debackere, 2018), be supplemented with the dynamic relationships, collaboration synergies and value-creating activities in the micro-analytical world (Hasche, Höglund & Linton, 2020; Kriz, Bankins & Molloy, 2018).

The processual approach has been applied to social networks, which are linked to Quadruple Helix collaborations (see García-Terán et al., 2019; Vallance et al., 2020) as micro-level analyses of its collaborations and processes (Hoang & Antoncic, 2003). However, Quadruple Helix literature (as noted in Section 3.5) has only superficially explored interactions from a processual perspective. This study addresses this gap by concentrating on the financial services interactions arena in Bahrain. By demonstrating how these sectors can be configured locally, the FinTech ecosystem in this study extends current Quadruple Helix conceptualisations. These are centred on intermediary actors' civic engagement activities.

The interest in a processual approach from an analytical standpoint is aligned with an interest in the processual character of collaborations as they evolve over time, and how actors shape the interactions, where a seamless step-by-step integration of the fourth helix is crucial

(Carayannis & Campbell, 2011). In order to develop this contribution, this study goes beyond rather static Quadruple Helix models in order to highlight how the interactions can have an impact on the Quadruple Helix model's implementation. A processual approach can assist in the analytical recognition of interactions "embedded in social and cultural contexts" (Steyaert, 2007, p.462). This aids in formulating a better understanding of how a particular Quadruple Helix structure evolves and how a successful model is put into action. According to Pettigrew (1997), not only individuals but also processes and "collective events, actions, and activities unfolding over time in context" (p.338) should be studied. The flow of events and interactions within the narrative of a Quadruple Helix configuration were examined in this study. This study indicates how the processual approach can be used to analyse the implications of the subsequent inclusion of the fourth helix in the financial services sector interactions arena. Essentially, these theoretical viewpoints on processes aid in the investigation of the 'how' of specific outcomes and how they are interrelated.

Prior studies have also noted the significance of intermediary actors in facilitating Quadruple Helix stakeholder engagement (Almirall & Wareham, 2011; Gredel, Kramer & Bend, 2012). According to the reviewed literature, there is a lack of research on how they can aid in the integration of public engagement in collaborations involving multiple stakeholders and contribute to knowledge transfer. As a result, it was critical to understand how the intervention of an innovation intermediary can aid in the integration of the fourth helix. As a result, it is critical to broaden conceptualisations of potential Quadruple Helix configurations by providing an example of local configurations centred on the activities of intermediary actors.

The objective of this research was to explain how the fourth helix is perceived and integrated into the trilateral innovative networks between academia, regulators and industry, as well as the implications of such integration. This study investigated how gaps in relation to the insufficient capacity to incorporate the fourth helix, and the tensions that can arise from their

incorporation are managed by innovation intermediaries.

In accordance with the literature, the transition to processual lenses in this work was also found suitable from a methodological standpoint. Grzanka (2021) stresses that situational analysis is highly suitable for researching topics that have an impact on a process, whereby the study goals include developing a contextually and explanatory theories. Such an analytical focus aligns with the research design and analytical method of this study (see Chapter 4, Section 4.8). The Clarkeian version of Grounded Theory, and situational analysis were chosen to explore how "all the most important human and nonhuman elements in the situation of concern" (Clarke, 2005, p.86-87) interact and function collectively to develop innovative solutions. This is explored in reference to integrating public members as a pertinent contributor to initiatives promoting innovation.

By using situational analysis (see Chapter 4, Section 4.8.2), this research "seeks processes and contingencies by analysing difference(s) and complexities" (Clarke, 2019, p.16). As a result, a processual perspective can aid in the analytical recognition of interactions in their setting (Clarke, 2005) to fully elaborate the dense complexities of the situation. Hence, by taking a micro perspective, this research illustrates how the Quadruple Helix configuration (academia- industry- regulators- public/civil society) emerges and evolves. This enhances understanding regarding how the dynamics may influence efforts to foster a more innovative environment by integrating the fourth helix. This is achieved by focusing on participants reported experiences, what shape the interactions take in practice, and what drives the heterogeneous relationships processually (Kriz et al., 2018; McAdam et al., 2018). This will contribute to the theoretical advancement of the helix model's processual nature.

This chapter consists of four sections, all based on conceptualising the role of the fourth helix, how it is integrated, what the implications are of these forms of integration, and what role do the intermediaries play in these processes. This is accomplished by illustrating their

interrelationships, and the integration of emergent theory with existing knowledge (see Figure 6.1). The section that follows presents the theoretical implications of the integrative framework. The chapter concludes with a summary.

6.2 Integrating the emergent theory with the existing knowledge

Although the Quadruple Helix's emergence and the collaborations that support it must be viewed in terms of a process, the integrative framework was updated (see Figure 6.1) to assist in the creation of a few illustrative examples. In comparison to the Quadruple Helix model in Figure 5.1, Figure 6.1 of the Quadruple Helix is built on a narrative that is more processual. It is important to note that this chapter's structure is based on the integrative framework depicted in Figure 6.1.

The following sections contrast the emergent theory's narrative explanation with prior theory thematic clustering to determine lines of divergence or convergence. The goal then is to integrate the emergent theory depicted in Figure 5.1 (see Chapter 5), which combined the main findings from situational analysis with pertinent literature.

Based on an acknowledgement of the gaps and tensions, this section discusses how to leverage the symbiotic relationship between the FinTech ecosystem, the Quadruple Helix innovation system, and innovation intermediation to address the challenge of accelerating innovation for long-term sustainability. These are used to support the conceptual argument that, despite the pervasiveness of collaboration and the support of innovation intermediaries, as a form of local innovation system, the existence of the Quadruple Helix should not be taken as a given fact.

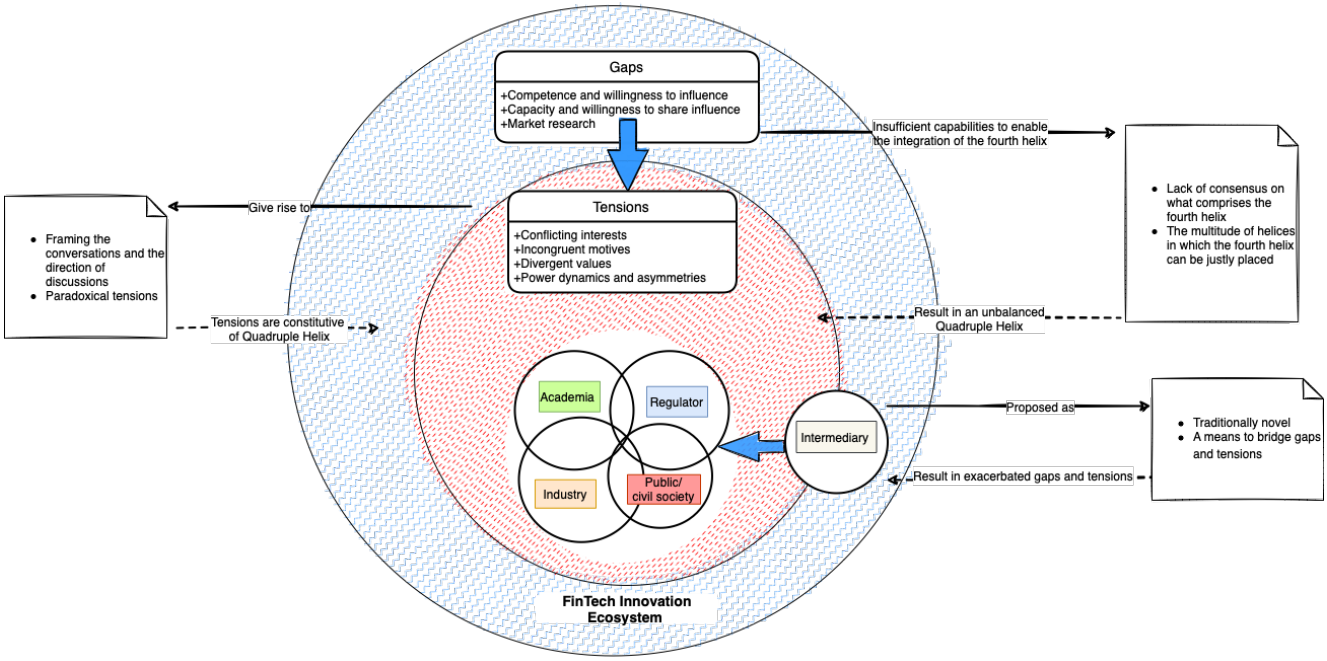

Figure 6.1 Integrative framework incorporating literature.

6.2.1 Unbalanced Quadruple Helix

In reference to the first research question, the aim was to determine how the fourth helix was perceived, using the Quadruple Helix as the theoretical departure point. The most obvious finding to emerge from the analysis was that there was no agreement on the composition of the fourth helix. This finding corroborates the findings of a significant body of previous work on the Quadruple Helix (Carayannis & Rakhmatullin, 2014; Hasche, Höglund & Linton, 2020). The findings reveal that, depending on the collaborative context and purpose, the role of the fourth helix, through public participation, appeared to be found across the Quadruple Helix continuum, making it difficult to determine what the fourth helix was. This conclusion is consistent with Carayannis and Rakhmatullin's (2014) contention that innovation users or entrepreneurs are not limited to civil society, but may also complement and reinforce "similarly minded individuals in the government, university and industry" (p.221). The concept of 'user-driven innovation' (Arnkil et al., 2010) and 'Quadruple Helix user' interaction is made more challenging by the fact that there are various different types of users. Thus, achieving public

integration can be particularly problematic. This is largely due to the lack of agreement on what constitutes the fourth helix, the changing role of the fourth helix, and the multitude of helices in which the fourth helix can be rightly placed.

The findings (for example, see Section 5.2.1) are in agreement with those obtained by Roman et al. (2020) who recognise that "the 'fourth helix' comprises a heterogeneous group of actors who must themselves be approached differently" (p.11). This study therefore agrees with Yang et al. (2012) and the fact that the helix frameworks are "in need of further clarification when it comes to transferring the relatively abstract theoretical framework to operational variables in order to guide empirical investigations" (p.377). As a result, these clarifications cannot come exclusively from focusing on only the perceptions of actors and sectors, hence avoiding operationalisation (Freeman, 2004; Miles, 2012).

According to Popa et al. (2020) there are two possible explanations for this. The first is related to how, when it comes to operationalising stakeholder-analytical models, stakeholder type labels remain ambiguous (Freeman, 2004; Miles, 2012). For example, in one well-known formulation, the four helices have been identified as "academia/universities, industry, and state/government… the 'media-based and culture-based public'" (Carayannis & Campbell 2009, p.206). Luhmann (1995) uses a similar demarcation 'Systems theory' as discussed earlier (see Section 3.2.3). Bryson et al. (2006) use a similar delineation in their understanding of 'cross-sectoral partnerships': "by cross-sector collaboration, we mean partnerships involving government, business, non-profits and philanthropies, communities, and/or the public as a whole" (p.44). This demonstrates the lack of a broadly acknowledged definition of these four systems. This was found to be problematic as it makes the concept of achieving public integration through Quadruple Helix even more difficult.

The second explanation relates to determining which organisations should be assigned to the helices (Björk, 2014). According to Powell and DiMaggio (2012), complex institutions that

operate in multiple fields tend to have multiple overlapping institutional identities. Moreover, it may be unclear which of these identities may take precedence over others. To illustrate why this is a problem, a deeper look at Bahrain's economy revealed that the financial ecosystem engages a full spectrum of stakeholders, namely financial institutions, governmental bodies, consultancies, start-ups and universities (Bahrain FinTech Bay, 2018a). The academic institution considered in this study describes itself as a network organisation committed to catering to the training needs of the financial services sector, with the main discourse being to gain access to the global digital economy. On the one hand, it may be considered an industry helix; on the other hand, the institute is taking an active role in aiding graduate and postgraduate students. As a result, this institute can also be classified as academic. It can be shown how, by placing the institute against the backdrop of its many contexts of operation, a multitude of helices in which it can be appropriately placed can be revealed.

As a result, the chapter develops the proposal that a process-analytical standpoint to Quadruple Helix, with reference to social worlds/arenas, can offer a solution to the aforementioned operationalisation problems by complementing the stakeholder analytical approach (Popa et al., 2020).

It is therefore considered important to respond to current calls for a more process-oriented approach to Quadruple Helix collaborative research (Kolehmainen et al., 2016; Vallance et al., 2020), as a continuous series of experiences that can be divided into separate processes (Whitehead, 1929). According to Vallance et al. (2020), this is a useful distinction as it shifts focus away from the mere presence of actors towards acknowledging interactions in their sociocultural context (Carayannis, Samara & Bakouros, 2015). This involves omitting issues of identity and titles. Crucially, in this viewpoint, the process by which a system of Quadruple Helix relations is constructed around a common goal or problem becomes the fundamental unit of analysis. A key question that Quadruple Helix frameworks should address, then, is how non-

traditional innovation actors such as public participants or users are incorporated into these emerging relational systems (Carayannis & Campbell, 2011; Vallance et al., 2020). As a result, it is possible to argue that the important thing is to recognise that Quadruple Helix needs to be contextual and respond to a local need rather than assuming who the actors are a priori.

According to the Literature Review Chapter (see Section 3.3.3), Quadruple Helix frameworks place a greater emphasis on collaboration in innovation, specifically the "dynamically intertwined processes of co-opetition, co-evolution, and co-specialization" (Carayannis et al., 2018, p.150). Similar to Carayannis et al.'s (2012) view on the fifth helix, the fourth helix in this study can be viewed as a social world that relies on "collective social action" (Clarke, 2005, p.114), rather than an actor or any type of sectoral identity (Clarke, 2005). The fourth helix can therefore be viewed as a drive in response to new inclusive and participatory frameworks in the financial services sector arena.

The Quadruple Helix emerges from the initial efforts of the regulators to encourage wider community inclusion in the financial services sector ecosystem. The evolving collaborations between actors in the various helices have demonstrated the desire to incorporate civic contributions. This can be achieved through the process of co-design and co-production of knowledge and innovations as critical to aligning financial systems with sustainable development. The wider community inclusion therefore becomes key in changing the path of the integrative initiatives of FinTech development processes. The micro-processes were influenced by an "overlay of negotiations and exchange relations" (Leydesdorff 2003, p.450), and tend to change due to the actions of the actors (Tsoukas & Chia, 2002). At this point, different stakeholders share a vision of the Quadruple Helix as interacting helices, as shown in Figure 6.1. However, the ambition is driven more by politics than by economic feasibility.

The findings show that the perceptions of participants regarding the fourth helix have resulted in three gaps that characterise their integration. These are identified in terms of the

capabilities, competencies, and characteristics of inclusion actors (i.e. academia, regulator, and industry). They need to develop these characteristics to enable public integration and consolidate their input. The inclusive characteristics are all aimed at appropriating new opportunities in the financial services interactions arena.

Gaps pertaining to Quadruple Helix innovations have been characterised as "the insufficient capability of local, regional and national authorities to involve citizens into the development of public services and organizations" (Arnkil et al., 2010, p.67). It is important to refine this definition by adding that if the helices were not systematically underperforming due to insufficient integration capabilities, we would not see this as a gap. Nor is there a disparity between what the various actors perceive to be required to realise a Quadruple Helix model of innovation. This definition is particularly interesting for Quadruple Helix collaborations as it highlights the essential independence of each helix (Popa et al., 2020), as discussed in the Literature Review Chapter (see Section 3.5).

As MacGregor et al. (2010) have suggested: "the quadruple helix intends civil society to be engaged with the other three types of innovation actors – government, academia and industry" (p.188). Most of the proposed Quadruple Helix approaches focus on user-centrality (Cavallini et al., 2016), as indicated previously in the Literature Review Chapter (see Section 3.2). Yawson (2009) formalises the fourth sphere as the user. According to Carayannis & Rakhmatullin (2014, p.219), "users or citizens here own and drive the innovation processes". Through its demand function, they are likely to have a significant impact on the generation of knowledge and technologies (Carayannis & Grigoroudis, 2016). Consequently, user-centrality and social inclusion have been included as essential elements in the knowledge production process (Cavallini et al., 2016). As a result, a related feature of the Quadruple Helix model is that the fourth helix is proposed as an inclusive framework.

In regard to the second research question, or how public members were integrated into the

trilateral networks, the findings reveal an 'unbalanced' Quadruple Helix in that the fourth helix is not fully integrated. Several possible explanations can explain this tendency.

First, and in agreement with Schütz et al. (2019), the ambiguous position of public members in the Quadruple Helix innovation system can make it difficult to formulate goals and apply appropriate strategies to participatory processes that integrate the fourth helix. This was especially true in terms of the ambiguity surrounding the direction for recruiting and integrating public members in the various participatory activities as the fourth helix, and the gaps transcending the collaboration networks. According to Fitzpatrick and Malmborg (2018), the fourth helix is only indirectly involved in the project design. The findings identify examples of user participation as a minimum requirement for the involvement of users in the Quadruple Helix innovation model. These ranged from information exchange to consultation (Arnkil et al., 2010) to innovation development by users and co-producing (Seravalli, 2016). The findings show how public members can be indirectly integrated as mere users of their services, implying that their functions are emphasised without decision-makers relinquishing control. As Arnkil et al. (2010) emphaised, the potential to realise a Quadruple Helix is contingent "on how much influence firms and public authorities are willing to give to users/citizens" (p.97). The partnerships are thus represented as a gap by excluding rather than including public participation. The findings suggest that the fourth helix reinforces the existing structural inequalities experienced in society today.

Alternatively, public members were given explicit decision-making positions and the opportunity to provide direct input, to broaden their options and allowing them to contribute. Hackathons, for instance, gave public participants, young professionals, and youth the opportunity to convert ideas into solutions, exemplifying how public participants were treated as the true developers of solutions. According to the Quadruple Helix literature, the level of involvement in the above example is inclusive of public participants and represents a

democratic form of governance and decision making. This is because public participants were empowered to be innovation co-creators and value generators (Arnkil et al., 2010; Carayannis & Rakhmatullin, 2014).

Few public engagement activities, however, as indicated by the findings, conformed to these democratic principles, and many were small-scale (i.e. curriculum design) and ad-hoc (i.e. Hackathons), resulting in widening 'power inequities', as termed by Powell et al. (2011). Public participants were viewed as implementers rather than co-designers. This finding is consistent with that of Schütz et al. (2019) who argued that simply stating that the societal perspective has been heard and will influence future decisions is insufficient. A possible explanation for this is that collaborative models, in their original form, do not clearly define public members or the various degrees and levels at which they may participate.

Carayannis and Campbell (2009) discussed the 'Pluralism of knowledge modes', as well as to how "knowledge, innovation, and democracy interrelate" (p.224). Democracy presumes that its strength lies "in its capacity for allowing and balancing different parties, politicians, ideologies, values and policies" (Carayannis & Campbell, 2009, p.224). This was determined to be in conflict with Bahrain's governance modes, in which various FinTech initiatives were largely forged by top-down hierarchical direction via established lines of command and initiatives. As a result, while the Quadruple Helix innovation provided a participatory domain, top-down policy interventions were ineffective in terms of fulfilment of economic development promises and, in some instance, exacerbated pre-existing inequalities. Yet, if a Quadruple Helix 'innovation-friendly' ecosystem (Casaramona, Sapia & Soraci, 2015) is desired, early consideration should be given to the fourth helix representing "the perspective of the 'dimension of democracy' or the 'context of democracy' for knowledge, knowledge production and innovation" (Casaramona, et al. 2015, p.506). Otherwise, as this study demonstrates, it can become fragmented and unbalanced.

