A Study on the Implication of Knowledge Transfer and Social Capital on Fostering Innovation Within the Partnership Between Universities and Technology-Based Small Firms (TBSFs)

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Submitted in fulfilment of the requirement for the degrees of
Doctor of Philosophy
2020

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Acknowledgements

Firstly, I would like to thank you, my supervisors, Dr Marie Griffiths and Dr Susantha Udagedara. I appreciate their kind support, advice and guidance over the past four years. Having such as an excellent support team compromising of experts and skills which all complemented one another was invaluable for the development of this thesis.

I am also thankful to the School of Business staffs and to all the participants for helping me with this research.

Finally, special thanks to my family, for their patient and encouragement.

Glossary

AI	Artificial Intelligence
BIS	Business Innovation and Skills
CQoE	Customer Quality of Experience (CQoE)
CRM	Customer Relationship Management
GDP	Gross Domestics Product
GVA	Gross Value Added
IC	Intellectual Capital
ICT	Information and Communication Technologies
IP	Intellectual Property
IT	Information Technology
KBV	Knowledge-Based View
KTP	Knowledge Transfer Partnership
OECD	Organisation for Overseas Economic Co-operation and Development
R&D	Research and Development
RBV	Resource-Based View
SIC	Standard Industrial Classification
SMEs	Small Medium Enterprises
TBSFs	Technology-based Small Firms
TCS	Teaching Company Scheme

Abstract

To remain competitive in the ongoing rapid transformation in the industry, technology-based small firms (TBSFs) have been establishing partnerships with universities for knowledge transfer to complement their limitations in terms of knowledge, skill and investment. This thesis is concerned with the transfer of knowledge between universities and TBSFs in fostering innovation and understanding the implications of social capital throughout the process.

Reviewing previous work, particularly on the topics of knowledge transfer, innovation and social capital, shows a clear gap in the literature. There is a lack of a holistic approach that integrates these topics to understand the implications of knowledge transfer and social capital for the fostering of innovation, considering the multiple dimensions of social capital and the subjective view of innovation. And this is particularly limited in the context of partnerships between universities and TBSFs. To address this gap, this study explores how social capital influences the transfer of knowledge in fostering innovation through partnerships between universities and TBSFs in the UK.

The study adopts a multi-method qualitative approach, with four case studies of university partnerships with TBSFs through the Knowledge Transfer Partnership (KTP) scheme. The case studies consist of 13 interviews with the main stakeholders in the partnerships (KTP Associate, Academic Supervisor and Business Supervisor). The second method adopted is the expert interview. A total of 27 expert interviews were conducted, allowing an in-depth understanding to be provided of the implications of knowledge transfer and social capital for the fostering of innovation.

Analysis of the findings has highlighted that social capital is significant in facilitating the transfer of knowledge to foster innovation. The study discusses the nature of the interrelation among the dimensions of social capital in promoting the transfer of knowledge to foster different types of innovation, namely product innovation, process innovation, marketing innovation and organisational innovation, as well as new reputations for TBSFs. The study acknowledges the importance of developing and sustaining social capital among the partners through the whole process of partnership. Regular communication through formal, informal and online platform channels encourages bi-directional interactions between partners and supports the development of strong relationships between them. The study also highlights the

importance and fruitfulness of proximity, informal hierarchies, prior ties and networks with a diversity of skills and knowledge in promoting knowledge transfer to foster innovation.

In terms of relational capital, the study highlights the importance of friendship-based and professional relationships in encouraging openness to knowledge transfer. Trust, primarily based on the proven performance and capabilities of the academics, is also significant in facilitating the transfer of knowledge. Commitment, reciprocity, compromise and respect are also found to be necessary for the transfer of knowledge within these partnerships. In terms of cognitive capital, a shared understanding, transparency, shared innovation mind set, shared interests outside the project, common institutional background, cultural fit and, finally, open communication policy help to facilitate the transfer of knowledge in fostering innovation outcomes.

This study makes two contributions. Firstly, it provides a holistic view of the implications for knowledge transfer and social capital in fostering innovation within the context of partnerships between universities and TBSFs. The study provides a conceptual framework that illustrates the theoretical interactions between knowledge transfer, innovation and social capital. The framework represents the multidimensionality of social capital in influencing the transfer of knowledge to foster innovation. It provides a shift in the standard view in the social capital literature, from structuralist perspectives to a relational and cognitive perspective.

Secondly, in terms of a practical contribution, the research develops a list of recommendations to benefit future partnerships between universities and TBSFs. The recommendations are based on the challenges faced by the stakeholders during the development of innovation outcomes. The lists of recommendation mainly provide understanding to assist the diverse stakeholders within these partnerships. The use of the expert interviews as an additional method generates new insight into the recommendations.

Keywords: Knowledge Transfer, Innovation, Social Capital, University-Industry Partnerships, Technology-Based Small Firms

Chapter 1. Introduction to the Study

1.0 Introduction

This chapter begins with a brief background discussion on the core topics and concepts: knowledge transfer, social capital and innovation. This introductory chapter also highlights the rationale for the research and defines and outlines the research gaps. Following this, the research aims and objectives, research questions, and the research methodology employed in the study are described and highlighted. Finally, the chapter presents the definitions of the key terms and provides an overview of the remaining sections.

1.1 Background to the research

This research seeks to understand the influence of social capital in fostering innovation through knowledge transfer. The investigation is specifically concerned with the context of knowledge transfer partnerships between universities and technology-based small firms (TBSFs) in the United Kingdom (UK). This is because it has been commonly accepted by many researchers since the beginning of 1980s that TBSFs are drivers of economic growth and innovation (Freeman and Perez, 1988; Spencer and Kirchhoff, 2006, Cahen et al., 2016; Rydehell et al., 2019). Recent data from the International Trade Administration (2019)., confirms that the UK information communication technology (ICT) sector contributed $160 billion to the UK economy in 2016, increasing by over 20% from 2011, of which 98% of this contribution was by small firms, the core of UK growth (FSB, 2018). The data also confirmed that the UK is one of the world's largest ICT markets, with the country being in second place in the ranking for ICT spending per head. The large UK ICT sector covers IT, software, hardware and cloud services (International Trade Administration, 2019).