Second, the findings revealed a number of structural challenges to public integration. Many of the structural challenges identified were in consistent with the notions of readiness for inclusive innovation and the barriers described by Heeks et al. (2013). These, for instance, involved the absence of policy support, lack of skills and knowledge, and poor access to capital. The findings here broaden these barriers to include socioeconomic class, language (i.e. Arabic vs. English competency, cross disciplinary), and a lack of knowledge about the various support options available from both the regulator and intermediaries (see Section 5.2.2). The findings reveal minimal integration of the fourth helix.

Third, and similar to Schillo and Robinson (2017), the findings here imply that "the means of social exclusion are changing, through widespread digitization and the use of big data analytics to define included and excluded populations" (p.40). A significant number of challenges emerged with the disruptive nature of the financial services sector and the introduction of new disruptive business realities (i.e. FinTech start-ups). Partly, these challenges may be explained by a lack of prior learning in terms of regulating a new industry and new activities.

Fourth, the findings reveal that the lack of perceived benefits of participatory approaches that include the public partner lead to superficial participation, further enhancing disparities between the public and other key actors. According to the findings here, intensive engagement with public members was frequently difficult and added to actor workloads. Further, commitments involving public participants did not always take the form of explicit or discrete decisions. The findings suggest that public members lacked the decision-making power of academia, the authority of the regulator, and the economic power of industry. This finding provides a further albeit tentative explanation as to why public members may be at a disadvantage and explain why gaps in the capacity to integrate the public partner may be reinforced.

Fifth, the findings presented a dichotomous dimension to integrating the public participant. In particular, actors were challenged to balance broadening the number of relationships and maintaining existing relationships. Adopting participatory thinking suggests that public integration could threaten participants existing power structures by requiring the relinquishment of control. This finding is consistent with that of Solebello et al. (2016) who argued that attempts to become more inclusive may raise issues related to identity and power. The findings contribute to the current literature by illustrating that public integration exposes the three actors to new tensions. Changing the identity of collaborative groups can be highly contested, as it is simultaneously met with countervailing desires to maintain membership exclusivity.

In accordance with the present findings, West and O'Mahony (2008) defined the amount of decision-making control that is relinquished to the community as 'openness'. This suggests that the degree to which collaborations are open for public integration can vary. At one end of the spectrum participants expressed concerns about disrupting the innovation model and the collaboration's focus, or, as Huxham and Vangen (2000) explained, bringing new agendas. According to the literature on open innovation, flexibility can increase the level of uncertainty in a team (Chatenier et al., 2009), leading to unproductive relationships (Gulati et al., 2012). Most studies of collaboration in fact assumed that public participation leads to more innovations (Beyerlein, Beyerlein & Kennedy, 2006; De Man & Duysters, 2005; Ponchek, 2016). Contrary to previous studies which suggested that the inclusion of nonexpert knowledge can be beneficial (Brabham, 2012), this study was unable to demonstrate that. Participants were generally less convinced that relationships with public members could lead to innovation and expressed concern over public members providing fragmented, irrelevant and sometimes insignificant input. This broadly finds support in the work of Lee and Bozeman (2005) who argued that "the benefits of collaboration are more often assumed than investigated" (p.673).

Despite the pervasiveness nature of collaboration, not all public contributions were explicitly considered to fit within the networks' agenda. Concerns often spurred indeterminacy in relation to relinquishing, retaining, or sharing influence and decision-making. Another possible explanation for this is that actors were often influenced by stereotypical attitudes towards public contributions. Public participation in decision making was thought to be counterproductive. This has the implication of potentially excluding participants who may have the necessary expertise and skills in relation to the subject matter on the grounds that their contributions would be ineffective. This finding corroborates what scholars describe as a rejection of potentially valuable knowledge because it is viewed as outside or external from the individual's perspective, all in an effort to defend "self-perception, rank, or status" (Antons & Piller, 2015, p.197). This suggests that stereotypical attitudes and mistrust towards public contributions can negatively impact the value of public engagement and thus create exclusion.

At the other end of the spectrum is the conversation in which actors interact strategically. Actors are not interested in a democratic exchange of information or ideas, hence interactions are typically one-sided (Carayannis & Campbell, 2014). Actors are not particularly receptive to differing points of view. Rather, they are "centred on communicating self-interest and aligning the other's interest to one's own" (Crane & Livesey, 2003, p.47). According to Chatenier et al. (2009), this may result in "groupthink" (p.363), or a team that is blind to new developments. As reported in the findings, many of the forums that were expected to assist public members in navigating the participatory frameworks with a diverse range of practitioners from the industry (i.e. Fintalks and start-up community-led initiatives) were really just opportunities to inform the public about the solutions conceived by the other helices, rather than a form of collective collaboration. Actors, then, seek public participation in order to secure commitment and acceptance for decisions that have already been made. This suggest that the options for public participants to form relationships with other actors can be limited. The

findings therefore reveal a lack of connection between the three actors' ongoing commitment and the public's responsiveness to their efforts to show a communication gap. One revealing finding was that the media represented a marginalised or implicated actant, in terms of transmitting innovation policy aims and discourse between decision makers and public members.

Sixth, the findings reveal a disconnection between regulatory efforts and practices that support innovation, as well as the discourse of building a business-friendly environment and the practices that support it. The findings, for example, have shown a significant contradiction and tension between the two goals of workforce nationalisation and becoming a FinTech hub This explains why the practices that should enhance inclusion of public members through workforce nationalisation (e.g. entrepreneurship and FinTech start-ups), have simultaneously and indirectly led to increasing exclusion. In other words, while there has been recent recognition of the importance of developing policies in line with improving innovation, these efforts were not necessarily sufficient. Furthermore, they indirectly created public exclusion and power imbalances.

This was explained by the fact that, 'paradoxically', domestic talent is in short supply in emerging FinTech hubs as growth outpaces the rate at which educational institutions adapt to market demands. As a result, outsourcing talent appears to have become a regular practice because local candidates lack the requisite skills and background, particularly in terms of technical expertise. With increased dependency on outsourcing talent the frameworks created exclusion. This also supports Schillo and Robinson's (2017) view on how "inclusiveness tends to reinforce existing structures of inclusion and exclusion rather than offer opportunities for the inclusion of excluded groups" (p.42).

The findings provide support for how troublesome the idea of integrating public members through entrepreneurial start-ups may be, and reflect those of Lindberg et al. (2014) who also

found that not everyone has equal access to entrepreneurship and innovation. It is thus posited here that not all networking opportunities enable public learning and joint collaboration. These findings also provide further explanation as to why public actors may be underrepresented.

One possible explanation is that actors are unaware of the contradictions or interrelationships between the various attempts to integrate public participants. Drawing on the literature of paradox, this gap could be attributed to its paradoxical nature, which entailed examining the interplay of the two contradictory (Clegg et al., 2002; Smith & Lewis, 2011), yet interwoven practices mentioned above (Lewis, 2000). This is also consistent with the views of Cunha and Putnam (2019) in relation to the 'paradox of success', and Nebasifu and Atong's (2020) 'paradoxical gap', which refers to "cases where practices that should enhance success simultaneously lead to a downfall" (p.109). First, the interactions create tensions. Second, they pose unintended consequences such as power imbalances. Third, uncertainties about these innovations reduced actor cooperation. Without being aware of these inconsistencies, regulators risk obstructing their ambitious economic targets.

The fourth helix is proposed as an inclusive framework. The inclusion should be expanded to respond to societal issues. These results corroborate the findings of a great deal of the previous work on inclusive innovation, and how it is often applied without , as Stam and Van de Ven (2019) stated: "answering several fundamental conceptual, theoretical and empirical questions" (p.810). Accordingly, Jiménez (2019) suggested going beyond integration mechanisms to assess the existing structures that may enable or constrain them. Consistent with the literature (George et al., 2012), this research suggests that both the process of inclusion as well as the outcome are important.

By its very nature, the fourth helix is implicated with tensions, and their integration as external participants into the innovation efforts has resulted in unintended consequences, as proposed by Balka et al. (2014). These are further discussed in the subsequent section.

6.2.2 Tensions as constitutive of Quadruple Helix

The third research question aimed to determine the implications of the subsequent inclusion of the fourth helix. This helped define the nature of the tensions that emerged and why they arose.

The opportunities and challenges arising from bringing together Quadruple Helix actors have been investigated from a stakeholder-analytical perspective (Cunningham et al., 2018). Studies that have taken this approach (McAdam et al., 2018) have mostly translated the term 'helix' to "a group of stakeholders joined together by some 'salient characteristics'" (Popa et al., 2020, p.877), for instance, their motivations and goals (Cunningham et al., 2018). As noted previously in Section 6.2.1, this study has been unable to demonstrate whether the request for micro-level investigations can be effectively operationalised from a 'stakeholder-analytical' viewpoint (Freeman, 2004; Popa et al., 2020). This further casts doubt on whether a stakeholder-analytical standpoint is the most effective approach to analyse collaborative conflicts and frictions (Cuppen, 2012).

The findings show tensions between actor individual discourses, agendas, collective action, and shared commitments (Clarke, 1991), as well as their obligations to the larger constituent or arena that constructs their actions and interactions (Clarke, 2005). As discussed in Section 4.8.2 (see Chapter 4), five social worlds were identified. These are self-organised and serve to discuss and negotiate problems and solutions pertaining to the financial services interactions arena. Their function is to enable innovations and entrepreneurship to thrive (see Figure 4.8). Section 4.8.2 reveals that stakeholder identities are not included in the description of the social worlds that comprise the financial services interactions arena. It is therefore assumed that all actors (via the concept of co-design/development) are actually contributing and that, in some cases, each actor can contribute to any social world regardless of their associated titles and backgrounds.

Participatory design processes that concentrate on how to co-design and co-create with end users or citizens have been showcased by previous Quadruple helix studies. In their study, Fitzpatrick and Malmborg (2018) focused on 'living labs' as a co-design approach and actor experiences. In this way, it is possible to understand the tensions in product design projects organised in a Quadruple Helix model for innovation. Similar to Fitzpatrick and Malmborg (2018), this study uses the term tensions to identify four interrelated collaborative tensions, with each compelling and giving rise to another tension: Conflicting interests; Incongruent collaboration motives; Divergent perceptions of the collaboration's value; and Power dynamics and asymmetries. According to Fang et al. (2011), tension is defined as "two co-existing contradictory forces with conflicting goals" (p.774). These forces have the potential to destabilise relationships and are frequently the source of conflict in collaborations (Linton & Hasche, 2021). Tensions are examined in this study in a network with four actors. Interestingly, some of these tensions were paradoxical in nature. This is because they tended to reproduce themselves and appeared to be persistent over time. Therefore, they were perceived though a paradox lens (Chen, 2008).

The findings reveal that the experiences of Quadruple Helix partners demonstrate that the tensions which were identified are constitutive of the Quadruple Helix and shape its interactions (Hafedh, Vasconcelos & Jimenez, 2020). There are several possible explanations for this finding.

First, as noted earlier, the findings show that the fourth helix is inherently implicated with tensions, and their inclusion in the innovation processes has resulted in unforeseen consequences. According to Carayannis and Campbell (2009) "heterogeneity and organisational diversity" (p.217) is the main asset of the Quadruple Helix collaboration. According to the findings, however, this diversity has been a main liability and source of tension. Participating in an innovation process was not simple. Actors frequently achieved

coherence as a result of a struggle with other network actors (Hafedh et al., 2020).

The findings here concur with those of Santos and Eisenhardt (2005) in regard to boundary logics and the key tensions of first identity (i.e. collective action), and second power (i.e. control of the process). This study adds to these logics by focusing on the Quadruple Helix and emphasising the financial services interactions arena in which the different social worlds intersect (see Figure 4.8). This study explores the tensions as constant trade-offs between conflicting forms of power and identity.

The findings reveal that attempts to become more inclusive of public participants through the fourth helix may raise issues related to identity and power. In carrying out their activities, actors work within the framework of the different institutions, which may constitute incentives or obstacles to them (Liljemark, 2004). The findings provide preliminary evidence that identity boundaries can be found to dominate power considerations due to their control over organisational members. This was particularly true due to the different allegiances actors have in their organisational roles and in their Quadruple Helix roles.

In relation to the first boundary, the findings show that this boundary emerges as actors signify the problematic nature of tensions related to identities (Santos & Eisenhardt, 2005). The findings suggest that participating in collaborative conversations is to participate in an endless struggle between two inseparable roles (Hafedh et al., 2020). These appeared as a result of boundaries constructed around actor diverse social worlds, and their inconsistent priorities, as well as comparisons of “we” vs “them” (Gnyawali et al., 2016, p.9). The findings here present these inconsistencies as a continuum (see Section 5.3.1). Collaboration research often refers to this as the ‘two table problem’ (Gray, 1985). Moreover, the findings support previous research into coopetitive relationships and role tensions, which frequently stem from the “tension between the goals of the organization and the goal of the cooperation” (Tidström, 2014, p.262). The findings also extend this definition to the context of Quadruple Helix

innovation models to further attribute the tension to pragmatic reasons related to accountability and representativeness (see Section 5.3.1).

The findings reveal that individual responsibility and ownership for specific tasks were unclear. It was shown that actors tend to determine their motives for contributing to the collaboration project by "favouring one of the two forms of attachment (group or individual)" (Lauritzen, Salomo, & La Cour, 2013, p.154), hence the dual positions. This entails their attachment to either their individual constituents (i.e. social worlds) or the collective group (i.e. the financial services interactions arena) with whom they share joint tasks. Actors were found to react to this tension in two different ways; however, both reactions negatively impacted the collaboration. The first way in which partners reacted was by placing an emphasis on the expectations related to their distinct spheres in favour of developing joint collaborative outcomes. Partners were therefore found to be involved only in a superficial manner, showing a lack of interest and contribution, and that this ran the risk of no collaboration (Hardy, Lawrence & Phillips, 2006). The second way was when some partners, specifically in academia, eliminated the tension by primarily serving the collaboration purpose, and ignoring their responsibilities to the wider sphere, again running the risk of not drawing on the diverse interests of the various actors (Hardy et al., 2006). With so many potentially diverse participants, and ambiguity in the early stages of collaboration, individual responsibility and ownership for specific tasks were unclear (Aranguren & Larrea, 2011).

Second, the findings indicate that tensions are likely to be related to the iterative and dynamic nature of the innovation process, which frequently results in new roles within the innovation process, and ambiguity especially in the early stages of collaboration. The findings are similar to those observed in earlier studies, which found that tensions were typically exacerbated during network reconfiguration (Hardy et al., 2005; Jarzabkowski et al., 2013; Smith & Lewis, 2011). According to the Quadruple Helix literature, this is caused by

institutional spheres filling “gaps that emerge when another sphere is weak, unable, or unwilling to enact its traditional role” (Carayannis & Rakhmatullin, 2014, p.215). The helices are therefore constantly reconfigured and are “not fixed or even definitive but evolving multiply as people create and are created by the roles and identities they inhabit/perform and by the practices they enact” (Hjorth et al., 2015, p.603). The conclusions support those of Huxham and Vangens (2000), that it is not uncommon for actors to ‘wear multiple hats’, and thus actors frequently “orient themselves more to the situation” (Luhmann, 1995, p.227).

According to participants, formalising interactions and identifying responsibilities and functions may aid in the reduction of inefficiencies (see Section 5.3.1). This implies that each of the four subsystems has its own dynamical identity (Görke & Scholl, 2006; Luhmann, 1995). The findings, however, detail struggles with formalisation. One revealing finding was that formalised relationships increase competition and limit knowledge sharing. The uncertainty surrounding the interactions, as well as how the helices interact with one another over time is thus fundamental to how the Quadruple Helix unfolds.

Third, the findings suggest that tensions further exacerbate in contexts that rely on both radical and creative disruption. According to Fonseca and Meneses (2019), the growing digitalisation of the financial sector gives rise to more or less radical changes, partly carried out by FinTechs. Banks may lose exclusivity and competitive advantage in this situation (Fonseca & Meneses, 2019). The findings demonstrate examples of how collaborations can elicit significant resistance. Tensions thus appear as a result of the need to simultaneously transform old to new in order for innovation processes to progress (Lewis, 2000; Smith & Lewis, 2011). These findings may partly be explained by the desire to maintain a developed sense of purpose (i.e. rigid legacy structures) to retain exclusivity.

Extreme circumstances, on the other hand, were found to have the potential to loosen this rigidity over identity. This finding is in agreement with Lee and Shin (2018). They showed that

for established financial institutions, the expense of complying with regulatory regulations and competing against FinTech firms can be enormous. Banks were thus expected to make changes that were inconsistent with their organisational identity and draw on the insights of FinTech start-ups in order to remain at the forefront of innovation (Jarzabkowski et al., 2013; Lee & Shin, 2018). This demonstrates how strategies that permit synergy between opposing boundary logics (i.e. identity and power) can create new opportunities for innovation. Identity and power boundaries therefore have the potential to be transformative (Lauritzen, Salomo & La Cour, 2013) that renders it possible to assume that identity with power can be synergistic.

The findings lend support to both Ponchek (2016) and Van Horne et al.'s (2012) viewpoint to identify actor divergent perceptions of values in terms of a network of interdependent relationships as the essential purpose to collaborate (Clarysse, Wright, Bruneel & Mahajan, 2014; Gray, 1985; Hasche et al., 2020). It was clearly established by the findings here that the Quadruple Helix framework can be distinguished by the presence of various value constructs that can be contested.

There are several possible explanations for this finding. First, value creation was assessed individually by the different helices. An important challenge is created by the lack of any immediate link between individual member's efforts and the collective benefits. A salient tendency was that of individual helices balancing their own contribution in comparison to the fulfilment of responsibilities by others. In their comprehensive model of goal management, Huxham and Vangen (1996) emphasised the point that making progress in collaborations requires being willing to compromise on diverse agendas. This line of thinking, however, contradicts the findings of this research. Instead, they are in agreement with those obtained by Fernandez et al. (2014), who suggested that actor individual interests need not become irrelevant, nor do they need to be suppressed for the sake of the whole. In line with the literature, the findings reveal that tensions appear when one or more actors fail to realise the

expected values (Cunningham et al., 2018; Popa et al., 2020). One possible explanation for this is that reciprocation is not always immediate or direct, and as a result, collaborative outcomes were not satisfactory to all actors.

Second, the findings show that while each helix actor has the ability to capture and improve value in their own helix, they also have the potential to devalue or eliminate the value of other helix actors. As stated in Section 5.3.4, public participants may not always be able to collaborate due to a lack of capacity or skills, which exacerbate the lack of confidence in their resources, voice, or legitimacy. This tends to result in domineering behaviour and one-way dialogue flows, keeping important issues out of the decision-making arena and rendering them inaccessible. According to Purdy (2012), initiatives that are meant to be collaborative can be derailed if participants are unable to engage in meaningful conversations or construct shared meanings (see Section 5.3.3). This creates an incentive for influential actors to advance their own agendas over those of their collaborators, and thus increase the risks of opportunism. According to Ritala et al. (2013), a systemic structured process that takes into consideration the motivation of each actor early on assists in resolving potential conflicts and move decisions forward. The findings here, however, indicate that such mechanisms rarely exist.

Third, and in terms of the second boundary (or the power boundary), analysing power relationships in a multi-stakeholder collaborative setting such as the Quadruple Helix was difficult, given how complex and evolving these settings are (Schütz et al., 2018). The findings identify these power relations within the arenas of participation and action, and mirror those of previous studies that have examined power relations as "a network of relations, constantly in tension, in activity, rather than a privilege that one might possess" (Foucault, 1977, p.26) (see Section 3.5). The findings of this research have shown that boundaries can limit potential arenas for participation and can create inclusion/exclusion patterns in terms of how public members can contribute their views to decision-making. Participation can thus be determined

by balancing control and openness (Lauritzen et al., 2013; West & O'mahony, 2008). These further correspond to the concept of boundary defined by Hayward (2000) as "a network of social boundaries that constrain and enable action for all actors" (p.11). The findings also reflect those of Gaventa (2006) who found that the boundaries of participatory spaces are shaped by power dynamics in terms of "what is possible within them, and who may enter, with which identities, discourses and interests" (p.26). It is posited that power relations can establish boundaries in terms of who created the participatory spaces, whose agenda was pursued, and who controlled member representation (Gaventa, 2006).

In terms of who created the spaces, the findings reveal that inclusive processes may not ensure that invitees participate as these spaces are often regularised and controlled environments. One intriguing finding was that the financial services interactions arena may have established what Cullen et al. (2014) referred to as 'invited spaces'. Invited spaces is "where policy-makers invite outsiders to contribute their views to decision-making, allowing influence but within boundaries determined by the powerful" (Cullen et al., 2014, p.265). The examples provided here show that established power boundaries disabled FinTechs' ability to connect to these banks' real environments (see Section 5.3.4). As a data intensive ecosystem (Abdulkarim, 2020), FinTechs give rise to security concerns. FinTechs desire for more data about the consumer's context, circumstances, and behaviours was found to fuel data and privacy concerns. Controls were established to govern how start-ups and banks interacted in terms of investment requirements for admission and exit, testing plans and risk control. The findings here therefore support Purdy's (2012) argument that simply providing an open and inviting environment does not guarantee the cooperation of invitees.

Concerning the agendas pursued, the findings have shown that innovation initiatives originate with a top-down approach, frequently conceived by the regulator, to be cascaded down to industry and academia for implementation. As such, power was more likely to be

defined in terms of legal authority by the regulators to advance new directions for the adoption of the digital agenda (see Section 5.3.4). One revealing finding is that the top-down versus bottom-up dichotomy can be a source of crippling policy constraints. This rather unexpected finding could be attributed to actor concerns about the likelihood of regulators' ambitious economic targets being met, as well as the disconnect between regulatory efforts and practices that support innovation (see Section 6.2.1). The findings further reveal a fundamental lack of market research which fell short of having a clear impact in terms of synthesising knowledge for application and action. This gap was described as entrenched. It tended to reflect a situation in which research capacities were limited, making it difficult to obtain funds to scale up projects and increasingly impeding informed decision making and collective strategising. In practice, these targets were not effectively attained, and despite the aspiration, they failed to deliver opportunity (see Section 5.2.2). These findings are contrary to those of Purdy (2012) who argued that without authority "the problem or [the] common goal that brought participants together in a collaborative governance process may not be solved or achieved" (p.410).

In terms of member representation, it was revealed by the findings that invited spaces can be subject to power dynamics and can be seen as an example of 'false homogenisation' as termed by Luttrell et al. (2009), or "represented in ways which do not reflect their true diversity" (Cullen et al., 2014, p.267). It was seen that representatives were chosen in ways that failed to reflect the true diversity of members in order to demonstrate false homogeneity. Several factors could explain this observation. First, representatives were frequently invited to participatory networks with the expectation that they would support predetermined agendas, as outlined by Intermediary Participant No.7:

"One negative thing that I see in these meetings having a lot of people who always say positive things and not acknowledging anything that is wrong" (INT7, 49:04).

According to Trumpy (2008), this can be seen as a form of 'co-optation'. In other words, actors are able to "bring the interests of a challenging group into alignment with its own goals" (Trumpy, 2008, p.480). The findings here demonstrated that it was difficult to challenge the selection of public representatives, implying that actors had limited control over network composition. The question of who controls stakeholder representation has significant implications, especially if they are established to encourage fourth helix participation. The consequences of who is included and who is excluded can be seen in the subsequent interventions made by intermediaries, as explained further below. The experiences of power dynamics can shape the ability of participants to act. Less influential actors, as observed in the findings of this research, often took action in the form of non-participation in decision-making as "a manifestation of fear and weakness, or of indifference", as reported by Edwards-Schachter and Tams (2014, p.5), or withdrawal from involvement using the 'threat of exit' (Vangen and Huxham, 2003). These findings concur with Berti and Simpson's (2021) view on how disempowered members may accept their position in the network as untreatable, internalise a narrative, and emulate the discourse of powerful actors. This also shows how power can shape participants "sense of self and acceptance of the status quo – even their own superiority or inferiority" (Gaventa, 2006, p.29).

Second, influential participants can exclude other stakeholders in order to avoid extreme or radical viewpoints. Participants can be pushed to reach an agreement, which may result in a false consensus (Brand, Blok & Verweij, 2020). A consensus-oriented dialogue, according to Brown and Dillard (2013), may be used to further the goals of the most powerful actors. It can thus be argued that emphasis on alignment and harmony overlooks the fact that fundamental

differences (i.e. views and interests) can exist between the various actors. These findings further cast doubt on invited spaces and how much participation they allow. This may further explain why collaborations can reinforce existing exclusionary structures rather than provide opportunities for inclusion (see Section 6.2.1).

One particularly interesting finding was that the dominance of these participatory networks changed over time. As a collaboration progressed, the opportunities to exert power changed, for example, between organisers, those who set the agenda for work, and those who align seed funding. It can thus be assumed that power relations are not static, and the locus of power can constantly shift.

The following section focuses on the role of intermediaries as a means of bridging gaps and assisting in the management of the various tensions.

6.2.3 Intermediaries reinforcing gaps and tensions

The fourth research question aimed to investigate the role of innovation intermediaries in integrating the fourth helix. The literature generally agrees that open network innovation processes are coordinated "through a visible hand, often referred to as innovation intermediary" (Katzy et al., 2013, p.298). The Quadruple Helix framework brings together actors from four sectors for learning and process development by an intermediary (Björk, 2014). The notion of intermediary was viewed as a range of roles that help to coordinate the arena's diverse interests. The findings reveal that intermediaries appear at the intersection of all four social worlds that comprise the arena of financial services interactions (see Figure 4.8). It was also manifest that these intermediary roles did not belong to any of the four actors: academia; regulator; industry; or public. This finding is consistent with that of Björk (2014), who also found that they are not a helix on their own.

The findings here broadly support other studies, which confirm that not all intermediaries

had an official or formal mandate to perform the role; some arose spontaneously and were thus informal (Brès et al., 2019). However, one revealing finding was that intermediaries who frequently appear without an official mandate are unable to challenge or obstruct existing or future legislation. Formal or official intermediaries, as opposed to unofficial intermediaries, were able to directly influence regulators through lobbying actions, preventing the industry from being crippled by disabling regulations (see Section 5.4.4). Official intermediaries, through their interactions with regulators, were able to co-construct regulatory actions. They were also able to redefine the regulatory process and contribute to the deployment of regulatory solutions. This often involved reinforcing them, as well as disrupting them. In contrast to Brès et al. (2019), it appears that intermediaries in their formal roles are more important than informal ones.

Similar to Lindkvist et al. (2019), the findings show (see Section 5.4.2) that intermediaries evolve over time and that intermediaries can take various forms and play various roles. The findings further show that these forms and roles can overlap, creating ambiguous boundaries. As a result of the evolving role of intermediaries, intermediary roles frequently appear as traditionally novel. This explains why little was known about the role of intermediaries throughout the various stages of collaboration, as well as whether or not their role began or ended at a specific stage.

Although the proposition of intermediaries offers theoretical advantages (Secundo, Toma, Schiuma & Passiante, 2019; Villani, Rasmussen & Grimaldi, 2017), it is not apparent whether this would be the same in practice. The role of intermediaries has been emphasised in the literature on helix models of innovation. Intermediaries were viewed as an effective mechanism for reducing power differentials in helix networks (Johnson, 2008), and proposed as a means to bridge the gap between the various actors (Wright et al., 2008). However, in many instances, they merely exacerbated them. Several factors could explain this observation.

First, and in relation to the work by Lauritzen (2017), who found that intermediaries can help expose tensions and thus shape new understandings of them. Lauritzen (2017) also argued that intermediaries assist firms in managing innovation tensions by exposing their paradoxical nature. This is achieved by highlighting the interdependencies between its opposing dimensions and thus can reconcile divergent interests by making them complementary. The findings here, however, revealed that because intermediaries were unaware of the paradoxical nature of some of the tensions, they simultaneously and indirectly led to increasing power imbalances and fourth helix exclusion.

Second, Cunningham and O'Reilly (2018) showed that intermediaries interacting with a multitude of helix actors can enable the creation of new networks, and as a result, new helix structures are being formed, inside and outside Quadruple Helix spheres. This differs from the findings presented here. The evolving role of intermediaries highlights the complexity of their work. The findings here demonstrate that intermediary roles were confined by role characteristics, preventing them from spanning boundaries and integrating with other helix actors. These findings corroborate a great deal of the previous work in user-driven innovation and Quadruple Helix (Arnkil et al., 2010; Miller et al., 2016), in terms of how the role of intermediaries is still evolving, particularly in the area of "embracing the emergence of Quadruple Helix structures" (Miller, et al., 2016, p.9).

Third, the findings indicate that intermediaries' prior experiences may challenge their ability to construct and shape actor diverse needs and thus appear to inhibit effective communication. The findings reveal that intermediaries may lack the technical expertise and knowledge required to make appropriate judgments or decisions, as acknowledged by Intermediary Participant No.1:

"Other challenges, I would say the miscommunication, and there are times where being from a training and development background may cloud my judgement into thinking I know it all" (INT1, 12:35).

In a Quadruple Helix setting, 'social capital' has been "regarded as an important prerequisite and facilitator of knowledge and technology transfer" (Van Horne & Dutot, 2017, p.290). This study, however, was unable to demonstrate this tendency. As previously stated in Section 6.2.1, opportunities to foster informal links were infrequently perceived as joint collaboration. The findings show that not all intermediary efforts increase public capacity to collaborate. This is contrary to Brès et al.'s (2019) findings; they considered intermediaries to be in a better position to closely monitor individual interests. The findings reveal that intermediary intervention failed to ensure that individual interests do not supersede collective interests.

Fourth, it was shown that intermediaries, instead of bridging opposing interests, can expose actors in the different helices to new tensions (Lauritzen, 2017). In accordance with the literature on interorganisational collaboration, provoking discussions through confrontation can highlight a variety of incompatibilities, necessitating seemingly endless discussion and negotiation (Vangen & Huxham, 2003). As demonstrated by the findings here, exposing these incompatibilities facilitated a tension (i.e. lack of ownership and action), as indicated by Intermediary No.2 below:

"So, I have been in these forums where you've got lots of people from lots of different industries with different perspectives, and it's very difficult to get meaningful consensus, but anything beyond that becomes quite difficult because nobody wants to own it […] it just feels like the action element to these forums, you know agreement might happen, but no action comes from it" (INT2, 9:18).

Fifth, the findings further cast doubt on intermediaries' abilities to generate value internally through collaboration. According to the literature, on the one hand, the competitive advantage of an intermediary depends on both their network position and ability to acquire the knowledge obtained through such a position (Colombo et al., 2015). The findings here, on the other hand, suggest that the ability of intermediaries to externalise pertinent knowledge and influence potential partners interests and actions may be diminished. In contrast to the emphasis given to knowledge sharing and disclosure in the literature (Arrow, 1962; Laursen & Salter, 2014; von Hippel, 2005; Yang, Fang, Fang & Chou, 2014), the findings here reveal a tension between transferring knowledge while keeping its exclusivity. The tension between sharing and protecting knowledge corroborate the findings of a great deal of the previous work related to paradoxical tensions, or a 'paradox of openness' (Laursen & Salter, 2014), and the constant trade-off between control and openness. As confirmed in the extant literature, openness is often linked to a fear of appropriation (Laursen & Salter, 2014; Zobel & Hagedoorn, 2020).

According to Yang et al. (2014), rather than limiting disclosure, a high level of transparency can help restrain opportunistic behaviour. Intermediaries were prompted to address the "conflict or trade-off between knowledge exchange and knowledge protection" (Yang et al., 2014, p.347), and avoid misappropriation of that same knowledge. The findings reveal that intermediaries can lack independence in terms of facilitating knowledge transfer while protecting commercially sensitive knowledge. Although intermediaries, as shown in the Findings Chapter (see Section 5.4.4), provided several safeguarding mechanisms (e.g. patenting, bad leaver clauses, and infringement insurance) to reduce opportunistic behaviour, it was discovered that intermediaries had to employ informal mechanisms to balance trust and control. This explains why separate conversations were held with bank representatives and those representing FinTechs. This demonstrates that the ability of intermediaries to shape interests and increase the likelihood of participating actors reaching a shared understanding

and mutuality can be diminished.

Sixth, the findings show that intermediaries can limit access to the FinTech ecosystem, thus undermining collaboration and resulting in power imbalances. Intermediaries were found to have a direct impact on both network construction and its structural characteristics. According to the findings here, only public participants with promising and innovative ideas were chosen through referrals and personal contacts. This can be explained by the fact that intermediaries did so in order to avoid integration issues caused by insignificant input contributions, as well as a loss of decision-making quality (see Section 5.4.4). An implication of this is the possibility that partners from various helices will mediate the opportunity and scope for public participants to exercise agency inside these innovation processes.

Seventh, the findings show that intermediaries can influence participation through established patterns of financial dependency by limiting access to capital (see Section 6.2.1). Influence stemmed from the unequal distribution of financial packages. The premise that all actors in a given innovation process should gain or benefit equally is relevant here. At the very least, no helix should gain an undue advantage at the expense of the other helices. Instead, intermediary efforts, as noted by Academic Participants No.2 and 3, reduced sources of potential capital that could flow into FinTechs. As stated in the Literature Review Chapter (see Chapter 3), this also contradicts "the premise of a functioning quadruple helix, where all stakeholders should have mutual interdependence" (Miller et al., 2016, p.393):

> *"The fact that [Intermediary No.4] holds the power of finance makes it less of an intermediary, more of a party in the power struggle" (A2, 2:00).*

> *"I mean I think a lot of times access to capital is a huge problem […] Even with the co-space incubators, not all of them got the advantages of the Covid19 package or the economic support package […] [Intermediary No.4]*

is a very direct stakeholder here, and they have a lot of money, but the question is how this money is being distributed […] the methodology of distributing the funds was not systematic enough in a way that makes since. So, these management issues need to be looked at" (IND3, 54:11).

Eighth, intermediaries can help public participants practice openness only through control. Arnkil et al. (2010) demonstrated hackathons as clear examples of a Quadruple Helix model where users have more agency as public members working with other partners. The findings in this study suggest differently. This is due to the relational dynamics that structure hackathons and the terms under which public members participate via pre-planned contractual and relational structures (i.e. themes, contacts, patents, equity shares). The findings, which are consistent with those of Lauritzen (2017), show instances where intermediaries have been assigning formal but temporary roles and responsibilities to public participants in relation to the innovation process (e.g. FinTech consortiums or incubators, hackathons, entrepreneurial start-ups, the regulatory sandbox).

The findings of this study do not support the previous research on Quadruple Helix which emphasise the importance of intermediary organisations being active to help bridge gaps (Cunningham et al., 2018; Lindberg et al., 2014), manage paradoxes (Lauritzen, 2017), and the progression of knowledge transfer (Lindkvist et al., 2019). Taken together, the most significant finding is that intermediary intervention may not always be helpful nor guarantees effective communication. Intermediaries have been proposed as a method of bridging gaps and tensions between actors (Lindberg et al., 2014). In many cases, however, they merely aggravated them.

6.2.4 Implications of the integrative framework

In this chapter, an integrative framework was presented to show the Quadruple Helix and the collaborations that underpin it. This study provides a dynamic theoretical framework

presented in Figure 6.1. This was based on a processual approach and situational analysis to help explore how the Quadruple Helix unfolds.

The Quadruple Helix model sits at the heart of the integrative framework in Figure 6.1. This exemplifies how partners collaborate to introduce innovation processes into the FinTech ecosystem in order to experiment and design innovative banking and financial solutions while keeping the public partner interests and the fourth helix into consideration. The fourth helix can serve as a tool and driving force in this context, potentially shifting narrowly focused innovation processes to emphasise societal and sustainability challenges. Figure 6.1 further depicts a framework that captures the process with the intervention of an intermediary actor, and illustrating "visually how [the researcher] moved from raw data (e.g. interview data) to the theoretical labels or constructs [used] to represent that data" (Pratt, 2009, p.860). The model presents gaps pertaining to Quadruple Helix innovations as the insufficient capability of the three actors (academia, regulators and industry) to involve public partners in the development of innovations. The framework demonstrates that when the fourth helix is not fully integrated, an unbalanced Quadruple Helix can result. This, as illustrated in the framework, was largely due to a lack of agreement on what constitutes the fourth helix and the multitude of helices in which the fourth helix can be properly placed.

The gaps, as shown in the framework, further resulted in difficulty in involving actors in innovation processes. By its very nature, the fourth helix was found to be implicated with tensions. Interestingly, some of these tensions were paradoxical in nature, as they exposed conflicting but interdependent poles that reproduced themselves, and thus appeared to persist over time. The four tensions depicted in the framework in terms of interests, motives, values, and power, were investigated as constant trade-offs between conflicting forms of power and identity. It was thus possible to speculate the tensions as constitutive of the Quadruple Helix, and that they shaped its interactions. This prevents the public partner from being a part of the

Quadruple Helix relationships' strategic core, which may explain the general difficulties in involving public partners in Quadruple Helix co-development and co-design processes.

Finally, the framework explores intermediaries as a means of bridging the gap and resolving tensions. The framework demonstrates that intermediary intervention is not always beneficial and does not ensure that gaps or tensions are bridged.

The framework aims to provide a useful heuristic for explaining the implications of integrating the fourth helix, as well as the processes that may serve to limit and undermine public participation in Quadruple Helix activities. The integrative framework can have significant implications for Quadruple Helix theory and policy. If the inclusion is expanded to respond to societal challenges, it can be argued that a much better understanding of the development processes of the helices is required, with the fourth helix being proposed as an inclusive framework.

Until recently, theoretical models of the Quadruple Helix innovation model mostly adopted a macro regional point of view (Caetano, 2017; Cavallini et al., 2016; Ivanova, 2014; MacGregor et al., 2010). This research adds to these studies by proposing a framework that adopts a micro perspective (Miller, Mcadam, Moffett, et al., 2016).

First, by employing a processual theoretical approach and emphasising interactions and events empirically (Kriz et al., 2018; McAdam et al., 2018), this research offers a dynamic theoretical framework for describing the implications of integrating the fourth helix into the trilateral innovation efforts of academia, regulators and industry. This research has further investigated how micro-processes influenced how distinct helices unfolded and emerged over time. This contributes to the integration process by providing a detailed empirical description (Carayannis & Campbell, 2011), as well as theoretically advancing the processual nature of the helix model.

Second, this research demonstrates the properties of the Quadruple Helix as being emergent,

dynamic and unfolding. As such, the findings contribute to the Quadruple Helix literature, which proposes the fourth helix as an inclusive framework (MacGregor et al., 2010) by indicating that the fourth helix reinforces the existing structural inequalities, thus revealing an unbalanced Quadruple Helix.