Furthermore, it is important to focus on the technology-based sector, as intellectual assets are the crucial component for the value of firms and innovation is crucial (Cockburn, 2007; Colombo and Grilli, 2010). Particularly in today's increasingly competitive society, TBSFs need to continuously innovate to exploit and sustain their competitive advantages (Lane & Lubatkin, 1998; Filieri and Alguezaui, 2014). This is because the complex technologies underpinning technology-based industry and the challenge of short product lifecycles mean that technology-based firms need to innovate at a quicker rate (Andersen et al., 2012; Rydehell et al., 2019). Rydehell et al., (2019) argue that technology-based firms face fast-changing,

dynamic environments; hence, they need to utilise existing internal resources and acquire external resources to be able to grow. Belluci and Pennacchio (2016) explore the importance of academic knowledge in firms' innovation activities across European countries, highlighting that firms belonging to the high-technology sector are more likely to place greater value on various links with universities.

Innovation has been perceived as vital for enhancing the performance of firms (Schumpeter, 1934; Varis and Littunen, 2010; Gunday et al., 2011; Lee et al., 2019) and countless studies of innovation consider knowledge as a source for innovation (Grant, 1996; Subramaniam & Youndt, 2005; Schweisfurth and Herstatt, 2016; Grillitsch et al., 2019). This statement is mainly grounded on the knowledge-based view (KBV), which stresses that innovation capabilities depend very closely on the knowledge and the intellectual assets possessed by firms (Grant, 1996; Subramaniam and Youndt, 2005; Ranga and Etzkowitz, 2013; Singh et al., 2019). In fact, one of the main assumptions of the theory emphasises that the ability of the firm to deploy knowledge in the business process will determine the extent which it can innovate and achieve competitive advantages (Nonaka and Takeuchi, 1995; Schweisfurth and Herstatt, 2016; Singh et al., 2019).

However, despite the importance of knowledge in fostering innovation, TBSFs do not always possess the necessary knowledge and are limited in terms of investment for innovation within their boundaries (Andersen et al., 2012; Rydehell et al., 2019). Therefore, they need to rely on external relationships and collaboration for knowledge transfer in fostering innovation (Romijn and Albaladejo, 2002; Yli-Renko et al., 2001; Cavusgal et al., 2007; Rydehell et al., 2019). The importance of collaborating with external organisations has been recognised in policy for many years. For instance, the guiding policy commissioned by the Department of Trade and Industry (DTI), emphasises the need to promote collaboration with external organisations to stimulate innovation (DBIS, 2017).

For small firms, one of the means available to complement their knowledge and foster innovation is to develop partnership with universities for knowledge transfer (Filieri et al., 2014; Perkmann and Walsh, 2007; Fudickar and Hottenrott, 2019). A considerable body of work highlights the benefits of engaging with universities for knowledge transfer. For instance, Fudickar and Hottenrott (2019), investigated the impact of direct interactions between public research and firms, in Germany. They outlined that firms engaging with universities and other

public research institutions are more likely to introduce new products and services to market. More recently, Europe 2020 especially targets 'smart growth', which seeks to better transfer knowledge and ideas into industry-embedded products and services (European Commission, 2017). This project is mainly based on strengthening the link between universities and other research institutions and industry (European Commission, 2017). Hobbs et al., (2017) reviewed the extant literature on knowledge transfer from science and technology parks (STP), which support start-up businesses to grow and innovate. They emphasised that knowledge transfer from universities can provide a source of new knowledge that can aid innovation and economic growth (Hobbs et al., 2017).

Nevertheless, university-industry collaborations for knowledge transfer are often regarded as an intricate process and face many challenges, commonly attributed to differing institutional backgrounds, expectations, cultures and norms (Plewa, 2009; Bruneel et al., 2010; de Wit-de Vries et al., 2018; Alexander et al., 2020). In fact, a policy report for higher education institutions (HEIs) to support the development of knowledge transfer in UK HEIs emphasised that knowledge transfer between universities and industry is rarely smooth and easy (PACEC, 2012). Some of the issues highlighted in the report are differences in expectations and lack of understanding between both partners (PACEC, 2012, p. 21). Furthermore, the process of knowledge transfer between universities and industry is becoming more complicated as the process involves many actors (Alexander et al., 2020). Consequently, there is a need to understand the underlying mechanisms and framework that facilitate the transfer of knowledge between universities and industry (Cunningham & O'Reilly, 2018; de Wit-de Vries et al., 2018; Alexander et al., 2020).

In the hope of mitigating the challenges and achieving desired outcomes, a growing amount of research has focused on how to overcome these challenges, and to facilitate knowledge transfer within these partnerships. Social capital has emerged as one of the theories to explain the many aspects of social context, such as trust, social ties and relationships, in facilitating inter-organisation knowledge transfer (de Wit-de Vries et al., 2018; Easterby-Smith et al., 2008; Van Wijk et al., 2008). Previous studies have argued that social capital plays an important role in facilitating the transfer of knowledge (de Wit-de Vries et al., 2018; Filieri et al., 2014; Easterby-Smith et al., 2008). Filieri et al., (2014) investigate the structural dimension of social capital within the collaboration between universities and the Irish pharmaceutical sector and suggest that a cohesive network configuration characterised by high levels of trust and joint problem

solving facilitate the transfer of knowledge within the partnerships between universities and firms. De Wit-de Vries et al., (2018), based on a systematic literature review of the facilitators of knowledge transfer within partnerships, highlighted the importance of trust and communication in reducing barriers to the success of knowledge transfer.

Social capital is defined as the actual and potential benefits embedded within, available through, and derived from the relationship with external partners (Nahapiet and Ghoshal, 1998). Nahapiet and Ghoshal (1998) illustrate social capital in three dimensions: structural, relational and cognitive. While previous studies have highlighted the importance of social capital in facilitating knowledge transfer, the focus was on the structural and relational dimensions of social capital (Vlaisavljevic et al., 2016; Filieri et al., 2014; Hemmert et al., 2014). There is limited evidence from the literature to show the multidimensional of social capital and hence provide restricted illustrations of social capital (Steinmo and Rasmussen, 2018; Vlaisavljevic et al., 2016). Therefore, it is necessary for all three dimensions of social capital to prevail for an understanding of how they may influence knowledge transfer in fostering innovation within the context of partnerships between universities and firms.

In addition, although previous research has mentioned the relevance interrelation between knowledge transfer, innovation and social capital, to date there has been a limited amount of studies that have considered all three concepts together. The integration of the three concepts has received less attention from scholars and is still under-researched. Consequently, this study applies these three concepts together to understand the implication of social capital on knowledge transfer through partnerships between universities and TBSFs in the UK. The rationale for the research is discussed in detail in the following section.