Third, through theorising on a processual model of Quadruple Helix, this study helps show that a processual approach enables a more nuanced understanding of the tensions. Further, it helps uncover the collaborative gaps and tensions that underpin interactions in the helix and shows their interrelations. This study extends previous research which found tensions were both inherited and unavoidable in helix contexts (Fitzpatrick & Malmborg, 2018; Van Horne & Dutot, 2017) by demonstrating that, beyond that, tensions are constitutive of the Quadruple Helix environment and the shaping of its interactions.

Fourth, while mediators have been presented as a means of bridging gaps and tensions between actors, (Lindberg et al., 2014), in many situations, however, they only aggravated them. In relation to the role of intermediaries, the integrative framework opens up new areas for tensions that an intermediary may create in addition to the tensions that exist between the four helix actors.

6.3 Summary

This chapter has discussed the findings of the study with reference to contemporary literature. Subsequently, the chapter was structured to conceptualise the role of the fourth helix; how it is integrated, what are the implications of these forms of integration, and what is the role of the intermediaries in these processes. This is accomplished by illustrating their interrelationships, and that they are constitutive of the Quadruple Helix interactions and the shaping of its interactions. This research implies that collaborations in a Quadruple Helix framework are ambiguous, complex and dynamic. The interdependence of the various actors

suggests that individual actors were frequently unable to achieve objectives that completely met their needs without being influenced by other helix actors. As a result, while the innovation may be created collaboratively, its value will be contested, thereby presenting power relationships. It is therefore reasonable to suggest that designing the networks structure without disintegrating the fourth helix is unlikely to be a simple task. This study further investigated how gaps in relation to the insufficient capacity to incorporate the fourth helix, and the tensions that arise from their incorporation, are managed by innovation intermediaries. The research suggests that not all intermediary efforts improved public capacity to participate in collaborations. Despite being proposed as an effective mechanism for bridging gaps and reducing power differentials in helix networks, in many instances they merely exacerbated them. Figure 6.1 summarised the theoretical model.

The following chapter discusses the conclusions, contributions, recommendations, limitations, and future research opportunities.

7. Conclusion

7.1 Introduction

Based on the Findings and Discussion (see Chapters 5 and 6), this chapter presents the conclusion of this study. First, it emphasises the research contribution in terms of how the research questions are addressed, and the theoretical contribution to the emerging body of literature on the Quadruple Helix model and innovation intermediaries. It also emphasises the research methodological contribution. Following this, it offers a number of practical recommendations. Finally, it identifies the research limitations as well as potential future research opportunities.

7.2 Research contribution

7.2.1 Research questions addressed

This section revisits the research questions to emphasise the extent to which they were addressed, as well as to set out the study's main findings. The aim of this study was to gain a comprehensive understanding of how interactions in the Quadruple Helix are structured, coordinated, and managed in Bahrain's emerging FinTech sector, where multiple diverse stakeholders interact. The study employs an 'exploratory' and 'explanatory' approach to investigate how the fourth helix – public/civil society – is perceived and integrated into existing trilateral innovative networks between academia, regulators, and industry, as well as the implications of such integration. This study also examined in detail how innovation intermediaries managed the gaps caused by insufficient capacity to incorporate the fourth helix, as well as the tensions that arise as a result of their incorporation.

Research question one: *How is the fourth helix perceived?* The first research question in this study sought to determine how the fourth helix was perceived. This can explain the gaps existing in adapting an inherently participatory framework such as in the Quadruple Helix model of innovation, and in regards to integrating the public participant. The fourth helix or the public actor, as indicated in the findings, was specifically connected to a recent market reform initiative that embraced diversification and innovation. Therefore, involving members of the public was part of the participatory collaborative nature of the financial services sector interactions arena and FinTech start-ups. The most significant finding to emerge from the analysis was that there was no agreement on what constitutes the fourth helix. The findings show that there were various points of view as to delimiting this fourth group. Another noteworthy finding is that the role of the fourth helix, through public participation, appeared to belong among any of the other three helices of government, industry, and academia. This role was found to be undertaken by a relatively large number of participants and practitioners. These

include students and learners, government entities, entrepreneurs, start-up companies, external consultants and auditors, customers, and consumers. Moreover, these roles were perceived as changing. In other words, the fourth helix was determined to have multiple roles, depending on the collaborative contexts and the purpose of consultation. This further contributed to the difficulty that actors faced with delimiting the fourth helix.

Research question two: *How is the fourth helix integrated?* Due to the existence of several definitions regarding what comprised the fourth helix, there was no clear direction on the various degrees and levels of participation by public members as the fourth helix. These ranged from more empowering to fewer empowering roles, and direct to very indirect ways of participation. Further, it depended on whether the innovations were developed for, with, or by the public members themselves. The inability to conduct successful participation and collaboration was attributed to several structural challenges. Compared to jurisdictions undertaking bottom-up initiatives, the need for innovation ecosystems and local strategies were often originated and conceived by the regulator, to subsequently be cascaded down to industry for implementation. Participants believed that having a conducive regulatory environment was important to facilitate and support many of the bottom-up entrepreneurial initiatives, and the operation of the financial services sector ecosystem. Several of these networks created exclusion, in terms of class, income, or language barriers. The openness for innovation therefore varied in terms of accessing the financial services sector ecosystem, and the opportunities to work and innovate were not available to everyone. Therefore, the fourth helix was underrepresented.

The findings of this research show that the participants' perceptions regarding the fourth helix resulted in three gaps which characterise their integration. These were often associated with public members competencies and willingness to influence, actors' various capacities and willingness to share influence, and the advanced knowledge or market research on each other's

specific requirements and expectations.

With respect to the first gap, it was found that public participants require specific competencies, knowledge and skills in order to navigate effectively and define their own role within the system. One noteworthy finding was that fourth helix exclusions were often motivated by public participants' scepticism concerning their ability to affect change or influence decisions. This could be attributed to the limited information provided to public members (e.g. the communication gap as explained below) about the innovative solutions conceived by the other actors. There was often a communication gap, and commitments involving public participants did not always take the form of explicit or discrete decisions. One finding was that media was a marginalised or implicated actant, in terms of transmitting innovation policy aims and discourse between decision makers and public members.

Regarding the second gap, this was identified in relation to actors' capacity and willingness to share influence and relinquish their decision-making power to public participants. Participants were generally less convinced that relationships with public members could lead to innovation and expressed concern over public members providing fragmented, irrelevant and often insignificant inputs. Another possible explanation for this is that actors were often influenced by stereotypical attitudes towards public contributions, and suspected that involving the public in decision-making would be detrimental. Therefore, not all public contributions were explicitly considered to fit into the networks' agenda.

Concerning the third gap (i.e. market research), it was found that there was a fundamental lack of market research which fell short of having a clear impact in terms of synthesising knowledge for application and action. This gap was described as entrenched. It tended to reflect a situation in which research capacities were limited. This made it difficult to obtain funds to scale up projects, further impeding informed decision making and collective strategising.

Responses to research questions one and two have revealed an 'unbalanced' Quadruple

Helix, where the fourth helix is not fully integrated (see Section 6.2.1, and Appendix 8).

Research question three: *What are the implications of fourth helix integration?* The extension of the trilateral interactions between academia, regulators and industry to incorporate more classes of actors via the participation of the public, was further associated with tensions that transcended the innovation process. This was useful in understanding the nature of the tensions that can arise and the reasons why they arise. Four distinct tensions were identified: Conflicting interests; Incongruent collaboration motives; Divergent perceptions of the collaboration's value; and Power dynamics and asymmetries. Interestingly, these tensions were often paradoxical in nature as they reproduced themselves and appeared to persist over time.

Concerning the first tension, the findings suggest that participating in collaborative conversations is to participate in an endless struggle between two inseparable roles: their individual constituents (i.e. social worlds); or the collective group (i.e. the financial services interactions arena) with whom they share joint tasks. This resulted in ambiguity in what is being represented. These were often described as entrenched in the collaborators' diverse worlds. The tensions were further intensified due to the iterative nature of the innovation process, as well as representation issues and actors being forced to take on new roles with unclear responsibilities.

Regarding the second tension, the conflicting interests further compelled tensions with partners holding and promoting incongruent collaboration motives. Examining these interests provided an early indication of the varying motivations and unequal incentives to collaborate. Thus, the relationships between the four helices were found to be guided and underpinned by varying motivations. In general, the actors were not equally incentivised to join the collaboration meetings. Therefore, sustaining the motivations of the different actors and engaging them actively in the innovation processes was found to be challenging. Occasionally, commitments towards the collaboration did not last the entire process, and hence the actors

were often hindered by the discontinued nature of interactions.

In relation to the third tension, the various motivations that propel partners to collaborate across sectors were found to generate incompatible values, giving rise to divergent perceptions of collaborative value. A salient tendency was that individual actors faced the tension of balancing their own contribution in comparison to the fulfilment of responsibilities by others. The actors, however, often came with preconceived expectations regarding collaboration outcomes and objectives. In other words, for them, value was measured by individual actors depending on their collaboration motives. Tensions were most likely to occur when anticipated values went unrealised by one or all actors. They tended to work together if they perceived that the cooperation brought value; however, often many were not persuaded by the benefits.

Concerning the fourth tension, the multi-sector relationships under the Quadruple Helix framework offered valuable insights into the power dynamics and asymmetries that governed the collaboration networks. The findings highlighted that these power relations can establish boundaries in terms of who created the participatory spaces, whose agenda was pursued, and who controlled member representation. Thus, some of these spaces were described as closed. In other words, they allowed less freedom for outsiders to influence the innovation processes, while other spaces were more open to including outsiders. Although the composition of members may fluctuate over time, representatives from the regulator, academia, and industry often dominated and persisted throughout.

Responses to research question three and the experiences of Quadruple Helix partners demonstrates that the tensions identified are constitutive of the Quadruple Helix and shape its interactions (see Section 6.2.2, and Appendix 8).

Research question four: *What is the role played by intermediaries in this integration?* The question sought to determine the role that intermediaries play in facilitating the integration of the fourth helix. This necessitated further investigation into determining who they are, what

challenges they face, and the extent to which they are involved in the various stages of innovation.

The findings revealed that several actors enacted the role, either internally or externally. However, not all intermediaries had an official or formal mandate to perform the role; some arose spontaneously and were thus informal. The findings highlighted the fact that intermediaries working at the interface between Quadruple Helix actors can undertake considerably more functions than their traditional role. Importantly, these roles can vary over time and they may involve the need for new functions. The extended roles for intermediaries were, however, viewed as traditionally new. This appears to suggest difficulties in accepting these new roles and thus limiting their capacities as intermediaries. This provides an explanation as to why little was known about the role of intermediaries throughout the various stages of collaboration. It also indicated limited knowledge regarding whether or not their role began or ended at a specific stage.

Intermediary supported networks were typically made up of various groups of actors, and hence maintaining congruence was found to require an ongoing effort. Intermediary participants, therefore, acknowledged the need to demonstrate competencies to be trusted with influencing a collectively shared insight. Intermediaries encountered friction in their relationship building activities and they had to overcome the challenges associated with facilitating negotiations across the various boundaries. Several mechanisms were employed by intermediaries to help bridge the gaps and resolve collaborative tensions, without disintegrating public members.

These were often applied throughout the various stages of the innovation process. Intermediaries were found to be beneficial with regards to constructing and developing the networks, reducing uncertainties, and increasing the social costs of opportunism. They also provided an efficient evaluation of the market and the ability to secure funds. However,

intermediaries, on the other hand, and as demonstrated by the findings, tended to expose incompatibilities and the ambiguities by provoking discussion and confrontation. These practices tended to create further tensions (i.e. lack of ownership and action). Furthermore, the findings show that intermediaries influenced participation through established patterns of financial dependency by limiting access to capital (see Section 6.2.1). According to the findings, only public participants with promising and innovative ideas were chosen through referrals and personal contacts. This can be explained by the fact that intermediaries did so in order to avoid integration issues caused by insignificant input contributions, as well as a loss of decision-making quality.

Intermediaries were thus found to create miscommunications, influence access to the networks, and generate power imbalances. Consequently, intermediary intervention was insufficient to ensure the inclusion of the fourth helix into the participatory frameworks of the Quadruple Helix.

Responses to research question four revealed that intermediaries can in many instances reinforce the gaps and tensions between the different helices (see Section 6.2.3, and Appendix 8).

7.2.2 Theoretical implications

This study provides a dynamic theoretical framework for describing the implications of incorporating the fourth helix into the innovation efforts of academia, regulators, and industry, as well as the processes that may serve to limit and undermine public participation in Quadruple Helix activities. As the first observation, the integrative framework identifies an unbalanced Quadruple Helix. Second, and based on this framework, tensions are constitutive of the Quadruple Helix, and are shaping its interactions. This prevents the public partner from being a part of the strategic core of helices relationships, which may explain the general difficulties

in involving the public partner in Quadruple Helix development processes. Third, the framework demonstrates that intermediary intervention is not always beneficial and does not guarantee that the gaps or tensions are bridged or resolved.

The framework draws together findings from a number of micro-processes aimed at developing innovations that are driven by the processes of co-creation within and between Quadruple Helix actors, as well as investigating procedures that allow public participants to be empowered through the fourth helix. This integrative framework has significant implications for Quadruple Helix theory and policy should the fourth helix being proposed as an inclusive framework.

This thesis contributes to existing knowledge in two areas: the Quadruple Helix model of innovation; and innovation intermediaries.

The thesis contributes to the emerging body of literature on the Quadruple Helix model of innovation in five ways. First, by adopting a micro perspective (Miller et al., 2016), it uncovers the collaborative tensions that underpin interactions in the helix and shows their interrelations. This study explored the nature of these tensions, the reasons why they arise, and the strategies employed by the various actors to address them.

Second, this research extends previous research which found that tensions were both inherited and unavoidable in helix contexts (Fitzpatrick & Malmborg, 2018; Van Horne & Dutot, 2017), by demonstrating that, additionally, tensions are constitutive of the Quadruple Helix environment and the shaping of its interactions (Hafedh, Vasconcelos & Jimenez, 2020).

Third, by demonstrating the dynamic, unfolding, and emergent properties of the Quadruple Helix, the findings contribute to the Quadruple Helix literature, which proposed the fourth helix as an inclusive framework (MacGregor et al., 2010), by indicating how the absence of an adequate integration of the fourth helix reinforces existing structural inequalities, thus revealing an unbalanced Quadruple Helix.

Fourth, by emphasising interactions empirically in conjunction with a processual theoretical perspective (Kriz et al., 2018; McAdam et al., 2018), this thesis contributes to both an in-depth description of the integration process (Carayannis & Campbell, 2011), and how the helices micro-processes emerged and unfolded over time. This was found to aid in exploring how the Quadruple Helix unfolds by referring to how the helices interact with one another over time, as being fundamental to how the fourth helix is integrated. As a result, this study fills a recent gap in the literature in terms of the theoretical advancement of the helix model's processual nature (Kriz et al., 2018; McAdam et al., 2018)

Fifth, this research adds to the growing body of knowledge of Quadruple Helix being based on a processual narrative and situational analysis. There are few studies that contribute to the empirical description of the fourth helix integration process (Carayannis & Campbell, 2011), and few qualitative research that utilises situational analysis toward grounded theorising framework. The current study adds to the existing body of knowledge on Quadruple Helix by providing richer insights into the critical aspects of interaction. Further, it elaborates the complexities of the situation and elucidates marginalised perspectives (Clarke, 2005).

This thesis also contributes to the growing body of literature on innovation intermediaries which have been presented as a means of bridging gaps and tensions between actors (Cunningham, Menter & O'Kane, 2018; Lindberg et al., 2014; Lindkvist et al., 2019), or to reconcile divergent interests by making them complementary (Lauritzen, 2017). In many instances, however, according to this research, they merely exacerbate them. Inadvertently, and without being aware of the paradoxical nature of some of the tensions, then, intermediaries have contributed to increasing power imbalances and fourth helix exclusion.

7.2.3 Methodological contribution

Situational analysis was found to make a significant methodological contribution in three ways.

First, in terms of importance and significance, and how it generates knowledge that alternative methods did not generate, or how it avoids replicating their problems (Bartunek et al., 1993). In this research, situational analysis allowed overcoming one-sided views of phenomena (Kalenda, 2016). Conducting situational analysis enabled emphasising on the discourses that are part of the situation, and how collective actors create meanings and commitments (Clarke, 2005). This study advances the idea that a process-analytical approach to the Quadruple Helix, with a focus on social worlds/arenas, can provide a solution to operationalisation issues that are frequently associated with a stakeholder-analytical perspective (Popa et al., 2020), as well as requests for micro-level investigations into collaborative conflicts and frictions (Cuppen, 2012). According to Langley et al. (2013, p.1) "process studies focus attention on how and why things emerge, develop, grow, or terminate over time". In such a view, over time, context is constantly reconstructed "within and by processes of interaction" (Langley et al., 2013, p.5), causing unpredictable and mostly uncontrolled activity chains constituted through its relations to other events in which actors "are all in constant and mutually interacting flux" (Langley et al., 2013, p.5). Using the maps, situational analysis provides unique visuals for the micro-processes that constitute a situation and how the different helices emerge and unfold over time. As an analytical process that employs mapping to visualise the components of a situation in order to capture complexity, situational analysis was useful for identifying patterns across the different helices and to uncover how the helices involved are shaped and produced in interactions with each other.

Second, compared to previous generations of grounded theory, situational analysis provides a means of openly and explicitly discussing the role of power in shaping interactions between

the different helices, to gain a broad perspective and consider the structural forces present in the situation. Situational analysis, for example, helped identify important silences (Mathar, 2008). The mapping exercises helped move beyond interview transcripts to elucidate marginalised perspectives (Rachel, Adele & Carrie, 2020). This revealed which actors have lost aspects of their ability to participate and shape action(s), as well as how they have done so. Situational analysis can therefore be viewed as more democratic in terms of representation, whereby significant power is granted to the less powerful worlds (Clarke, 2005).

Third, in terms of adhering to accurate and methodologically sound strategies (Bartunek et al., 1993), as stated in the Methodology Chapter (see Chapter 4, Section 4.6.2), situational analysis can be considered to be adequate and appropriate. Situational analysis was found to be sufficiently comprehensive as a methodological approach for the underlying investigation (Bartunek et al., 1993). Methodologically, it retains the strong systematic approach of grounded theory to mapping analysis (Clarke, 2005). The researcher was able to carefully examine the data and ensure that the concepts and categories were "grounded in data" (Glaser & Holton, 2004, p.48) by employing grounded theory procedures such as constant comparative analysis. The analysis made use of three key sets of tools (i.e. situational maps, social worlds/arenas maps, and positional maps) (Clarke, 2005), and assisted in exploring the critical aspects of interaction (Clarke, 2005). The mapping strategies were employed to provide an in-depth examination of the various facets of the situation under investigation (Clarke, 2005). They aided in developing a substantive theory in order to represent the implications of incorporating the fourth helix into the Quadruple Helix framework, as well as the role of innovation intermediaries in managing them. This enabled the researcher to combine situational analysis with numerous qualitative data collection approaches into a single methodological framework.

7.3 Practical implications and recommendations

This study provides an understanding of the various perceptions regarding the fourth helix. The findings provide a tentative explanation as to why public members may be at a disadvantage and explain the gaps, structural challenges, and numerous limitations in the capacity to integrate the fourth helix. Hence, the findings help improve awareness of how the fourth helix can reinforce the existing structural inequalities and result an unbalanced Quadruple Helix.

The integrative framework in Figure 6.1 can be viewed as a tool by policymakers and practitioners convening collaborative structures and promoting them, based on how this study identifies systemic failures in participatory frameworks, to avoid existing structural challenges and inequalities and thus enable inclusive innovation. Three implications are presented below.