1.2 Rationale for the research

The rationale for the research has emerged from the theoretical and empirical needs identified regarding how to understand the elements that influence knowledge transfer in fostering innovation. The influencing elements for this research are explored through the lens of social capital.

1.2.1 An integrative approach to knowledge transfer by linking social capital and innovation

As mentioned, knowledge transfer has been regarded as one of the key drivers for innovation in firms and social capital can be crucial in supporting knowledge transfer between universities and firms. However, research into understanding the implications of knowledge transfer and social capital for innovation within academic partnerships remains underdeveloped. For instance, Filieri and Alguezaui (2014) carried out a systematic review of the role of structural capital in knowledge transfer and innovation. They argued that knowledge transfer, social capital and innovation are complementary highlighting that there is a lack of studies that focus on the implications of social capital for knowledge transfer and deeming knowledge transfer to be the missing link in the context of social capital and innovation. In addition, they argued that knowledge transfer is often not accounted for and, indeed, that it is important to innovation. Their study further suggested that future study should take time to consider the three bodies of literature together.

In the same vein, Alexander et al., (2016, p. 306) discussed recent empirical work on knowledge transfer and innovation, highlighting that "transferring knowledge for innovation was recognised as being of growing importance, but the field is under-researched, particularly in terms of developing practical insights into stimulating, managing and delivering success to the organisations who participate in these types of knowledge transfer projects; where success is realised in terms of innovation". Subramaniam and Youndt (2005) examined the influence of intellectual capital (IC) on innovation by looking at the perspectives of social capital and human capital. They emphasised the need for further understanding of each these elements and their influence on innovation.

In addition, there is a clear gap in the literature regarding the different dimensions of social capital that could be crucial in facilitating knowledge transfer in fostering innovation. Previous studies have paid broad attention to the structural and relational dimensions of social capital (e.g. Filieri et al., 2014; Hemmert et al., 2014; Santoro and Bierly, 2006). Although previous research on the structural dimension of social capital provides useful insight into the configuration of social networks, it has led to a static conceptualisation of the other dimensions of social capital (Kilduff and Tsai, 2012). Furthermore, many scholars have emphasised the need to consider the multidimensionality of social capital through its structural, relational and cognitive dimensions. Scholars have argued that the application of only one dimension of social

capital provides a restricted understanding of the phenomenon (Nahapiet and Ghoshal, 1998; Rass et al., 2013; Carey et al., 2011; Steinmo and Rasmussen, 2018). For instance, Rass et al., (2013) reviewed previous studies on the extent that social capital influences innovation, emphasising that the application of structural capital alone does not present the effectiveness of social capital in the theory, and claiming that social capital needs to be focus on from a multidimensional point of view. They suggested that future study need to focus on different dimensions of social capital in the innovation setting. Therefore, this research focuses on the three dimensions of social capital introduced by Nahapiet and Ghoshal (1998) and develops a conceptual framework to provide a more comprehensive picture of social capital in facilitating knowledge transfer.

Furthermore, there is a lack of empirical works that explore the implications of knowledge transfer for different types of innovation outcome. Although some studies have implicitly investigated innovation along with social capital and knowledge transfer, previous studies have mainly focused on innovation indicators, such as new product development or organisational learning and performance (e.g. Reagan and McEvily, 2003; Herrera et al., 2010; de Zubeilqui et al., 2019). For instance, Martínez-Cañas et al., (2012) considered knowledge, social capital and product innovation, emphasising the role of knowledge as a mediator between social capital and product innovation in science and technology parks (STP). Furthermore, Maurer et al., (2011) found that social capital influences intra-organisational knowledge transfer to achieve innovation performance through the objective view of innovation; they mainly regarded innovation as product and process innovation. The subjective view of innovation outcomes was identified as receiving less attention from scholars. Zheng (2010) studied the role of social capital in innovation and emphasised the need for a subjective measure to explore the outcomes of innovation in future research, as this would have another potential impact on innovation in terms of how it is perceived by individuals. Hence, this study proposes to consider different forms of innovation outcome as perceived from the subjective view.

1.2.2 Understanding the nature knowledge transfer between university-TBSFs partnership

Studies in knowledge transfer between universities and firms have often focused on the commercialisation channel of academic engagement, such as patenting, licensing and spin-off (Agrawal, 2001; Shane, 2005; de Wit-de Vries et al., 2018). However, other forms of engagement, such as partnerships, are still under development in terms of theoretical perspectives and need further conceptualisation (Perkmann et al., 2013; de Wit-de Vries et al., 2018). Perkmann et al., (2013) review knowledge transfer between universities and firms, emphasising that studies often focus on the commercialisation channel because this type of engagement has been considered to contribute more to the economic wealth of society (Perkmann et al., 2013). However, Perkmann et al., (2003) stressed that different forms of engagement, such as partnerships, consulting and contract research, are practised by a far larger proportion of academics than commercialisation, and are valued more by industry (Cohen, 2002). In fact, Innovate UK (2014) has reported that in the UK, firms that partner with universities have been found to have created more than £9.67 gross value added (GVA) per pound spent, compared to projects without university partnerships at £4.22 GVA per pound spent. The UK Government has increasingly and intensively encouraged partnerships between universities and small firms. They have sought to raise awareness of the importance of knowledge transfer for UK universities (Lambert Review, 2003). For instance, Research England increased its overall budget for recurrent funding of research and knowledge exchange for the academic year 2018-2019 to £70m (UK Research and Innovation, 2018).

Despite the importance of academic partnership, to date, this form of interaction still lags behind in terms of the development of theoretical practice (de Wit-de Vries et al., 2018). There is a noted absence of ‘one size fits all’ types of model since underlying elements may be different across different types of knowledge transfer between universities and firms (McAdam et al., 2016; Alexander et al., 2020). Several papers have highlighted the need to explore further development and conceptualisation of knowledge transfer and the focus of social capital in the context of academic partnership. For instance, de Wit-de Vries et al., (2018) highlighted that there is a need for qualitative research that focuses on theory development with respect to academic partnership, in order to provide better insights into the elements that influence the success of knowledge transfer in academic partnership. Morandi (2013) pointed out that there is insufficient theory regarding several aspects that influence the partnership process and that this requires more attention from scholars. Steinmo and Rasmussen (2018) studied the role of

social capital for firms with varying degrees of experience in collaborating with universities in the successful achievement of such collaboration, highlighting that the underlying mechanism for successful academic collaboration remains poorly understood. Consequently, they showed that there are limitations to studies in providing any insightful theoretical link between knowledge transfer, innovation and social capital in partnerships between universities and TBSFs. Hence, this study seeks to address this limitation and to contribute to the current body of knowledge in this area.

1.3 The aims and objective of the research

As mentioned, research has highlighted the limitations of studies in providing an insightful and comprehensive picture of the complex nature of, and interconnections between knowledge transfer, innovation and social capital in the context of partnerships between universities and TBSFs. Therefore, the overall aim of this research is:

> To understand the implications of social capital for knowledge transfer in fostering innovation within the context of partnerships between universities and technology-based small firms (TBSFs) in the UK.

Based on this overall aim, the following research objectives are identified:

a) To carry out a comprehensive literature review, primarily on knowledge transfer, social capital and innovation, mainly from peer-reviewed journals, to identify gaps and to inform the direction of theoretical research.

b) To investigate the implications of knowledge transfer for innovation within partnerships between universities and TBSFs, by means of conducting case studies and expert interviews.

c) To identify the challenges impeding knowledge transfer in fostering innovation within partnerships between universities and TBSFs, by means of conducting case studies and expert interviews.

d) To explore the implications of social capital for knowledge transfer in fostering innovation

within the partnerships between universities and TBSFs, by conducting case studies and expert interviews.

e) To analyse the data collected by conducting thematic analysis in order to identify the emerging themes.

f) To arrive at findings that have theoretical and practical relevance and that can inform recommendations to benefit partnerships between universities and TBSFs.

The research questions that guide this study are:

Main research question:

I. How does social capital influence knowledge transfer in fostering innovation in partnerships between universities and TBSFs?

The following sub-questions provide additional scope to this study:

II. How does knowledge transfer foster innovation in partnerships between universities and TBFSs?

III. What are the challenges for knowledge transfer in fostering innovation within partnerships between universities and TBSFs?

1.4 Research context

Knowledge Transfer Partnership (KTP)

The concepts of knowledge transfer, social capital and innovation are studied in the context of partnerships between universities and TBSFs in the UK. The empirical setting for the research is based on the Knowledge Transfer Partnership (KTP). KTP, formerly known as Teaching Company Scheme (TCS), is a collaborative scheme involving knowledge-based partners (universities) and external business partners, who work together to deliver a project of strategic value to the latter.

KTP is one of the largest partnership schemes in the UK and has been helping business for more than 40 years. The partnership scheme aims to facilitate the transfer of knowledge and help small businesses in the UK to innovate (Innovate UK, 2014). Partnership projects can last between 12 and 36 months, depending on the type and the needs of the project (Innovate UK, 2018). KTP often delivers significantly increased profitability for business partners as a direct result of partnerships through improved quality and operations, increased sales and access to new markets (Innovate UK, 2018). The impact of the scheme in 2013-2014 was around £211 million in increased annual profits for UK companies (Innovate UK, 2014). KTP is an administrated scheme, with all relevant documents, databases and reports related to the project being well documented, with some available for access by the public. Nevertheless, the KTP scheme provides a relevant context for exploring the influence of social capital on knowledge transfer between universities and TBSFs in fostering innovation. This context offers opportunities to reveal the challenges for knowledge transfer in fostering innovation and is useful for understanding the implications of social capital.

Technology-based small firm (TBSFs)

The study focuses on independently owned firms with less than 50 employees operating in the technology-based sector. The definition of TBSFs developed for this research adopts the delineation found in Brown and Mason (2014) as listed on the two tables below. This definition has been found to cover most technology-based firms found in the recent literature, particularly in the UK context. This allows the researcher to make comparisons with and a coherent contribution to other studies. The definition also allows the researcher to fully explore technology-based firms in the UK context, as it is not too narrow to meet the research circumstances. Table 1.1 and Table 1.2 present the classification of TBSFs following UK SIC codes (Brown and Mason, 2014):

High technology Industries
Aircraft and spacecraft Pharmaceuticals Office, accounting and computing machinery Radio, TV and communications equipment Medical, precision and optical instruments
Medium high-technology industries

Electrical machinery and apparatus
Motor vehicles, trailers and semi-trailers
Chemicals excluding pharmaceuticals
Railroad equipment and transport equipment
Machinery and equipment

Table 1.1 Classification of technology-based firm based on OECD (2007) (Glasson et al., 2006)

SIC Code	Sector
11.1, 11.2	Energy
22.1, 22.3	Electronic publishing
24.4, 33.1	Life Science
(no specific SIC category)	Biotechnology
25.24, 26.15, 26.82	Composites and other advanced materials
28.52	Precision engineering and precision components
29 (all)	Machinery and equipment not classified elsewhere
30.01, 30.02	Computer Equipment and office machinery
31.1, 31.2, 31.4, 31.62	Electrical equipment
32.1, 32.2, 32.3	Electronic equipment and components
33.1, 33.2, 33.3, 33.4	Medical and surgical equipment
34.10, 34.3	Transport equipment
35.3	Aerospace and related activities
36.5	Manufacture of games and toys
64.2	Telecommunications
72.2	Software development and consultancy
72.6	Web / internet services
72.1,72.3,72.4,72.5,72.6	Other computer
73.1	R&D (natural sciences and engineering)
74.2	Architectural and engineering activities
74.3	Technical testing and analysis
74.60/2	Security and related activities

Table 1.2 SIC classification of the technology-based sector (Brown & Mason, 2014)

1.5 Overview of Research Methodology

To fulfil the research objectives and to answer the research questions, the methodology for this study is designed to gain in-depth insight into the implications of knowledge transfer and social capital on fostering innovation within the context of partnerships between universities and TBSFs. Consequently, the nature of this study is exploratory, and data collection and analysis are applied correspondingly within the interpretative stance. As is elaborated upon further in Chapter 3, a multi-method qualitative approach is used in this study. The two research strategies undertaken in this study are: 1) multiple case studies; 2) expert interviews. A total of four case studies have been conducted to provide an in-depth insight into the implications of

knowledge transfer and social capital for innovation within its real-life context. The case studies were conducted with TBSFs involved in partnerships with universities in the Knowledge Transfer Partnership (KTP) scheme across the UK. Consequently, 13 interviews were conducted with the main stakeholders within the partnerships and reviews of documentation related to each case were also undertaken.