First, the findings draw attention to what is a minimum requirement for a democratic form of governance with the fourth helix being proposed as an inclusive framework. If the inclusion is expanded to respond to societal challenges, it can be argued that a much better understanding of the development processes of the helices is required.

Second, the findings enhance awareness of why the practices that should enhance inclusion of public members can simultaneously and indirectly lead to increasing exclusion or fourth helix disintegration. The findings draw attention to the paradoxical nature of inconsistencies and the contradictions or interrelationships between the various attempts to integrate the fourth helix. This offers practical insights into what factors may impede regulatory efforts and ambitious economic targets, as well as the discourse of inclusive frameworks. These findings also provide practical insights that are beneficial for academic representatives. In particular, it shows how, paradoxically, emerging FinTechs may face a shortage of domestic talent and expertise.

Third, this research has implications for Quadruple Helix planning practices in terms of becoming more aware of the role of intermediaries early in the innovation processes. This research can help understand whether intermediary intervention can aid in the integration of the fourth helix. The findings further contribute to raising awareness that intermediary intervention may not always improve public participation and thus limit opportunities for its inclusion.

Therefore, a number of recommendations are advanced based on the significance for practice. These were made in relation to different domains (education, policy, and practice).

1. **Restructure the top-down modus operandi.** Policy formulation, in the context of a top-down modus operandi, according to the findings, was seen as unsuccessful and crippled innovation policies. The solution lies in a combination of both top-down and bottom-up processes to help integrate actors whose potentials have currently been insufficiently expressed or effectively supported. Mechanisms or dissemination schemes must be created to ensure that public concerns are factored into decision-making processes.
2. **Provide a structured framework.** Actors should develop a strategy for setting up a collaborative network that defines its structure. When the four helical partners come together to jointly construct a shared goal, they must address disparities between the various actors' agendas, ideally in coordination with one another. This entails establishing a systemic process firmly anchored in mutual relationships. By doing this, the parameters for collaboration can be clear and any misunderstanding or conflicts are avoided.
3. **Develop a pipeline of FinTech talent.** Structural challenges remain to enter into FinTech roles. As key players in the FinTech ecosystem, there should be a focus on both the incoming and existing workforce. This entails developing a pipeline of

FinTech talent (e.g. FinTech-related educational resources) while also encouraging upskilling of the current workforce. This aims to bridge the gap in technical and entrepreneurial skills.

4. **Improve capacities to support fourth helix integration.** To avoid a fragmented and unbalanced Quadruple Helix collaboration, the actors must recognise the underlying tension between innovation and participation rhetoric, which considers public members to be equal partners in the innovation process. Hence, a significant amount of effort and energy should be invested in the identification of contradictions and the development of management approaches to manage gaps and tensions of a paradoxical nature. Attention may usefully be directed at synergies and complementarities.
5. **Enhance the role of research and media.** When considering the innovation process, the media is frequently overlooked or undervalued. These can serve as an infrastructure for the development of democratic forms of governance and developing FinTechs' current and future workforce. Workshops, events, conferences, and community participation can all help key ecosystem players raise awareness. Moreover, Quadruple Helix partners can shed light on the role of research and use big data analytics to define which populations are included and which are excluded, given how the means of social exclusion are changing through widespread digitisation of financial services.
6. **Monitor intermediary role.** Intermediaries need to publicise their potential impact and availability. In order to maintain a high level of transparency, practices and routines meant to maintain influence on potential collaborators and influential decision makers should be closely monitored. This helps to carefully balance trust and control, avoiding power imbalances or the perception of control loss.

7.4 Limitations and directions for future research

All research has limitations, and this work is no exception. The limitations are reflected in four perspectives, and to address these, corresponding directions have been proposed, which future research can investigate further.

One of the limitations is that this study was partially conducted during the COVID-19 pandemic. Due to lockdown restrictions, all forms of official activities were suspended. Therefore, participant availability and overall willingness to take part in the research were affected by the current situation, as they had, at the time, limited access to their work emails and organisational resources. This also affected gaining access to some important data sources, such as policy documents and minutes of meetings. Therefore, data collection had to be put on hold until the lockdown was eased, and participants resumed normal activities. Therefore, the strategies for the second and main phase of the data collection had to be rescheduled and re-considered, for example, restructuring interviews to be conducted online.

In addition, the sample could have been expanded to include a broader range of industry and civil sector actors. However, as this research follows grounded theory procedures, participants were recruited based on theoretical sampling and theoretical saturation (Glaser & Strauss, 1967). In this study, data collection and analysis were iterated until categories became theoretically saturated. Theoretical saturation occurs when the analysis does not reveal new relevant data and each category is developed with its properties (Corbin & Strauss, 2015; Glaser & Strauss, 1967). Theoretical saturation was reached in this study after thirty-two interviews.

This study provides potential insights for future research on the Quadruple Helix and innovation intermediaries. One possible direction for future research is to develop the emergent theory. Based on the integrative framework presented in Figure 6.1, and the emergent theory, future research can delve deeper into other categories that may affect Quadruple Helix micro-

processes and how the different helices emerge and unfold overtime. The findings of this study, for example, revealed some tensions with a paradoxical nature that transcended the inclusion of the fourth helix. This research proposes a future agenda to draw on a paradox meta-theory to investigate the ways that paradoxes emerge in Quadruple Helix interactions, capture the interrelationships of tensions and paradoxes, and determine the synergistic potential of a tension's elements and how they can be managed.

In addition to the intermediaries studied in this study, future research should broaden the unit of analysis at the individual level to investigate interactions as new stakeholders emerge within a Quadruple Helix.

Furthermore, because this study only investigated the financial services sector in Bahrain, future research can look into how interactions in the Quadruple Helix are structured and managed in different contexts. As a result, future research may use data from other emerging markets to validate and extend the Quadruple Helix framework, as each context may yield unique insights.

7.5 Summary

The chapter provided the conclusions of this research. The first section restated the research questions to summarise the main findings and to illustrate the extent to which the research questions were addressed. The findings of this study revealed an unbalanced Quadruple Helix in that the fourth helix is not fully integrated and have shown that the fourth helix is inherently implicated with tensions. The findings also revealed that the intervention of intermediaries is not always beneficial in terms of bridging the gap between the various actors or resolving collaborative tensions without disintegrating public members. The theoretical contribution of the research to current literature on the Quadruple Helix model of innovation, collaborations and organisational tensions, and innovation intermediaries was established in the second section. Based on the theoretical framework, this study provides a dynamic for describing the

implications of integrating the fourth helix and how micro-processes influenced how the helices unfolded over time, theoretically advancing the processual nature of the helix model. The third section examined the practical implications of this research and made a number of recommendations. Finally, the concluding section acknowledged the limitations of the study and offered promising areas for future research. Despite the fact that the findings are relevant to the financial services sector in Bahrain, they may be applicable to other industries as well. Future research can build on this research by expanding into new contexts, for example Bahrain's other sectoral priorities (i.e., public health and ICT) and by investigating their relevant stakeholder communities.

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Appendices

Appendix 1: Interview Guide: Pilot stage

CODE: **INTERVIEW GUIDE – Academic participants.**			
Interviewee Name		**E-mail/ Phone**	
Organization /Department		**Job title**	
Date/Time		**Place**	

Interview opening:

- Express gratitude to the respondent for agreeing to participate in the study.
- Explain the research's objective and significance.
- Discuss the ethical issues.
- Obtain authorisation to tape the interview.

Section A	**Background Questions**

. To start, why don't you tell me a little about yourself?
  - What is your professional background? (How you came to this role?)
  - What is your main role?
  - What are the key responsibilities of your position?

Section B	**Knowledge transfer and network dimensions – exploring the Quadruple Helix context and dynamics** ➢ Who are the key actors? ➢ What interaction takes place among them? ➢ What forms of knowledge are transferred? ➢ What knowledge transfer processes occur between them?

1. Would you please describe the programmes your institute offers?
2. How are these programmes planned and structured?
3. I understand that your institute was established by the Central Bank of Bahrain, and works closely with major banks and insurance companies, can you describe this association?
4. What experiences do you have of interaction/collaboration activities between your organization and external partners?
5. Who participates in these interactional relationships? (stakeholders)
6. Are there any strategies developed for an appropriate stakeholder involvement?
7. Are these interactional relationships based on mutual understanding or contract?
8. Would you please describe how these relationships develop and evolve? Could you kindly respond by referring to the nature of relationships in the past, present, and what you expect in the future, if possible?
9. What forms of knowledge have been shared/exchanged/transferred in these collaborative initiatives?
10. Who initiates this exchange/transfer process? (What's the mechanism and process)
11. How do you collect this knowledge? Do you conduct meetings for this?
12. How do you ensure the input from different sources is effectively collected and utilized? (Articulate needs precisely)
13. What do you think are the distinct phases in this knowledge transfer process?
14. How do you view your role as a partner in a collaborative project?
15. What expectations do you have of other partners in this collaborative project?
16. Which network of relationships is the most important and useful in acquiring the knowledge you need and why? (Internal or external)
17. What benefits did your institution see in interacting with different stakeholders? (Advisory services, knowledge and competencies, access to industry skills and facilities)

Section C	**Conceptualisation of power and intermediaries and how it coalesces**

	with Quadruple Helix interactions ➢ What is the impact of knowledge boundaries on such processes? ➢ What is the role of intermediaries? ➢ What is the role of power imbalance in shaping the knowledge transfer process?

1. How can everyone, diverse stakeholders, interact in a meaningful way if they do not share the same institutional context? (Shared vision)
2. How much influence is given to the different stakeholders? who are the most salient/dominating stakeholders? (Introduce change, takes leadership, decision making power)
3. What potential challenges/tensions may emerge because of the diverse stakeholders? (Competition, workplace culture, objectives and interests of individual stakeholders)
4. How are challenges/tensions, if any, handled between your institution and your stakeholders?
5. In your opinion, what could enable collaborations and create forms of continuity between the different institutional contexts?
6. Many organizations have people with long and valuable experience of collaboration, these individuals can mediate between stakeholders, and help stakeholders to navigate in what initially may be perceived as unknown territory:
    - Are there any internal role(s) for performing an intermediary function within your institute, as well as externally to establish/maintain links with other institutions?
    - What role could intermediaries play in building linkages with other institutions?
    - What role could intermediaries play to mediate between the different stakeholders? (Governance schemes for collaborative leadership)
    - What is the key attribute or role that should develop with regard to intermediaries? (Visualize new opportunities for collaboration)

Interview Closing:

- Thank the interviewee once more for taking part in the study.
- Ask if there are any documents that can be consulted (procedure flow diagrams and minutes of meetings), and whether access is permitted.
- Ask if there is any other information that they would like to add, and if they have any comments regarding the interview questions.

CODE: **INTERVIEW GUIDE- Intermediary participants.**			
Interviewee Name		**E-mail/ Phone**	
Organization /Department		**Job title**	
Date/Time		**Place**	

Interview opening:

- Express gratitude to the respondent for agreeing to participate in the study.
- Explain the research's objective and significance.
- Discuss the ethical issues.
- Obtain authorisation to tape the interview.

Section A	**Background Questions**

. To start, why don't you tell me a little about yourself?
    - What is your professional background? (How you came to this role?)
    - What is your main role?
    - What are the key responsibilities of your position? (Identifying partners, helping identify what knowledge to be transferred, scanning and locating new sources of knowledge, building linkages with external knowledge providers)

Section B	**Conceptualisation of power and intermediaries and how it coalesces**

	with Quadruple Helix interactions ➢ What is the impact of knowledge boundaries on such processes? ➢ What is the role of intermediaries? ➢ What is the role of power imbalance in shaping the knowledge transfer process?

1. Who do you interact/communicate with in order to do your work?
2. Who participates in these interactional relationships? (stakeholders)
3. What experiences do you have of such interaction/collaboration activities?
4. Are these interactional relationships based on mutual understanding or contract?
5. Would you please describe how these relationships develop and evolve? Could you kindly respond by referring to the nature of relationships in the past, present, and what you expect in the future, if possible?
6. What forms of knowledge have been shared/exchanged/transferred in these collaborative initiatives?
7. Who initiates this exchange/transfer process? (What's the mechanism and process)
8. How do you collect this knowledge? Do you conduct meetings for this?
9. How do you ensure the input from different sources is effectively collected and utilized?
10. How do you assist and support the different stakeholders? (ICT, stimulate participation, funding, guidelines, support development)
11. Describe your role in terms of how different actors (diverse stakeholders) interact in a meaningful way if they do not share the same institutional context?
12. Where are the efforts of building public involvement concentrated right now? (e.g., policies)
13. How do you view the role of the users/civil society in terms of service development?
14. What expectations do you have of other stakeholders in these interactions?
15. What benefits do you see from participating in these interactions?
16. What are the major barriers/problems that you might face during these interactions?
17. How are challenges/tensions, if any, handled?
18. How do you ensure pursuing the interests of all parties?
19. Do you as an intermediary have any interactional expertise?
20. Do you as an intermediary intervene in the interactions? If yes, how?
21. What might intermediaries become more involved in?
22. Who are the most salient stakeholders? Who exerts more influence on the knowledge transfer process among the different actors? (Imposing financial penalties, withholding important support)
23. What mechanisms are in place that may help balance power relationships between the actors?

Interview Closing:

- Thank the interviewee once more for taking part in the study.
- Ask if there are any documents that can be consulted (procedure flow diagrams and minutes of meetings), and whether access is permitted.
- Ask if there is any other information that they would like to add, and if they have any comments regarding the interview questions.

CODE: **INTERVIEW GUIDE- Industry participants.**			
Interviewee Name		**E-mail/ Phone**	
Organization /Department		**Job title**	
Date/Time		**Place**	

Interview opening:

- Express gratitude to the respondent for agreeing to participate in the study.
- Explain the research's objective and significance.
- Discuss the ethical issues.

- Obtain authorisation to tape the interview.

Section A	Background Questions

. To start, why don't you tell me a little about yourself?
    - What is your professional background? (How you came to this role?)
    - What is your main role?
    - What are the key responsibilities of your position?

Section B	Knowledge transfer and network dimensions – exploring the Quadruple Helix context and dynamics ➢ Who are the key actors? ➢ What interaction takes place among them? ➢ What forms of knowledge are transferred? ➢ What knowledge transfer processes occur between them?

1. What types of knowledge do you need to perform your job?
2. Who do you interact/communicate with in order to do your work?
3. Do you interact with other institutions or stakeholders to acquire the knowledge you need?
4. Who participates in these interactional relationships? (stakeholders)
5. What experiences do you have of interaction/collaboration activities between your organization and external partners?
6. Are these interactional relationships based on mutual understanding or contract?
7. Would you please describe how these relationships develop and evolve? Could you kindly respond by referring to the nature of relationships in the past, present, and what you expect in the future, if possible?
8. What forms of knowledge have been shared/exchanged/transferred in these collaborative initiatives?
9. Who initiates this exchange/transfer process? (What's the mechanism and process)
10. How do you collect this knowledge? Do you conduct meetings for this?
11. How do you ensure the input from different sources is effectively collected and utilized? (Articulate needs precisely)
12. What do you think are the distinct phases in this knowledge transfer process?
13. How do you view your role as a partner in a collaborative project?
14. What expectations do you have of other partners in these collaborative projects?
15. Which network of relationships is the most important and useful in acquiring the knowledge you need and why? (Internal or external)
16. What benefits did your institution see in interacting and transferring the knowledge? (Advisory services, knowledge and competencies, access to skills and facilities)

Section C	Conceptualisation of power and intermediaries and how it coalesces with Quadruple Helix interactions ➢ What is the impact of knowledge boundaries on such processes? ➢ What is the role of intermediaries? ➢ What is the role of power imbalance in shaping the knowledge transfer process?

1. How can everyone (diverse stakeholders) interact in a meaningful way if they do not share the same institutional context?
2. What are the major barriers/problems that you might face during these interactions? (Workplace culture, lack of incentive, limited time and money)
3. Who are the most salient stakeholders? Who do you think is more likely to introduce change? (Decision making power)
4. How are challenges/tensions, if any, handled between your institution and your stakeholders? (Objectives, interests and concerns of individual stakeholders)
5. In your opinion, what could enable collaborations and create forms of continuity between the different institutional contexts?
6. Many organizations have people with long and valuable experience of collaboration, these individuals can mediate between stakeholders and help stakeholders to navigate in what initially may be perceived as unknown territory:
    - Are there any internal role(s) for performing an intermediary function within your organization, as well as externally to establish/maintain links with other institutions?
    - What role could intermediaries play to mediate between the different stakeholders? (Governance schemes for collaborative leadership)

- What is the key attribute or role that should develop with regard to intermediaries? (Visualize new opportunities for collaboration)

Interview Closing:

- Thank the interviewee once more for taking part in the study.
- Ask if there are any documents that can be consulted (procedure flow diagrams and minutes of meetings), and whether access is permitted.
- Ask if there is any other information that they would like to add, and if they have any comments regarding the interview questions.

CODE: **INTERVIEW GUIDE- Regulatory representatives.**			
Interviewee Name		**E-mail/ Phone**	
Organization /Department		**Job title**	
Date/Time		**Place**	

Interview opening:

- Express gratitude to the respondent for agreeing to participate in the study.
- Explain the research's objective and significance.
- Discuss the ethical issues.
- Obtain authorisation to tape the interview.

Section A	**Background Questions**

. To start, why don't you tell me a little about yourself?
  - What is your professional background? (How you came to this role?)
  - What is your main role?
  - What are the key responsibilities of your position?

Section B	**Knowledge transfer and network dimensions – exploring the Quadruple Helix context and dynamics** ➢ Who are the key actors? ➢ What interactions take place among them? ➢ What forms of knowledge are transferred? ➢ What knowledge transfer processes occur between them?

1. Can you please describe your interactions with the different stakeholders? (institutional/programme reviews and accreditation exercises).
2. Who initiates this exchange/transfer process? (What's the mechanism and process)
3. How do you assist and support the different stakeholders? (Funding, guidelines, support development)
4. What forms of knowledge have been shared/exchanged/transferred in these interactions?
5. How do you collect this knowledge?
6. How do you ensure the input from different sources is effectively collected and utilized?
7. How do you view your role?
8. What expectations do you have of the others?
9. What benefits do you see in these interactions? (Advisory services, knowledge and competencies)

Section C	**Conceptualization of power and intermediaries**

1. How can everyone, diverse stakeholders, interact in a meaningful way if they do not share the same institutional context?
2. How much influence is given to the different stakeholders? who are the most salient/dominating stakeholders?
3. Do you face any challenges/tensions because of interacting with diverse stakeholders? (Workplace culture, lack of incentive)

4. How are these challenges/tensions, if any, handled between your institution and your stakeholders? (Objectives, interests and concerns of individual stakeholders)
5. Many organizations have people with long and valuable experience of collaboration, these individuals can mediate between stakeholders and help navigating in what initially may be perceived as unknown territory:
6. Are there any internal role(s) for performing an intermediary function within your institution, as well as externally to establish/maintain links with other institutions?
7. What is the role of intermediaries in the early phases of the collaboration? and does their role change in the final stages?

Interview Closing:

- Thank the interviewee once more for taking part in the study.
- Ask if there are any documents that can be consulted (procedure flow diagrams and minutes of meetings), and whether access is permitted.
- Ask if there is any other information that they would like to add, and if they have any comments regarding the interview questions.