Following the recommendation of Saunders et al., (2019) and Levy and Kellstadt (2012), this study subsequently adopts additional qualitative methods to maximise data triangulation and to gain a clearer idea of the implications of social capital and knowledge transfer in fostering innovation. The study identifies the expert interview as another appropriate methodology to be implemented in this research. Thus, 27 interviews were conducted with key people that had previously had practical experience and involvement in KTP activities. Some of the experts had experienced more than one KTP project. The participants included KTP Associates, Business Supervisors and Academic Supervisors. The expert interviews are also intended to provide information for one the objectives of the study, which is to inform recommendations regarding the influence of social capital in terms of knowledge transfer in fostering innovation in order to benefit partnerships between universities and TBSFs. This objective implies that there was a need for an additional method to be considered alongside the case studies.

1.6 Contribution

The contribution of this study is that the research has been developed on the lines of studies of knowledge transfer, innovation and social capital. This study makes two main contributions. Firstly, responding to the lack of research that theorises about the implications of social capital and knowledge transfer for innovation, the study provides a holistic view on how social capital influences the transfer of knowledge in fostering innovation within the context of partnerships between universities and TBSFs. The study provides a conceptual framework that illustrates the implications of social capital and knowledge transfer in fostering innovation within partnerships between universities and TBSFs. The framework represents the multidimensionality of social capital in influencing the transfer of knowledge in fostering innovation. The study of these three dimensions adds knowledge about the implications of social capital by contributing a shift in the standard view from the social capital literature, from the structuralist perspective to the relational and cognitive perspectives. The framework shows that the three dimensions of social capital are important for fostering innovation through

knowledge transfer. These social capital dimensions are interrelated, and it is also noted that social capital is stored in each dimension, which facilitates knowledge transfer to foster innovation. The study also acknowledges the importance of developing and sustaining social capital among the partners through the whole process of partnership. Figure 1.1 presenting the conceptual framework of the role of social capital in fostering innovation through knowledge transfer between universities and TBSFs

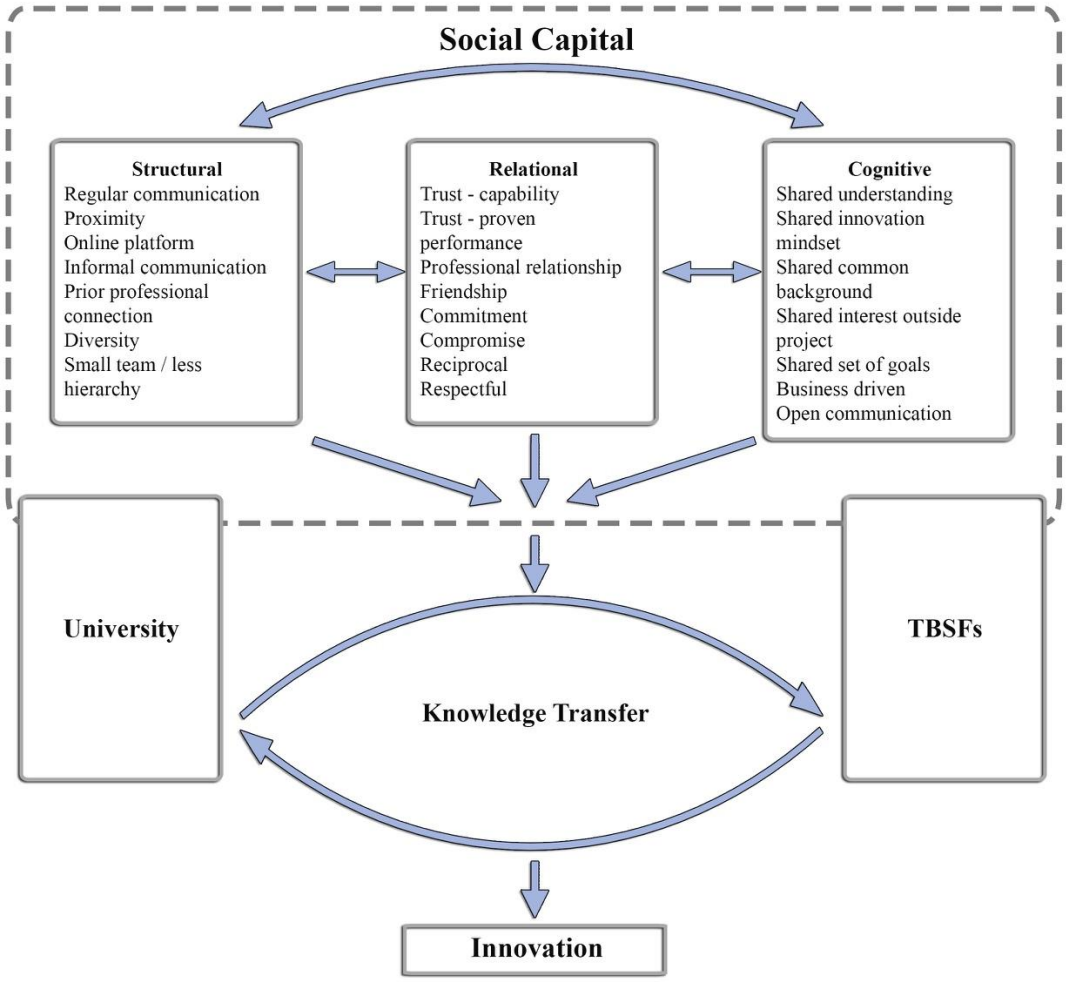

Figure 1.1 The role of social capital in fostering innovation through knowledge transfer between universities and TBSFs

Secondly, in term of practical contribution, the research develops specific recommendations to benefit future partnerships between universities and TBSFs. This corresponds with the limitations of studies on understanding the underlying elements that facilitate knowledge transfer in fostering innovation within the context of academic partnership. The study untangles the challenges of knowledge transfer and reveals the social capital elements that are important in fostering innovation outcomes specifically within the context of partnerships between

universities and TBSFs. The list of recommendations mainly provides understanding by assisting diverse stakeholders in managing and planning knowledge transfer in fostering innovation outcomes for future partnership projects. Apart from multiple-case studies, the use of expert interviews as an additional methodology generates new insight into these recommendations. The list of recommendations is presented below, and they are discussed in more detail in Chapter 6.