Appendix 2: Interview Guide: Main stage

CODE: **INTERVIEW GUIDE – Academic participants.**			
Interviewee Name		**E-mail/ Phone**	
Organization /Department		**Job title**	
Date/Time		**Place**	

Interview opening:

- Express gratitude to the respondent for agreeing to participate in the study.
- Explain the research's objective and significance.
- Discuss the ethical issues.
- Obtain authorisation to tape the interview.

Section A	**Background Questions (skip if already interviewed in the pilot)**

. To start, why don't you tell me a little about yourself?
  - What is your professional background? (How you came to this role?)
  - What is your main role?
  - What are the key responsibilities of your position?

Section B	**Public integration (Quadruple Helix interactions)**

1. Previous interviews revealed that limited focus was given to stakeholder' interactions that involve the public (learners, government entities). Can you explain why have the institute been less active in involving civil society members?
2. Where are the efforts of building public involvement concentrated right now? (policies)
3. Are there any processes in place to ensure public inclusion?
4. Learners for example are mostly professionals in employment, mainly in the financial sector. How do you use them to create openings for industry collaboration?
5. Do you face any challenges in promoting public involvement?
6. How can public involvement be enhanced?
7. In your opinion, do you see any potential benefits from stimulating public participation?

Section C	**Power asymmetry and intermediaries**

1. Previous interviews revealed that the relative power of each actor is roughly matched, and power imbalance/inequality exists:
   - In your opinion, what caused these power differences?
   - Why are some actors in a more powerful position than others? (Dependencies)
   - Do certain actors lend themselves more to these interactions? (Get more involved)

2. Previous interviews also revealed that only internal Intermediation roles were undertaken to pair up the institute with its stakeholders, creating long-term linkages:
   - What type of intermediaries are needed most in to increase stakeholders' engagement?
   - What is the role of intermediaries in the early phases of the collaboration? and does their role change in the final stages?
   - Will third-party intermediaries ever be considered?
   - How successful have these intermediation roles been in balancing power differences? (In appealing to the common goals of all stakeholders)
   - How can the objectives be aligned to reduce conflict between stakeholders?

Interview Closing:

- Thank the interviewee once more for taking part in the study.
- Ask if there are any documents that can be consulted (procedure flow diagrams and minutes of meetings), and whether access is permitted.
- Ask if there is any other information that they would like to add, and if they have any comments regarding the interview questions.

CODE: **INTERVIEW GUIDE – Regulatory representatives.**			
Interviewee Name		**E-mail/ Phone**	
Organization /Department		**Job title**	
Date/Time		**Place**	

Interview opening:

- Express gratitude to the respondent for agreeing to participate in the study.
- Explain the research's objective and significance.
- Discuss the ethical issues.
- Obtain authorisation to tape the interview.

Section A	**Background Questions**

. To start, why don't you tell me a little about yourself?
   - What is your professional background? (How you came to this role?)
   - What is your main role?
   - What are the key responsibilities of your position?

Section B	**Knowledge transfer and network dimensions – exploring the Quadruple Helix context and dynamics** ➢ Who are the key actors? ➢ What interaction takes place among them? ➢ What forms of knowledge are transferred? ➢ What knowledge transfer processes occur between them?

1. Can you talk about fintech/sandbox?
2. Can you describe sandbox as a collaboration approach?
3. Can you talk about "global financial innovation network" and "Fintech Group GCC"?
4. Who is involved? Who are the main stakeholders?
5. Would you please describe how these relationships develop and evolve?
6. Who initiates this exchange/transfer process? (What's the mechanism and process)

7. What forms of knowledge have been shared/exchanged/transferred in these collaborative projects?
8. How do you view your role as a partner in in these collaborations?
9. How do you see Fintech contributing to SDGs?
10. How do you assist and support the different stakeholders? (ICT, stimulate participation, funding, guidelines, support development).

Section C	**Conceptualisation of power and intermediaries and how it coalesces with Quadruple Helix interactions** ➢ What is the impact of knowledge boundaries on such processes? ➢ What is the role of intermediaries? ➢ What is the role of power imbalance in shaping the knowledge transfer process?

1. How can everyone, diverse stakeholders, interact in a meaningful way if they do not share the same institutional context? (Shared vision)
2. How much influence is given to the different stakeholders? who are the most salient/dominating stakeholders? (Introduce change, takes leadership, decision making power)
3. What are the major challenges that you might face? (Complexities of balancing regulatory objectives, stability, integrity, customer protection)
4. How are challenges/tensions, if any, handled? (Objectives, interests and concerns of individual stakeholders)
5. Where are the current efforts to increase public participation focused? (policies)
6. Are there any processes in place to ensure public inclusion?
7. Many organizations have people with long and valuable experience of collaboration, these individuals can mediate between stakeholders and help stakeholders to navigate in what initially may be perceived as unknown territory:
    - Are there any internal role(s) for performing an intermediary function within your organization, as well as externally to establish/maintain links with other institutions?
    - If not, why?
    - If yes, what is the role of intermediaries in the early phases of the collaboration? and does their role change in the final stages?
    - Any boundary objects used to facilitate communication (contracts, workshops, training material).

Interview Closing:

- Thank the interviewee once more for taking part in the study.
- Ask if there are any documents that can be consulted (procedure flow diagrams and minutes of meetings), and whether access is permitted.
- Ask if there is any other information that they would like to add, and if they have any comments regarding the interview questions.

CODE:			
INTERVIEW GUIDE – Public members.			
Interviewee Name		**E-mail/ Phone**	
Organization /Department		**Job title**	
Date/Time		**Place**	

Interview opening:

- Express gratitude to the respondent for agreeing to participate in the study.
- Explain the research's objective and significance.
- Discuss the ethical issues.
- Obtain authorisation to tape the interview.

Section A	**Background Questions**

. To start, why don't you tell me a little about yourself?
    - What is your professional background? (How you came to this role?)
    - What is your main role?

- What are the key responsibilities of your position?

Section B	Industry and user integration (Quadruple Helix interactions) and power relations.

1. Can you talk about the regulatory sandbox/incubation/accelerator?
2. Who is involved? And what do they do?
3. It was discovered that the region's young people lack entrepreneurial spirit. In Bahrain, however, 70 percent of students said they want to establish their own business, but even those who regarded it as a viable career option were often held back by cultural stigma and a fear of failure, and the limited access to funding networks. How can this be overcome?
4. Are there any intermediaries involved?
5. How is the customer involved? How do you recruit them?
6. What kind of interactions take place as part of joining the sandbox?
7. What forms of knowledge and feedback have been shared/exchanged/transferred in the sandbox? In order to function.
8. How are you being assisted and supported by the different stakeholders?
9. Who do you think is the most powerful member in terms of decision making?
10. Are there any tensions that emerge?
11. Are there any gaps that need to be fulfilled?
12. How do you raise awareness about what you do? There have been many examples of institutional frameworks to support entrepreneurship in Bahrain, but I was told that many don't know they exist.
13. Did you have to conduct any market research before being admitted to the sandbox?
14. How can the situation be enhanced?

Interview Closing:

- Thank the interviewee once more for taking part in the study.
- Ask if there are any documents that can be consulted (procedure flow diagrams and minutes of meetings), and whether access is permitted.
- Ask if there is any other information that they would like to add, and if they have any comments regarding the interview questions.

CODE:			
INTERVIEW GUIDE – Industry participants.			
Interviewee Name		**E-mail/ Phone**	
Organization /Department		**Job title**	
Date/Time		**Place**	

Interview opening:

- Express gratitude to the respondent for agreeing to participate in the study.
- Explain the research's objective and significance.
- Discuss the ethical issues.
- Obtain authorisation to tape the interview.

Section A	Background Questions

. To start, why don't you tell me a little about yourself?
  - What is your professional background? (How you came to this role?)
  - What is your main role?
  - What are the key responsibilities of your position?

Section B	Industry and user integration (Quadruple Helix interactions) and power relations.

1. How did you become involved in the programme review committee/advisory panel?
2. What is your main role?
3. Are there any tasks associated with this role?
4. Can you talk about your experiences interacting with other members on board?
5. What forms of knowledge have been shared/exchanged/transferred in these meetings?
6. How do you assist and support the different stakeholders? (Funding, guidelines, support development)

7. How do you view the role of the users/civil society in terms of service development?
8. Do you view your role as significant? were significant changes made as a result of your involvement?
9. Who do you think is the most powerful member in terms of decision making?
10. Do you face any challenges for taking this role?
11. How can your involvement be enhanced?

Interview Closing:

- Thank the interviewee once more for taking part in the study.
- Ask if there are any documents that can be consulted (procedure flow diagrams and minutes of meetings), and whether access is permitted.
- Ask if there is any other information that they would like to add, and if they have any comments regarding the interview questions.

CODE: **INTERVIEW GUIDE- Intermediary participants.**			
Interviewee Name		**E-mail/ Phone**	
Organization /Department		**Job title**	
Date/Time		**Place**	

Interview opening:

- Express gratitude to the respondent for agreeing to participate in the study.
- Explain the research's objective and significance.
- Discuss the ethical issues.
- Obtain authorisation to tape the interview.

Section A	**Background Questions**

. To start, why don't you tell me a little about yourself?
  - What is your professional background? (How you came to this role?)
  - What is your main role?
  - What are the key responsibilities of your position? (Identifying partners, helping identify what knowledge to be transferred, scanning and locating new sources of knowledge, building linkages with external knowledge providers)

Section B	**Conceptualisation of power and intermediaries and how it coalesces with Quadruple Helix interactions** ➢ What is the impact of knowledge boundaries on such processes? ➢ What is the role of intermediaries? ➢ What is the role of power imbalance in shaping the knowledge transfer process?

1. With whom do you interact/communicate in order to do your tasks?
2. Who participates in these interactional relationships? (stakeholders)
3. What experiences do you have of such interaction/collaboration activities?
4. Are these interactional relationships based on mutual understanding or contract?
5. Would you please describe how these relationships develop and evolve? Could you kindly respond referring to the type of relationships in the past, present, and what you expect in the future, if possible?
6. What forms of knowledge have been shared/exchanged/transferred in these collaborative initiatives?
7. Who initiates this exchange/transfer process? (What's the mechanism and process)
8. How do you collect this knowledge? Do you conduct meetings for this?

9. How do you ensure the input from different sources is effectively collected and utilized?
10. How do you assist and support the different stakeholders? (ICT, stimulate participation, funding, guidelines, support development)
11. Describe your role in terms of how different actors (diverse stakeholders) interact in a meaningful way if they do not share the same institutional context?
12. Where are the current efforts to increase public participation focused? (e.g., policies)
13. How do you view the role of the users/civil society in terms of service development?
14. What expectations do you have of other stakeholders in these interactions?
15. What benefits do you see from participating in these interactions?
16. What are the major barriers/problems that you might face during these interactions?
17. How are challenges/tensions, if any, handled?
18. How do you ensure pursuing the interests of all parties?
19. Do you as an intermediary have any interactional expertise?
20. Do you as an intermediary intervene in the interactions? If yes, how?
21. What might intermediaries become more involved in?
22. Who are the most salient stakeholders? Who exerts more influence on the knowledge transfer process among the different actors? (Imposing financial penalties, withholding important support)
23. What mechanisms are in place that may help balance power relationships between the actors?

Interview Closing:

- Thank the interviewee once more for taking part in the study.
- Ask if there are any documents that can be consulted (procedure flow diagrams and minutes of meetings), and whether access is permitted.
- Ask if there is any other information that they would like to add, and if they have any comments regarding the interview questions.

Appendix 3: Ethical Approval

Downloaded: 15/11/2018
Approved: 15/11/2018

Hooreya Ali
Registration number: 170210560
Information School
Programme: Information Studies -PhD

Dear Hooreya

PROJECT TITLE: Knowledge transfer from the perspective of a Quadruple Helix: The banking sector in Bahrain
APPLICATION: Reference Number 023108

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 15/11/2018 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 023108 (dated 12/11/2018).
- Participant information sheet 1052683 version 1 (03/11/2018).
- Participant information sheet 1052682 version 1 (03/11/2018).
- Participant information sheet 1051957 version 2 (03/11/2018).
- Participant consent form 1052685 version 1 (03/11/2018).
- Participant consent form 1052684 version 1 (03/11/2018).
- Participant consent form 1051958 version 3 (03/11/2018).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Yours sincerely

Daniel Rose
Ethics Administrator
Information School

Appendix 4: Information sheet

Participant Information Sheet
for interviews

You are being invited to take part in this research study. Before you decide whether or not to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

1. The purpose of the study

The financial services sector has been identified as one of Bahrain's priority industries, where close collaboration between university, industry and government was viewed important, by recognising the need to promote an innovation agenda that is of societal relevance. Consequently, there has been a growing need to develop university-industry-regulator-public linkages, given that such linkages are below their potentialities.

This study will generate an understanding of knowledge and innovation co-creation processes with multiple stakeholders. The study's outcomes should help understand who the key actors are, why they interact, what interactions takes place, how collaborations among different actors are structured, coordinated and managed.

2. Intended participants

In this study, different participants will be recruited. These include representees from academia, industry, public and the regulator.

3. Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep (and be asked to sign a consent form) and you can still withdraw at any time* without any negative consequences. If you wish to withdraw from the research, please contact Hooreya Ali Hafedh at hahafedh1@sheffield.ac.uk

*Please note there is a point at which it will not be possible for a participant's data to be withdrawn from the research (e.g. once data have been anonymised and included within a large dataset).

4. Interviews/Observation

You will be asked to participate in a face-to-face interview, an outline of the topics that will be covered in the questions should be provided, and the questioning style should be explained (whether open-ended and whether in-depth discussion is needed). The interview will take about 45 minutes to 1 hour. It involves questions and discussion about your experience regarding the knowledge transfer interactions.

5. Possible disadvantages and risks of taking part

It is important to note that this research poses low risk to participants, given that the research does not involve sensitive topics, and that the research does not exercise any interference in the lives of research participants nor exposes them to unnecessary levels of risk.

6. Confidentiality

All the information that we collect about you during the course of the research will be kept strictly confidential and will only be accessible to members of the research team. You will not be able to be identified in any reports or publications unless you have given your explicit consent for this. If you agree to us sharing the information you provide with other researchers, then your personal details will not be included unless you explicitly request this. The audio recordings of your activities made during this research will be used only for analysis. No other use will be made of them without your written permission, and no one outside the study will be allowed access to the original recordings.

7. Research data and results

Due to the nature of this research, it is very likely that other researchers may find the data collected to be useful in answering future research questions. We will ask for your explicit consent for your data to be shared in this way. Information gained during the research project may additionally be published in connected publications such as academic journals, conference papers, book chapters, etc.; and used for subsequent research. Information gained during the research project may be published in connected publications such as academic journals, conference papers, book chapters, etc.; and used for subsequent research.

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8. Data Controller

The University of Sheffield will act as the Data Controller for this study. This means that the University of Sheffield is responsible for looking after your information and using it properly.

9. Ethical review

This study has been ethically approved via the University of Sheffield's Ethics Review Procedure. The University's Research Ethics Committee monitors the application and delivery of the University's Ethics Review Procedure across the University.

10. Contact for further information

In case they wish to obtain further information about this study, please contact:

Hooreya Ali
PhD student, University of Sheffield, Information School
Hahafedh1@sheffield.ac.uk

Or

Dr. Ana Cristina Vasconcelos
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+44 (0)114 222 2633

&

Dr Andrea Jimenez
Lecturer in Information School
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NOTE: Participants will be given a copy of the information sheet and, if appropriate, a signed consent form to keep.

Thank you for taking part in this study

Appendix 5: Consent form

The University Of Sheffield.

Participant Consent Form

Knowledge transfer from the perspective of a "Quadruple Helix":

The banking sector in Bahrain

Consent Form – for interviewees

Please tick the appropriate boxes	**Yes**	**No**
Taking Part in the Project		
I have read and understood the project information sheet and the project has been fully explained to me. (If you will answer No to this question please do not proceed with this consent form until you are fully aware of what your participation in the project will mean.)	☐	☐
I have been given the opportunity to ask questions about the project.	☐	☐
I agree to take part in the project. I understand that taking part in the project will include being interviewed, being recorded (audio).	☐	☐
I understand that my taking part is voluntary and that I can withdraw from the study at any time/before [Month/day/year]; I do not have to give any reasons for why I no longer want to take part and there will be no adverse consequences if I choose to withdraw.	☐	☐
How my information will be used during and after the project		
I understand my personal details such as name, phone number, address and email address etc. will not be revealed to people outside the project.	☐	☐
I understand and agree that my words may be quoted in publications, reports, web pages, and other research outputs. I understand that I will not be named in these outputs unless I specifically request this.	☐	☐
I understand and agree that other authorised researchers will have access to this data only if they agree to preserve the confidentiality of commercially sensitive and/or confidential information in the content of the interviews.	☐	☐
I understand and agree that other authorised researchers may use my data in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
So that the information you provide can be used legally by the researchers		
I agree to assign the copyright I hold in any materials generated as part of this project to The University of Sheffield.	☐	☐

Name of participant [printed]	Signature	Date
Name of Researcher [printed]	Signature	Date
Hooreya Ali Hafedh		

Project contact details for further information:
Hooreya Ali Hafedh

Hahafedh1@sheffield.ac.uk

Save 2 copies of the consent form: 1 paper copy for the participant, 1 copy for the research data file

The template of this consent form has been approved by the University of Sheffield Research Ethics Committee and is available to view here: https://www.sheffield.ac.uk/rs/ethicsandintegrity/ethicspolicy/further-guidance/homepage

Appendix 6: Codebook sample

Open Coding	***Selective coding***	***Raw data***
Academia reviewing the rulebook	Dual role of actors as reviewers and consultants	*"We have an internal version that was sent by the [regulator] for review and input as a centre we reviewed it I don't think they were proud of the changes we made" (A6, 19:52).*
Academia supporting the financial services sector	Dual role of actors as supporters to other sectors	*"I'm pushing to stay in that relationship, so always going the extra mile to see well what we can do to be supportive" (A1. 9:59).*
Academia undertaking the role of intermediary	Dual role of actors as intermediary	*"Well, we do that ourselves, so basically, we are the intermediary here in Bahrain" (A6, 9:25).*
Dual role of actors taking extra roles	Dual role of actors	*"The third element we have a whole department around feasibility and corporate strategy, their role is also to collect studies and international studies and to implement studies" (INT4, 16:14)*
Facilitating collaborative atmosphere	Dual role of actors as collaboration facilitators	*"So, it's all facilitating so I think it's the atmosphere that they have created plus the people just make it very comfortable and pleasant I don't think I ever felt discomfort in general" (IND2, 19:15).*
Excluding actors in the design stage	Excluded partners	*"If you have a programme or you design a programme between an HR and training, and the management handling the programme over there without involving the instructors, so we are not aligning and bridging the gap of what we need, we normally do it with instructors" (R1, 12:42).*
Involving many stakeholders leads to scope creep and losing control	Scope creep	*"So sometimes you end up with a scope creep as they call it, let's get things out of control, doing too much without the need for doing it, getting the project scope out of control in project management" (A6, 6:41)*
Lack in the number of volunteered customers	Customer engagement	*"Lack in the number of volunteered customers that they were not able to onboard" (R4, 13:51)*
Lack of faith industry has in learners	Trust	*"And the interesting thing was the lack of faith that the industry had in the ability of the students" (INT2, 11:0)*
Lack of information available to public	Public awareness	*"And it's not people are not interested in it, or people just don't understand it, it's more toward the availability of information and there's no easy-to-use tools, for them to budget for them to save and all of that" (P3, 0:18)*
Limited public integration	Public engagement	*"I must say very limited, how active are we in seeking feedback from other sectors" (A2, 19:37)*
Motivation to integrate public	Motivation	*"Two sources: competition encourage institutions to get to know what learners want and need; regulators encourage the same through review frameworks…. Matching supply of courses with demand and working on shared projects" (A2, 2:00)*
Not being heard	Unheard stakeholders	*"And second of all [Academia] doesn't listen anyway, why should I come, so she was saying there's been no changes" (INT2, 6:07)*
Not catering to client's expectations	Uncatered expectations	*"And the biggest thing was we are not catering to the expectation of the client" (INT2, 11:00)*

Publics low financial literacy	Gaps	*"Another layer of complication is why you want to work with the banks? Another layer of complication was the fact that financial literacy in the country is very low. I think the latest stat was about 40% or less, which is quite shocking because most of the people are educated here in Bahrain" (P3. 0:18)*
Vocal candidates preferred over quiet members	Expressive partners	*"And we try to choose, I'm not trying to show off my personality, but like vocal not quiet people" (A6, 14:22)*
Young population changing expectations and need for innovative products	Bottom-up initiatives	*"From another end we also have a huge young population which is forcing existing financial institutions to innovate to meet their changing needs and expectations" (R4, 0:21)*
Academia developing initiatives in the area of FinTech	FinTech initiatives	*"So, you can think of the whole FinTech ecosystem in Bahrain, in terms of education we have got academics at Bahrain university starting to play a big role in developing initiatives in the area of FinTech" (R4, 6:18)*
Academic regulators new requirements to involve stakeholders in a systematic manner	Stakeholders' engagement	*"But I think, thanks to the regulator, the governing body, I'm not talking about the central bank, but the BQA and NQF, they come to the table as an independent external body who remind us there is a better way to do, there's a more comprehensive way to it" (A6, 0:21)*
Bottom-up initiatives from the private sector requesting new regulations that fit the innovation agenda	bottom-up initiatives	*"And in some jurisdictions, the private sector in the financial services sector has pushed regulators to go into innovation, forcing the regulators to come up with the regulations" (R4, 0:21)*
Bringing new stakeholders can add new perspectives	New partners perspectives	*"So, to bring in new people just for the sake of having a new perspective maybe" (IND2, 22:10)*
Establishing regulatory sandbox	The regulatory sandbox	*"And at the point it was when the regulatory sandbox was just establishing and I think we got in the right time as well, where in the regulatory sandbox what happens basically it's a proof of case, an exercise where you need to show the regulator that your solution is actually working" (P3, 0:18)*
Events to educate the local players about global changes and trends	Events	*"So, we organised an event where we invited them in, and we had like a full talk and a Q&A, he gave us a presentation about what is Fintech, what they are doing, how are they developing, and after that there was a Q&A session and it was open to the students and the general public" (P1, 8:12)*
Financial sector sustainability	Financial sector sustainability	*"It is more into fostering more innovation in FinTech, and I think this year during Singapore. FinTech festival one of the biggest topics, how FinTech can help achieve sustainability, financial sector sustainability" (R4, 9:44)*
Financial services sector ecosystem	Financial services sector ecosystem	*"Our role is pretty much we have to be in agreement with the and the ecosystem of the financial services sector in general" (INT3, 1:50)*
FinTech Bay based on a collaborative partnership model	FinTechs	*"And the models of Bahrain FinTech Bay have been quite collaborative, because it's based on partnership model" (INT3, 7:02)*
Forums events talk shows to exchange knowledge and awareness	Forums to exchange knowledge	*"There's no like an educational expo that we can attend" (A8, 1:32)*
Freedom to share feedback	Freedom to share feedback	*"I think when you encourage that culture and you start with smaller things then absolutely as they grow, they will feel free and safe to actually tell you this, like why don't we*

		change more significant stuff" (IND2, 17:04)
Innovative financial solutions must provide value to end consumer	Value added	*"We ensure that any innovative financial solutions that is being introduced in Bahrain, either by FinTechs or by banks or existing financial institutions has to have a clear value to the end customer or the economy in Bahrain" (R4, 11:30)*
Integrating the digital agenda into the financial services sector	Integrating digital agenda	*"Across all of those we have been looking at a digital agenda, so how that translate into the financial services sector" (INT3, 0:18)*
Intermediary must articulate client's objectives and expectations	Articulating needs	*"So, we have to make sure we know the objective, what is the aim of this course, for example if they need a course in budgeting that is not enough, I need to know who you are doing it for, why are you doing it, what's the level of it, what's the expectation" (INT1, 8:40)*
Opportunities found in new sectors	Identifying opportunities	*"Because at the end of the day this is a new sector, and everything is new, not to them but to all of us, because yes we do understand the opportunities it brings and everything, we do understand the inside out, but the truth is it's just picking up now in Bahrain…because this is again a new space all together to everyone around the world, so we are looking at finding opportunities that will upskill the current talent in Bahrain" (P3, 27:25)*
Opportunities to connect with banks and other FinTechs	Identifying opportunities	*"So, some of the areas that I'm looking after is finding opportunities between ourselves and other FinTechs or connecting FinTechs with banks as well which is the direction we want to head as a company" (P3, 0:18)*
Parties involved in drafting the training and competency module	Co-drafting the rulebook	*"The draft talks more about the professional qualifications, and talks about people who get approved by the [Regulator], so, the parties interested are more to do with the institutions providing the professional qualification, such as [Academia], [intermediary], and the industry themselves because they will provide the candidates, so these are the parties involved I am drafting the training and competency module" (R2, 12:40)*
Shifting away from closed ecosystems	Closed ecosystems, narratives were prompted by the arrival of new public members	*"When we are talking about open banking, before it was a closed ecosystem, where it's just the relationship you have with the banks and that's it, right now we are seeing the opening up of the financial services sector to increase competition and as well as to offer and deliver better services to the end customers" (P3, 0:18)*
Sufficient public engagement	Public engagement	*"I would partly agree and partly disagree. Overall, there is an involvement, that originally that involvement was considered sufficient in the development of standards" (A6, 0:21)*
The basis for selecting public members	Public engagement	*"When you're choosing demographics a lot of the way people segment the demographics, is gender, and these overall high-level things. Which is important, but when we are talking about money it's even more important to think about the money mindset, how people think and feel about money will probably be more important than just their gender" (P3, 19:16)*
Translating feedback into material changes	Change per feedback	*"I was never, I never witnessed anything that they are now taking feedback, or maybe there has been like those feedback sessions, but I didn't see it put into practice or materialise it into something that will actually excite us the*

		industry" (IND2, 8:15)
Uplift Bahrainis' opportunities in labour market	Uplifting skills	*"Better utilise that money in terms of development and improvement and at the same time for Bahrainis to uplift their opportunities in the labour market" (INT4, 0:10)*
Volunteered customers to test the financial solution in the sandbox	Public partners	*"Customers work closely with us specifically through our regulatory sandbox, in which the groups collaborate with volunteered customers to test out their innovative financial solutions in their controlled environments that are working with a real time live volunteered customer" (R4, 6:18)*
Welcoming public integration	public integration	*"It was ok, they were welcoming, I'm new at the industry not like them, they're all experts with more than ten years of experience, and I was only with three years, but they never underestimated be for being a new guy with little experience. They take my ideas" (P2, 4:19)*
Academia not fully aware of market needs	Gaps: market knowledge	*"Like now 2019 we are developing an actuary pricing for medical, the industry initiated the request, I wasn't that smart of knowing they want it" (A6, 16:31)*
Bahrainis are not the first choice of employers	Employability	*"At the entry level of jobs not necessarily Bahrainis are the first choice of employers, and that's due to multiple things without getting into details, could be training skills, qualifications and cost of labour etc" (INT4, 0:10)*
Banks not compliant with open banking	Open banking compliance	*"For the regulator, they have been super supportive to us, the only challenge we might face, there's a problem right now very early on stage in enforcing the regulation on banks, the banks came to become open banking compliant, but they are not" (P3, 33:11)*
Banks not publishing information for FinTechs	Unsupportive	*"In the sense they are supposed to publish certain information through what they call APIs, for us to plug in like a socket. But let's say they publish like the loans that people have, so when you connect your account, you connect your loan account as well in the account aggregation, but do all of them publish the amount of your loan the interest rate and all of that at this point, no. so when you as a consumer you see and compare different loans or need to know information on interest rates and loan amounts for me to start recommending things back to the customer" (P3, 33:11)*
Challenge of teaming up and engaging partners	Teaming and engaging partners	*"I know from my previous place that it's very difficult to make people teamed and its quite hard to get industry engaged like that" (INT2, 5:25)*
Challenge with imposed open banking regulation	Open banking regulations	*"Right now, very early on stage in enforcing the regulation on banks, the banks came to become open banking compliant, but they are not. In the sense they are supposed to publish certain information through what they call APIs, for us to plug in like a socket. So, there is a challenge with imposing the regulation" (P3, 33:11)*
Changing policies is challenging	Change in policies	*"But in making some sort of change in policies it's quite difficult" (A8, 14:46)*
Collaborations seen as waste of time	Collaboration	*"Well, they are very busy, and I think one of the main things this what I've heard from the HR managers when I went to see them, they are waste of time, we gave our*

		advice, and nothing changes. That's what they say to me" (INT2, 5:53)
Communication gap	Communication gap	*"Whereas I know behind the scenes some of the things that were said were followed up, so there is also a communication gap there between us and them" (INT2, 6:50)*
Competing in the innovative FinTech market	FinTech	*"Show Bahrain has done this and that, and we are able to compete on a global level and say that we are a FinTech or an innovative economy" (INT3, 10:39)*
Competition	Competition	*"So, we were pioneers in that but we're no longer the only players" (A2, 3:20).*
Debate on intermediary roles	Intermediary roles	*"This debate about whether that's my role or not, hasn't been clarified" (INT2, 21:40)*
Different technical languages used	Technical and professional language	*"It here you take a trainer to industry, and they start ranting all about some diploma and ILOs and you can see the industry person doesn't know what an ILO is" (INT2, 18:50)*
Different world views	Worlds of thought	*"And is often because of the gap between how academia sees the world and how the industry sees the world and having that commercial person liaising can often be helpful" (INT2, 16:55)*
Difficult to frame suggestions with regard to new topics	Framing challenges	*"Not because they don't know better, but it's a new topic, they don't know how to start or how to frame their suggestions" (P3, 18:15)*
Difficult to judge the integrity of the feedback	Feedback challenges	*"Also, it is difficult to judge the integrity of the feedback" (IND2, 10:53).*
Difficulty aligning aims and learning outcomes	Alignment of aims	*"But there was a difficulty linking the academic requirements, these are the ILOS, and these are the outcome, and these are the marking scheme and whatever, again I look at it from what I need to understand in order to give input from my field" (R2, 5:28)*
Diverse objectives	Diversity	*"You know see if you think from a macro perspective their goal is well economic contribution and benefit to the shareholders" (A1, 19:41).* *"But nobody will have the same interest because the industry has a different focus, a different objective" (INT1, 18:40)*
Doing things in a traditional way caused a gap in terms of developing more systematic processes	Gaps	*"This is what we have learned, so why we were like this, because we had an existing model, it was working good enough that we did not have a benchmark or any other body considered better than us" (A6, 0:21)*
Drastic changes sought	Changes per feedback	*"I think it's them seeing us making more drastic changes, if they give us feedback and we don't react according to the feedback, they don't see the change visibly" (A2, 27:23).*
Dynamic context with many changes	Dynamic context	*"The way we do work in [intermediary] is dynamic, we may do changes on a regular basis and sometimes the market does not feel comfortable with the changes that [intermediary] does" (INT4, 20:22)*
Entrenched gap of valuing research	Gaps	*"You know it is such a mindset shift, that made me realize*

		it's quite entrenched" (INT2, 13:47)
Fear of sharing information	Not sharing information	*"And in some cases, some universities try to benchmark against local institutions, but they don't get any response, it's like if everyone is afraid of sharing the information, sharing their documents or practices" (R3, 22:33)*
Feedback loop	Feedback loop	*"And most of the time you don't have all the time that you will need to gather the feedback and develop the course, so it is always sort of a feedback loop rather than a feed forward loop, that's mainly the challenge that we face" (IND1, 10:53)*
Financial technology changes how banks operate	Technological changes	*"I mean Islamic contract is an Islamic contract for 500 years, it's the same, but from an operational perspective yes things are changing" (A3, 8:17)*
Finding champions is a challenge	Champions	*"it's not difficult it's challenging, and it happened we've managed actually get the right parties to come sits together, so it's more about, you need to find champions, at every organisation there needs to be that champion that you need to serve and warm up your relationship with. Once we have someone that can advocate on your behalf, then you're almost halfway through. Finding those champions is a challenge" (INT3, 12:50)*
FinTechs requiring new academic qualifications	FinTechs	*"We hear data engineers, data scientists, and all of that, they are somewhere here in the world, but finding them in Bahrain can be quite challenging" (P3, 30:11)*
Fragmented strategies	Fragmented strategies	*"In terms of having multi-disciplinary teams, not departments working in silos and not knowing what the other person is doing and they end up having really fragmented strategies" (P3, 24:33)*
Gaining trust of partners by meeting their needs	Trust	*"They want to know that what you're giving me is suitable for my specific need" (INT1, 8:40)*
Gap between banks and fintech needs	Gaps	*"And obviously the requirements as a FinTech are very different than the banks, there is that gap where other departments do not really cater to our needs" (P3, 33:11)*
Gap in terms of understanding the various needs	Gaps	*"I would see a gap in many cases you will notice this between the HR of the organisation and the remaining bodies or functions" (A1, 12:55)*
Gaps and mismatch of needs	Gaps	*"So sometimes it does not match or fit what is being offered, we do have gaps and that's normal in the entire world, the president of the United States in fact in July last year talked about how the education and the training system does not match the needs of the century" (INT4, 20:22).*
Gaps in graduating the sandbox	Gaps	*"I'll tell you where the gap is. So, they tell you as part of graduating you need to test this out to 100 customers, real life customers. Right, that's the mandate. The trick is, you cannot, so within, I'm gonna get a bit technical, within the banks, there are sandbox environment, testing environment, just dummy data for you to show that your solution actually works, it's not real transactions that people make" (P3, 13:23)*
Intermediaries viewed as third parties	Third-party intermediaries	*"So, I don't think from that perspective we do have or do require in my opinion third-party intermediaries" (A3,*

		15:02)
Intermediary role start, to finish	Scope of intermediary roles	*"I totally believe my role is relationship management start to finish including a phone call afterwards how was that what else can we do anything else for you" (INT2, 21:40)*
Knowledge cannot be created alone	Knowledge co-creation	*"It is almost impossible to create some sort of knowledge internally, so that's why we don't want to do that btw" (INT4, 22:25).* *"Because we cannot work alone, we have to work with them to provide the learning and development" (R1, 15:38)*
Lack of ownership	Ownership element	*"The consensus is always yeah we need to change this, but anything beyond that becomes quite difficult because nobody wants to own it" (INT2, 9:18)*
Lack of robust structured mechanisms	Structured mechanisms	*"Would say previously we didn't have a structured mechanism to ensure that we are, we know we have strong insights that we fulfil them, but don't have a robust mechanism to make sure that to what extent we are in line, and how far we need to improve" (A4, 16:34)*
Legacy structures and doing business in certain ways	Legacy structures	*"Because their legacy structures they have always thought about doing business in a certain way, and that is changing as well…there was like a pushback, even in terms of well we are a huge well-established bank we've been doing this in a certain way, there has been a pushback" (P3, 38:44).*
Overlap of work	Work overlap	*"Sometimes a lot of work that we do, and they do overlap, and we all know this…Now sometimes the pressure maybe more on universities, because instead of being evaluated by a single internal party in Bahrain, they are being reviewed by two. So, they are doing like similar work for us, for our reviews, and they are doing similar work for the [regulator]. So that's maybe the pressure on the institutions that they sometimes complain about" (R3, 20:13)*
Partners different understandings of innovation	Different understandings	*"So, you could be talking about innovation, but people's understanding of innovation is completely different, they could assume that just having online portals as innovative while someone else will thing open banking is actually being innovative" (INT3, 11:27)*
Partners having various foci and objectives	Diverse foci and objectives	*"But nobody will have the same interest because the industry has a different focus, a different objective" (INT1, 8:40)*
FinTech challenges in terms of policy	Policy challenges	*"Policy challenges in terms of innovation and FinTech" (R4, 0:21).*
Research for internal purposes	Dual role of partners as researchers	*"Like I said we do want to promote market research, market intelligence, research aspects, we are doing some sort of research internally" (P3, 37:18).*
Research gap	Gaps: research	*"Actually, one thing that I think is interesting is the role of research in this because that seems to be a gap that is lacking" (INT2, 30:18).*
Sharing finance information as a sensitive area	Sharing information	*"If I would dare to say, while here in Bahrain it's important for people to go and see other people and talk to them about finance, and that's a very sensitive subject for us as a market" (P3, 33:11)*
Tension emerged from miscomprehending	Tension	*"And at the beginning because people did not understand what this quality assurance is, they did not understand*

roles		*their role, there was this miscomprehension thinking that quality assurance works like inspectors" (R3, 15:39).*
Tension from working with less structured partners	Tension	*"So, every jurisdiction we work in is different for example in north Africa there is no structure, so they give everything to you, and if they are not happy, they give feedback, but they don't give support" (A3, 9:00).*
Tensions in terms of value sought	Tension	*"So, we speak from the perspective of intended learning outcomes ILOs and the activities involved, but they look at it from the perspective can the learning do their job better" (IND1, 13:07).*
FinTech ecosystem cannot function without its key players	Fintech ecosystem	*"I might we could do one thing, but we cannot function without the rest of the ecosystem playing together. And that's quite clear in the FinTech journey" (INT3, 5:25).*
Innovation agenda is slow	Innovation	*"So, it takes a long time, but the results are quite fruitful" (INT3, 1:50).*
Need for knowledge transfer	Knowledge transfer	*"So, I think there needs to be more transfer of knowledge. And that's something we want to tackle within our own organisation is implementing more of design thinking in your business strategies and business models in terms of having multi-disciplinary teams" (P3, 24:33).*
Timeline gaps	Gaps	*"You have to understand the needs in timelines of industry, there's a really big gap specially the timelines, academia tends to move a lot slower than industry" (INT2, 23:33).*
Wrong people attend collaborations	Collaborator's fitness	*"So that's very interesting, so my observation of that, to some extent they had the wrong people" (INT2, 6:50).*
Advisory committee feedback	Advisory committee	*"And the purpose of that meeting is to get industry feedback on the programmes and things, any new programmes" (INT2, 5:25)*
Brainstorming sessions to identify market gaps	brainstorming	*"They normally speak about a general need then our job is to translate and see where the gap and we is having to do some brainstorming" (A6, 3:01)*
Building mutual understanding	Mutual understanding	*"The initial relationship no, it's mutual understating its discussion it's building a relationship but when the course is going to go ahead no, it has to be a contract" (INT1, 7:15)*
Capacity and skills building	Capacity building	*"We do a lot of capacity building, where we do training sessions for them, so that's one kind of knowledge sharing or capacity building activity that we do" (R3, 6:35)*
Collaboration to voice opinion	Collaboration	*"Collaborating, you know, I think trying to voice our opinion getting there by is one way" (A2, 40:32)*
FinTech contribution towards sustainability development	FinTechs	*"So, my unit is more into fostering more innovation in FinTech, and I think this year during Singapore. FinTech festival one of the biggest topics was, how FinTech can help achieve sustainability, financial sector sustainability" (R4, 9:44)*
Having a receptive and open mindset for feedback	Receptive mindset	*"Whenever we have a thought to share, we don't strictly stick to that we are open for any development and changes" (R1, 16:45)*
Participants showing holistic perspective	Holistic perspective	*"Really to add value in that meeting you need to have a holistic perspective, understand where Bahrain is going, when it comes to skills and you know the future industries in the region, you know you've got to have some higher-level insight to really be able to contribute and help" (INT2, 6:50)*