No	Recommendations for fostering innovation through partnerships between universities and TBSFs
I.	Promote regular communication, formal and informal
II.	Consider the proximity and location of the business partners
III.	Promote the application of an online platform and project management tools
IV.	Value the diversity of skills brought by both partners
V.	Company partners to have an open working environment and informal hierarchy approach
VI.	Recognise the value of professional and informal relationships between partners
VII.	Recognise both tangible and intangible outcomes during the project
VIII.	Hire experienced academics with complementary skills, who are committed and business-driven
IX.	Establish clear project details and clear goals
X.	Recognise the significant role of the KTP Associate's job title
XI.	Compromise by adopting a more flexible and parallel approach
XII.	Be proactive in the effort to create an innovation mind set

Table 1.2 List of recommendations for fostering innovation through partnerships between universities and TBSFs

1.7 Definitions of the Key Terms

University-Firm Partnership: This is a formal collaborative arrangement between a university and a firm with the objective of co-operating to advance the knowledge and technologies of the partner firm (Bekkers et al., 2008; Perkmann and Walsh, 2007; Santoro and Bierly, 2006). It is a temporary project and could be wholly or partly funded by public funds (Perkmann and Walsh, 2007).

Technology-Based Small Firm (TBSF): This is an independently owned firm with less than 50 employees operating in a high-technology sector. Some of the sectors included are electronic equipment and components, electrical components, software development and medical equipment.

Knowledge: Knowledge is a social process of knowing between academics and firm partners within the partnership (Empson, 2001; Wasko and Faraj, 2000; Schultze,1999).

Knowledge Transfer: Knowledge transfer is the process through which one unit is affected by the experience of another. It involves a bidirectional approach, purposeful communication, and learning that results in improved action (Polanyi 1962; Albino et al., 1999; Argote and Ingram, 2000; King, 2009; Rosli and Rossi, 2015).

Innovation: Innovation is the introduction of a new or improved product/ services, or new process, or opening new market or new organisation structure, that is valuable/useful or non-trivial to firm (Schumpeter, 1934; Utterback, 1971; Damanpour 1991; Quintane et al., 2011)

Social Capital: This refers to the actual and potential benefits embedded within, available through, and derived from a relationship with external partners. Social capital can be described along three dimensions: structural, relational, and cognitive (Nahapiet and Ghoshal, 1998).

1.8 Outline of the Thesis

This study consists of six main chapters. The following outline is a presentation of the thesis:

Chapter 1.0 – Introduction

Chapter 1.0 provides an introduction to the study. It begins with a brief discussion of the background to the core topics and concepts: knowledge transfer, social capital, and innovation. The chapter also highlights the rationale for the research and outlines the research gaps. This leads into development of the research aims and objectives, as well as the research questions. The chapter also outlines the research methodology employed in the study. Finally, the chapter gives definitions of the key terms and provides an overview of the remaining sections.

Chapter 2.0 Literature review

The purpose of this chapter is to review existing literature to identify research gaps and inform the study. The chapter is divided into four sections. Section I presents a review concerning knowledge, knowledge transfer and knowledge transfer in university-firm settings. Section II reviews the literature concerning innovation, covering the characteristics and types of innovation and briefly discusses the need for innovation within TBSFs. Section III discusses social capital theory, its conceptual perspective, and its dimensions. Finally, Section IV highlights the research gaps found within the literature.

Chapter 3.0 – Research methodology

A review of research methodology and research paradigms is presented. The chapter discusses the philosophical assumption, methodological approach, research strategy and data collection methods employed in the study. This is followed by discussion on relevant issues of validation, reality and ethics. Finally, data analysis concludes this chapter.

Chapter 4.0 – Research findings – Case Study

Chapter 4.0 discusses the key findings of the four cases studied. The chapter is divided into two main sections. In the first section, the researcher initially analyses the data case by case (to gain a good understanding of the unique properties of each case study), while the second section discusses the findings of the cross-case analysis to determine similarities and differences (Eisenhardt 1989). Two forms of data collection were used for the case study: semi-structured interview and reviews of documentation.

Chapter 5.0 – Research findings – Expert interviews

The data collected from the expert interviews is discussed in this chapter. The interviews were conducted with the aim of maximising data triangulation and obtaining a diversity of perspectives from people that have practical experience and involvement in KTP projects.

Chapter 6.0 – Discussion and conclusions

Findings and contributions that have emerged from this study are discussed in this chapter. The chapter presents the conceptual framework developed and the recommendations for enhancing knowledge transfer in fostering innovation in the context of partnerships between universities and TBSFs. The contributions and the limitations of the research are also highlighted.

Chapter 2. Literature review

2.0 Introduction

This chapter reviews the relevant literature in order to inform the direction of the study and to identify the current knowledge gaps. This chapter is organised into four sections. **Section I**, presents a review concerning the nature of knowledge, knowledge transfer and knowledge transfer in a university-firm setting. **Section II**, reviews literature concerning innovation, covering the characteristics and types of innovation and briefly discuss the need for innovation within the TBSF. **Section III** discusses social capital theory with particular attention to its conceptual perspectives, and on the structural, relational and cognitive dimension of social capital. Finally, **Section IV**, highlights the research gaps found within the literature.

2.1 Section I. Knowledge transfer

2.1.1 Concept of knowledge

In order to understand knowledge transfer, it is first useful to have some understanding of the concept of knowledge in itself. According to scholars, it is difficult to find a single definition of 'knowledge' because there is some disagreement and ongoing discussions in term of the understanding the meaning of knowledge. For instance, Alvesson and Kärreman (2001) argued that the term of "knowledge" in management literature suffers from five problems: ontological incoherence, vagueness, breadth, conceptual emptiness and the argument between regarding it as objective or subjective. This view corresponds well with Tsoukas and Vladimirou (2001, p. 975) who state that the term knowledge is "discussed a lot but little understood." Moreover, in the literature, the concept of knowledge often leads to open-ended philosophical debate. Different philosophical views and diverse epistemological views have contributed to different notions of knowledge. In agreement with Boyeett and Boyett (2001), it is easy to talk about knowledge, but it is difficult to provide one comprehensive definition of knowledge.

However, in defining knowledge, scholars traditionally begin with the philosophical approach to discussing the meaning of knowledge (Alavi and Leidner, 2001; Jasimuddin, 2012). Plato was the first philosopher to provide a definition by describing knowledge as that which "justifies true belief". Although this definition is widely cited, there is still much criticism and debate. Gettier (1963, p. 121) questions this definition by asking "is justified true belief

knowledge?" and arguing for the complexities of the meaning of "true" (Fernandez-Armesto, 1997). The question of what evidence is necessary and sufficient to allow a correct belief to be justified has been a topic of discussion (largely by philosophers) for more than 200 years (Hunt, 2003).

Mainly, there are two philosophical perspectives that can be found within the literature. Firstly, there is the functionalist view which considers knowledge as an object, and secondly, the interpretive perspective which considers knowledge as a social dynamic process (Garavelli et al., 2002; Schultze, 1999).The functionalist or positivist perspective is rooted in ontology. According to Schultze (1998), this perspective assumes that knowledge exists as an object, is representative of the world, and is waiting to be discovered by the human mind. Knowledge is defined as "justified true belief" (Nonaka, 1994, p. 15), and exists independently of human action and perception (Townsley, 1993, cited in Hunt, 2003).

According to the functionalist perspective, knowledge exists both as tacit and explicit (Nonaka, 1994) and assumes that it can be separated and codified in the minds of people (Hunt, 2003). The functionalist also assumes that knowledge could reside in a variety of locations such as in the individual, the group, and in the organisation (Hedlund, 1994) where it could be directly observed, stored, reused, or transferred. Therefore, from this perspective, the primary objective of knowledge management is to convert tacit knowledge (knowledge that resides in the minds of people) into a structural asset owned and stored by a firm (Hunt, 2003). Hence, from this perspective, technology would appear to play a vital role in supporting knowledge management and knowledge transfer (Albino et al., 1999). With help from technology, knowledge which is assumed to be an object can be codified and stored in repositories where it can be easily accessed and used by anyone in an organisation (Albino et al., 1999).

The limitation of this perspective is that it tends to simplify the idea of "knowledge", particularly concerning codification - the storage and transfer of knowledge using a common database or 'knowledge repository', that stores codified, text-based knowledge -- and the function of technology to accommodate knowledge (Hunt, 2003; Schultze, 1999). However, researchers have demonstrated that people within an organisational culture have a significant impact on knowledge transfer (Easterby-Smith et al., 2008; Van Wijk et al., 2008). Therefore, the functionalist view is often criticised because it ignores the political and social aspects of

managing knowledge (Alavi and Leidner, 2001; Hunt, 2003). For example, in Nonaka's (1995) SECI model, which is inspired by the functionalist perspective, it is assumed that knowledge can be decomposed into objective elements and considers that explicit knowledge and tacit knowledge are unidirectional but not interdependent. This model has been criticised as over simplistic as a definition of "knowledge" because it ignores the complexity of social-related issues. With a similar point of view, Garavelli et al., (2002) argue that the 'object' notion of knowledge seems to neglect the process of transferring 'tacit' to 'explicit' knowledge which involves variables such as personal attitudes, beliefs, culture, and incentives.

The second perspective on knowledge is inspired by the interpretivist paradigm. Interpretivists view knowledge as socially constructed with a flow of interacting changes taking place in the people involved in a learning process (Garavelli et al., 2002). The term "socially constructed" means that the creation of knowledge depends on groups of similar professionals who agree to construct an acceptable set of underlying assumptions (McAdam, 2004). In this scenario, individuals need to engage with others in making interpretations and in taking action (Schultze, 1999). The focus of this perspective relies on a collective mind rather than an organisational mind in order to highlight that organisations consist of individuals who coordinate their actions with others in the same organisation (Schultze, 1999). The essence of this perspective is that people act based on their interpretation of the world, and, thus, enact particular social realities by endowing them with meaning (Orlikowski and Gash, 1994).

From this perspective, knowledge is viewed as subjective, and is understood as an ongoing accomplishment or as a process rather than as an object. Knowledge is considered as inherently indeterminate and continually emerging (Tsoukas, 1996). Likewise, Schultze (1999) distinguishes between the functionalist and interpretive perspectives, suggesting that through an interpretive lens, knowledge is subjective, and knowledge is continuously shaping and being shaped by the social practices. This means that knowledge is highly contextual and is embedded within a community (Wasko and Faraj, 2000; Schultze, 1999). In this case, knowledge cannot be separated from individual and social knowledge (Schultze, 1999). Knowledge is disseminated through an ongoing process of interaction among individuals (Jasimuddin, 2012). Consequently, this perspective strengthens the view that knowledge transfer occurs primarily through open discussion and collaboration (Hunt, 2003).

This perspective also suggests that knowledge cannot exist without experience and practices: it is rooted in action and social practice (Jasimuddin, 2012; Schultze, 1999). In other words, interpretivists assume that knowledge is inseparable from an action (Schultze, 1999). From this perspective, learning is not simply the acquisition of facts but rather it is the acquisition of the ability to act in the world in a socially recognised way (Brown and Duguid, 2001). Therefore, knowledge can be observable by its effects on behaviours, practices, mental structures, values, and beliefs (Garavelli et al., 2002). Table 2.1 presents the differences between the functionalist view and the social perspective of knowledge.

Functionalist Perspective	Interpretive Perspective
Justified true belief	Social practice of knowing
Knowledge as an object	Knowledge is subjective requiring social interaction
Explicit knowledge is privileged over tacit knowledge	Tacit and explicit knowledge are inseparable
Resides in a variety of locations	Resides in practice

Table 2.1 Difference between functionalist and interpretive perspective of knowledge (Schultze,1999; Empson, 2001).

2.1.2 Data, information and knowledge

Rather than defining knowledge from philosophical point of view, some scholars have defined knowledge in relation to data and information. For example, Alavi and Leidner (2001, p. 110) define knowledge as the "information possessed in the minds of individuals: it is personalised information (which may or may not be new, unique, useful or accurate) related to facts, procedures, concepts, interpretations, ideas, observations, and judgements". Davenport et al., (1998, p. 43) suggests knowledge as "information combined with experience, context, interpretation and reflection".

Within the literature the term 'data', 'information' and 'knowledge' are sometime used interchangeably. However, some scholar has emphasised the differences between the three term. For instance, Albino et al., (2001) differentiate knowledge from information by stating that knowledge requires an interpretation process which associates meaning. They also described that information is a set of data, of a variable which has been recorded and classified according to either random criteria or a specific and logic criterion. And they further suggest that data is seen as raw form of numbers and facts (Albino et al., 2001).

Bender and Fish (2000), distinguished data, information and knowledge through the process of adding meaning, personal application, values, beliefs, and experience, training and education, data can be transformed into knowledge and to expertise. They also assumed that knowledge itself must be created in the mind of the individual and, therefore, cannot be easily transferred (Bender and Fish, 2000). They also distinguish data, information, and knowledge by organising them into a hierarchy (Bender and Fish, 2000). According to Jasimuddin (2012), each level in the hierarchy builds on the one below it, so that data is necessary to create information and information is necessary to create knowledge. Most scholars agree on the fact that data occupies the lowest level in the knowledge hierarchy, while knowledge is above data and information (Jasimuddin, 2012). The knowledge hierarchy has been used over the years to explain the differences between data, information and knowledge. The hierarchy of knowledge is illustrated in Figure 2.1.