How conversations help translate in terms of value added to partners	Collaborative value	*"Sometimes the ideas are fantastic but then what does it translate to me as a business user, what you're saying is excellent, in terms of delivering the training plans, you staff" (IND2, 9:49)*
Ideas prioritised	Ideas picked and prioritised	*"the very first was more like brainstorming to hear out from them, like for us like to pour our ideas, and what we expect to achieve you know for having such a thing in place, and then the following ones were more structured and highly relevant to be honest, so anything that we brainstormed in the very first meeting, there were ideas that we talked about, and then the following meetings were actually built on those so few ideas were picked up and prioritised" (IND2, 5:03)*
Intermediary roles require a lot of knowledge transfer	Intermediary roles	*"So here there's a lot of knowledge transfer that I have to make sure to be the focal point without making any information miss outs" (INT1, 0:21)*
Intermediary's sectoral knowledge	Intermediary's knowledge	*"And what needs to be regulated and not, and it's very healthy that you do have sectoral knowledge, I've been through experience or by you know getting on the job kind of experience" (INT3, 17:53)*
Multi-disciplinary teams instead of working in silos	Teamwork	*"In terms of having multi-disciplinary teams, not departments working in silos and not knowing what the other person is doing and they end up having really fragmented strategies, but having multidisciplinary teams where the end product actually has been reviewed from different perspectives" (P3, 24:33)*
Balanced power as a result of proper representation	Balanced power relationships	*"But again, as long as the remaining members other than the governor are active in discharging their directorship duties, the industry can't have a say, it is represented" (A6, 25:27).*
Common understanding reduces power asymmetry	Power asymmetry	*"So, we really don't have that power struggle or challenge with the [regulator] it's just that it's common understanding for the different roles that we are playing" (R3, 20:13).*

Appendix 7: Table of themes

Theme	Sub-theme	Argument	Evidence provided	Interview Excerpts
Gaps	Defining public/civil society: who comprises this fourth helix, why integrate them, and how?	Lack of consensus with respect to defining public members	Actors gave several examples to who public members be, such as end users, customers, public organisations, learners, entrepreneurs.	*"At the end they are the consumer and users of the final product" (A6, 16:14).*
		Why integrate them? (Rationales for public inclusion)	Actors described how competition and new regulatory requirements and policies for sustainability development and diversification, have motivated public inclusion	*"So, two sources; competition encourage institutions to get to know what learners want and need; regulators encourage the same through review frameworks" (A2, 3:00).*
		How to integrate Public? (Mechanisms for public inclusion)	the successful involvement of public members and finding the right and capable representatives	*"It is not difficult it's challenging, to actually get the right parties to come and sit together" (INT3, 12:50).*
		Characteristics that disqualify people, and finding champions	Participants were expected to be active, displaying the willingness to taking initiative and undertaking responsibility, in addition to exhibiting good communication skills	*"I think they were selected very carefully, that even the personalities are quite pleasant, they are all very expressive and vocal about what they think, but they have good communication skills, so it's all facilitating" (IND2, 19:15).*

	Public/civil society interactions and engagements	Degrees of inclusion/engagement	Participants giving examples of varied understandings of what was meant by true and illusive inclusion	*"I did a survey, in a process of introducing a new programme, checking the relevance and the need for that programme, in order for me to plan for the future" (A2, 21:04).* *"We bring a large number of young professionals, students and so on […] basically you're taking the raw talent that is available in the market and you're converting their talent into ideas" (INT5, 0:10).*
	Capacities and willingness to influence	Capacities and willingness to influence/share influence (Characteristics that disqualify people)	Members of public must have particular competencies and willingness to influence also the three actors' must have inclusion characteristics and increase their capacity to engage with the public and share influence	*"In terms of consumers, when it comes to financial literacy there's a clear gap, it's more toward the availability of information" (P3, 0:18).* *"It was a suggestion made by the committee, that members should have some knowledge, they don't have to go for full technical knowledge, they need some fair knowledge" (P2, 8:16).*
	Market research	Lack of market research	There is lack of market research. Some actors relied on internal and secondary approaches instead gathering advanced knowledge of actors' unique needs and expectations, to harness existing opportunities in the market	*"Because what we found there was a clear lack of data in Bahrain and it is difficult to make decision without any data, so we tried to bring a lot of that inhouse because we couldn't find it outside. We take parts of information that is available from different sectors and bring them together" (INT5, 0:10).* *"It's not really heavily implemented here; it just depends on what type of research you do with these customers. Right now, we are seeing the opening up of the financial services sector to increase competition, we can see opportunities, this could introduce new revenues" (P3, 27:51).*
	Other gaps	Media	The findings have found that this was an implicated actor	
Tensions	Conflicting interests (Dual position of actors and undertaking new roles)	Dual position of actors and undertaking new roles	different actors have different objectives, the interests of actors in different groups can conflict in terms of prioritising key issues	*"But nobody will have the same interest because the industry has a different focus, a different objective" (INT1, 8:40).*
	Incongruent motives	Collaboration motives, and aligning the incongruent motives	Varying motivations, with respect to the individual actors, and the collective innovation process Aligning the incongruent motives was found challenging	*"The purpose of the exchange is more for sales than it is for knowledge sharing" (INT2, 16:55).* *"It's impossible to have a 100% involvement of everybody and sometimes it could be lack of interest" (A6, 39:33).*
	Divergent perception of value	Sources of collaborative value, value significance, and tensions associated with divergent perceptions of value	Actors can contribute to the collaboration either with generic resources or actor specific resources The significance of the value depends on the nature of the resources transferred. Some were more durable than others. To remain an attractive ongoing value, actors needed to repeat the transfer	*"We are a strong brand name, an extremely respected institution, highly associated with important stakeholders. To be associated with us is a good thing. Normally these people have the endorsement of their CEO's" (A6, 22:26).* *"So, we always go and iterate to make sure we are in line […] because people's*

			lack of consensus of what value is, and changes in value over time Mismatch of actors' diverse expectations and incorrect assumptions	*mentality and people's expectations have been changed throughout the year" (INT8, 11:30).* *"They are in like in education more than in industry, but we see it a different angle and a different perspective" (P2, 8:16).* *"You've got lots of people from lots of different industries with different perspectives. Very often what they actually want is quite looks different to what actually they said they wanted" (INT2, 18:50).*
	Power dynamics & asymmetries	Spaces for participation	Closed and invited spaces for participation Variations in understanding aims presents an opportunity for dominant actors to pursue their agendas The issue of who has control over stakeholder representation has important implications for the participatory spaces	*"When we are talking about open banking, before it was a closed ecosystem, where it's just the relationship you have with the banks and that's it" (P3, 0:18).* *"You know the [Regulator] has been progressive in some areas as we mentioned opening up in terms of regulations and so on, but I mean yes, there is obviously a balance issue […] The barriers of entry for FinTechs are very high, the requirements to be in compliance are very high, and very painful in terms of the funding required to back these projects" (INT5, 41:56).* *"Another layer of complication was the fact that financial literacy is very low, when it comes to financial literacy and peoples' understanding of what's the best way to manage their finances, there's a clear gap, and it's not people are not interested in it, or people just don't understand it, it's more toward the availability of information" (INT3, 11:27).* *"One negative thing that I see in these meetings having a lot of people who always say positive things and not acknowledging anything that is wrong" (INT7, 49:04).*
		Forms of power	Visible forms of power may be easily identified, whereas invisible forms are difficult to uncover and address	*"The fact that they hold the power of finance makes it a party in the power struggle" (A2, 12:00).* *"I think in terms of people, we have like the highest skilled, but they are not the ones with power to make the change […] I have even seen them trying to interrupt the higher-ranking people in the ministry, they tried to listen to what they are saying to understand what they are trying to communicate" (INT7, 20:00).*
			Actors and policies at local levels influence the innovation process. Despite the rhetoric about decentralisation, the networks were subject to top-down power dynamics, which influenced attempts for bottom-up initiatives	*"So, there's this discourse that speaks of encouraging creativity and innovation but at the same time, it's difficult sometimes to have that space […] and to achieve the goal of a post-oil economy will be limited,*

				it's not gonna be sufficient to carry us through" (IND3, 26:26).
Intermediary roles	Defining intermediaries	Defining intermediaries (internal & external)	Define and distinguish intermediaries on the basis of their purpose rather than roles First to limit the class of actors that play the role. Secondly, very often intermediaries undertake several roles beside their traditional role	*"You can consider us as an intermediary, but there is no like formal position that puts us into that, we have taken that role because that's where we think we can add a lot of value, but it's not like we've been mandated by the government to become responsible for this. We are a private company that has undertaken this role to support the cause" (INT5, 24:48).*
	Intermediary roles	Intermediation as a process, and function (accessing and transferring knowledge)	Intermediaries differed in terms of how they access their network knowledge sources and in transferring the knowledge to the different actors	*"So, what we do is, we do a lot of industry consultation, so what we do is we do workshops and through surveys we invite the relevant people and we you know share with them our wide, so that's the first phase. And then the second phase will be to start to try to do a sort of matchmaking of some sort, they don't actually have the know how internally, we could engage and introduce them to some potential players because of our wide network locally and internationally" (INT3, 9:17).*
	Intermediary challenges	Intermediaries undertaking considerably more functions than their traditional role, and boundary crossing challenges	Intermediary roles cannot be reduced to matchmaking activities Knowledge boundaries appeared to be useful in analysing the challenges with regards to actors' dissimilar understandings and perspectives	*"You have to be able to put yourself in their shoes, so your role is always changing, it needs to be adapting, adaptable to the different situations you might find yourself in" (INT3, 18:51).* *"So, it happened many times, there are certain conversations where the academic person uses a whole lot of jargon that the other person doesn't understand or vice versa, so it's very common I think" (INT2, 18:50).*
	Managing challenges	The capabilities or competencies that intermediaries need to develop, and the mechanisms by which intermediaries can be beneficial.	Participants acknowledged that intermediaries should demonstrate a number of skills to effectively foster collaborations between the different sectors Outline the organisational structures of the four influential actors operating under the and how intermediaries meet their main motivations Analyse intermediary role for each stage of the innovation process	*"Our involvement is more of catalysts to start those conversations. And we obviously have good insights of what is happening between all the different players […] So, having those insights helps us direct FinTechs" (INT5, 32:12).* *"So, bridging this gap between what we offer and their expectations, that could be an opportunity for the mediator that we are speaking about […] So, that might be a useful exercise, there might be an interesting opportunity for it" (IND1, 13:07).* *"So, after the programme we help them raise more money, and a second round of investments. We connect them with someone to secure pilot projects. And there is a huge legal part here because legal fees are very expensive here, so, we give them the legal advice as well" (INT8, 37:22).*

Appendix 8: Table of boarder themes

Research Question	Evidence provided	The nature and perceptions of the fourth helix	Broader theme (category)
Research Question One: How is the fourth helix perceived? (Section 6.2.1)	Difficult to determine who the public as there were different perceptions of the public participant.	*(See 5.2.1):* *According to participants, the role was undertaken by students/learners, fresh graduates, employers, employees, government entities, ministries, entrepreneurs, start-ups, partners, external consultants and auditors, clients, customers/consumers, and end users*	Lack of consensus on what the fourth helix is comprised of.
	The fourth helix can be found across the Quadruple Helix continuum and appeared to belong among any of the other three helices of government, industry, and academia, depending on the collaborative context and purpose.	*(See 5.2.1):* *"So, it depends on how you define public entities, because we work very closely with the [Regulator], ministry of labour, ministry of foreign affairs" (A3, 1:12).* *"In drafting the module related to training and competency, the final draft goes to the market for public consultation, so it's open even for we call them external consultants, external auditors, whoever thinks he's part of or a stakeholder of this, and all licensees" (R2, 12:40).* *(See 5.2.1):* *"So, our clients, the representatives of the banking and financial sector, and hence we design our programmes according to their needs and provide them solutions" (A4, 19:46).*	The multitude of helices in which the fourth helix can be justly placed.
Research Question	**Evidence provided**	**Gaps**	**Broader theme (category)**
Research Question Two: How is the fourth helix integrated? (Section 6.2.1)	Disparity between the perceived views of what the various actors perceive as being required to realise a Quadruple Helix, showing lack of clarity regarding the directions for recruiting and integrating the fourth helix. Three gaps characterised public integration.	*The different levels of integration formed varied understandings of what was meant by public integration. These ranged from more empowering to fewer empowering roles, direct to very indirect ways of participation (See 5.2.2).* *Many gaps existed in the ability to integrate and make use of public engagement. The first gap is associated with the participating members of public, their particular competencies and how much influence they are willing to undertake. The second gap is associated with the three actors' inclusion characteristics and the various efforts to increase their capacity to engage with the public, and how willing they are to share influence. The third gap is concerned with the lack of market research and the advanced knowledge of actors' unique needs and expectations. (See 5.2.3).*	Gaps as the insufficient capability of actors to enable public integration into the co-design and development of innovations.
	A disconnect between regulatory efforts and practices that support innovation. (e.g., Contradiction and tension exist between the two goals of workforce nationalisation and becoming a FinTech hub). Actors were unaware of the	*(See 5.2.2):* *"There are these structural barriers that will not be conducive for young entrepreneurs to achieve what they want, I think we know the gaps in terms of education, in terms of developing skills, providing capital, the political well to actually achieve that […] So that is why we have this tension. As long as we don't have Bahrainis or nationals in the country that have this expertise then automatically it means we will bring it from outside" (IND3, 39:16).* *(See 5.2.3.1):*	Gaps with paradoxical nature (i.e., inclusiveness may reinforce existing structures of exclusion)

	contradictions between the various attempts to integrate public participants or their interrelationships.	*"We didn't give or send them a summary of the meeting, we didn't send them an action list, we didn't send them any outcome from the meeting, so there is a communication gap there between us and them […] agreement might happen, but no action comes from it" (INT2, 9:18).* *(See 5.3.4):* *"You know the [Regulator] has been progressive in some areas as we mentioned opening up in terms of regulations and so on, but I mean yes, there is obviously a balance issue […] The barriers of entry for FinTechs are very high, the requirements to be in compliance are very high, and very painful in terms of the funding required to back these projects" (INT5, 41:56).*	
	The fourth helix exclusions were motivated by a number of structural challenges. The degree to which collaborations are open for public integration can vary.	*(See 5.2.2):* *"Official discourses and statements by officials and the business community have shown so much emphasis on entrepreneurship. There was this promotion of the idea of young graduates, and we want them to open their own business. I'm very sceptical of efforts like this. You can notice that after a while and pay a close attention to the different entrepreneurships and start-up events, a lot of these spaces are not accessible to low-income families or students. Another point is that most of these programmes are in English, I don't recall many conferences on entrepreneurship in Arabic, and I think this creates a class barrier" (IND3, 46:00).*	Unbalanced Quadruple Helix.
Research Question	**Evidence provided**	**Tensions**	**Broader theme (category)**
Research Question Three: What are the implications of fourth helix integration? (Section 6.2.2)	By its very nature, the fourth helix is implicated with tensions, and their integration as external individuals into the innovation efforts has resulted in unintended consequences	*(See Section 5.3)*	Tensions are constitutive of the Quadruple Helix and shape its interactions.
	The nature of the helices and the way the fourth helix is integrated led inherently to four interrelated tensions: Conflicting interests; Incongruent collaboration motives; Divergent perceptions of the collaboration's value; and Power dynamics and asymmetries.	*(See Section 5.3)*	
	Tensions were identified between actors' individual constituents (i.e., social worlds) and the	*(See 5.3.3):* The mismatch of actors' diverse expectations has further inhibited the ability to construct shared meanings, leading actors to acting on their individual goals ahead of their	Paradoxical nature of tensions.

	collective group (i.e., the financial services interactions arena). While they have the ability to capture and improve value in their helix context, they also have the ability to undermine or destroy value for other helix actors. Actors were prompted to address the conflict between learning and protection.	collaborating partners, and thus presenting power relationships. *(See 5.3.1 p. 46):* *"FinTechs and the financial institutions, each one of those are kind of pigeonholed into their kind of area […] Obviously, these banks are competing against each other, so, you don't want your competitors to understand your strategy" (INT5, 30:11).*	
Research Question	**Evidence provided**	**Intermediaries**	**Broader theme (category)**
Research question Four: What is the role played by intermediaries in this integration? (Section 6.5)	Not all intermediaries had an official or formal mandate to perform the role. Not all intermediaries were capable of challenging or obstructing current or future legislation or gain direct access to stakeholders. Little was known about the role of intermediaries throughout the various stages of collaboration. Intermediary roles were constrained by role parameters that did not allow them to integrate more with other helix actors.	*(See 5.4.3.1):* *"My frustration is they see our role stops as soon as they win the business, then we pass it to somebody else, and they may or may not do a good job, I totally believe my role is relationship management start to finish. So, this debate about whether that's my role or not, hasn't been clarified" (INT2, 21:40).* *(See 5.4.3.1):* *"So, I'm never in a position to create detailed knowledge in my position, it stops at the higher level. Here you take a step back because I'm the mediator, this may inhibit my motivation" (INT1, 0:21).* *"I know from my previous place that it's very difficult to make people teamed and its quite hard to get industry engaged" (INT2, 5:25).* *(See 5.4.1):* *"You can consider us as an intermediary, but there is no like formal position that puts us into that, we have taken that role because that's where we think we can add a lot of value, but it's not like we've been mandated by the government to become responsible for this. We are a private company that has undertaken this role to support the cause" (INT5, 24:48).* *(See 5.4.1):* *"[Intermediary No.4] don't have the power to influence ministry decisions" (INT8, 55:25).*	Intermediary roles are frequently regarded as traditionally novel.
	Intermediaries had a direct impact on the network's construction and its structural characteristics. Instead of bridging opposing interests, intermediaries may expose participating members	*(See 5.3.1):* *"So, I have been in these forums where you've got lots of people from lots of different industries with different perspectives, and it's very difficult to get meaningful consensus, but anything beyond that becomes quite difficult because nobody wants to own it […] it just feels like the action element to these forums, you know agreement might happen, but no action comes from it" (INT2, 9:18).*	Intermediaries were proposed as a means to bridge gaps and tensions, however, in many instances, they merely exacerbated them.

	to new tensions (i.e., lack of ownership and action). Not all intermediary efforts increased public capacity to participate in collaborations. Intermediary intervention does not always guarantee effective communication.	*(See 5.3.4):* *"The fact that "[Intermediary No.4] holds the power of finance makes it less of an intermediary, more of a party in the power struggle" (A2, 2:00).* *"Even with the co-space incubators, not all of them got the advantages of the Covid19 package or the economic support package […] [Intermediary No.4] is a very direct stakeholder here, and they have a lot of money, but the question is how this money is being distributed […] the methodology of distributing the funds was not systematic enough in a way that makes since. So, these management issues need to be looked at" (IND3, 54:11).* *(See 5.4.4):* *"We obviously have good insights of what is happening between all the different players, but because of our unique situation, sitting in the middle between them, we actually have signed with every bank separately and with every FinTech separately […] even within our teams we make sure that the information or the communications that happened between them does not get passed on to another conversation that's happening" (INT5, 30:11).*	