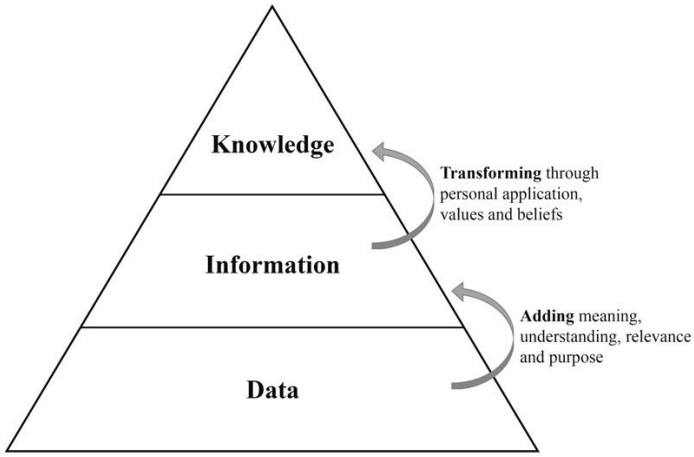

Figure 2.1 The knowledge hierarchy (Bender and Fish, 2000; Malik et al., 2019)

Although, the organising data, information and knowledge into a hierarchy is useful to distinguish data, information, and knowledge for knowledge management theory. However, according to Alavi and Leidner, (2001), this definition falls short for providing a means to readily determine when information has become knowledge. The problem of this definition of knowledge is that the presumption of a hierarchy from data to information to knowledge, each of which has its own individual interpretation, which each is varying along some dimension such as interpretability, rarely survive scrupulous evaluation (Alavi and Leidner, 2001). In the same line, Gourlay (2006, p. 15) indicates the limitation in defining knowledge in relation to information and data by stating that no account is given for how information is "constituted," "processed," or "combined" in order yield knowledge.

2.1.3 Stance of knowledge

In considering the different views of knowledge, this research adopts the definition and assumptions of knowledge mainly from an interpretive perspective which views it as primarily a socially constructed phenomenon. It is relevant to choose the definition of knowledge based on the interpretive perspective as it is considered most appropriate within the context of this study because, in the partnership, the transfer of knowledge could mostly depend on the interactions of the stakeholders. Therefore, this research indicates that knowledge is not an object but is dependent upon the social process of knowing between the university's academics and the firm's partners within the partnership.

This conceptualisation of knowledge also argues that knowledge is linked to the capability of action. Drawing from Schultze's (1999) argument for the interpretivist approach of knowledge, it is appreciated that knowledge cannot be separated from action. This is aligned with Newell et al., (2002) work on the "Community Model", which emphasises that knowledge is linked, intrinsically, with human action. Furthermore, despite different perspectives on the meaning of knowledge, most scholars agree that knowledge is linked to the capacity for action (Jasimuddin, 2012).

While the interpretive definition is considered as most suitable for the study, the study also incorporates aspects of functionalism, by considering that information may contain a potential to further an understanding of knowledge. As in the context of business, knowledge can be viewed as relevant information that is based on experience and often increases an individual's capacity to take effective action (Alavi and Leidner, 2001; Leonard and Sensiper, 1998). Nevertheless, knowledge is understood in this research, principally from the interpretivist perspective. Thus, knowledge is not viewed as an object contained within information but as information that has accumulated to become knowledge, and which requires a social integration mechanism and communication to learn from that information (Berger and Luckman, 1966). This view supports the interpretivist approach to knowledge (Venters, 2003). Table 2.2. shows the stance of knowledge underpinning this study.

Definition of knowledge	• Social practice of knowing
Key assumptions	• Knowledge is the social process of knowing between academics and firm partners • Knowledge is disseminated through an ongoing/social process of interaction among individuals (academics and firm partners) • Knowledge rooted social practice and link to capability of action • Tacit and explicit are inseparable • Knowledge links to capability of action

Table 2.2 Stance of knowledge underpinned in the study (Garavelli et al., 2002; Hunt, 2003; Jasimuddin, 2012; Wasko and Faraj, 2000; Schultze, 1999)

2.1.4 Tacit and explicit knowledge

A further common discussion on knowledge is by discussion on the different classification of knowledge. Knowledge can be categorised in many ways. One of the most widely referenced classifications in management studies is from Nonaka and Takeuchi's (1995) theoretical study on the creation of organisational knowledge. These concepts were built on Polanyi's (1966) philosophical concepts of tacit and explicit knowledge. Polanyi (1966, p. 16) describes tacit knowledge as non-verbalised, unarticulated, intuitive and knowledge deeply rooted in action. On the other hand, Polanyi (1966, p. 16) describe explicit knowledge as codified knowledge that can be transmitted formally. Nonaka's (1994) work brings Polanyi's concept of knowledge into a more practical content in business. Nonaka (1994) describes tacit knowledge comprised of both technical and cognitive elements. The technical element refers to skills, know-how, and crafts that apply within a specific context (Alavi and Leidner, 2001). Meanwhile, the cognitive elements refer to a person's mental model consisting of belief, perception, and paradigm (Alavi and Leidner, 2001). On the other hand, Nonaka (1994) describe explicit knowledge as knowledge that is codified, articulated, and communicated in a symbolic form or in natural language (Alavi and Leidner, 2001).

The notion of tacit and explicit knowledge can be conceptualised from two perspectives, 'knowledge as a category' and 'knowledge as a spectrum' (Jasimuddin et al., 2005, p. 103). From the 'knowledge-as-continuum' perspective, tacit and explicit knowledge represent two separate types of knowledge which have distinct features. From this perspective, both dimensions are treated as unidirectional and independent (Jasimuddin et al., 2005). Nonaka's

(1994) work reflects this view by assuming that tacit and explicit knowledge are on the same scale of knowledge, with new knowledge created from their interaction. This perspective of knowledge, however, is said to have emerged from the functionalist and positivist perspective (Gourlay, 2006).

On the other hand, from the 'knowledge-as-continuum' perspective, it is important to understand that tacit knowledge and explicit knowledge should not be perceived as two independent types of knowledge. Indeed, according to Jasimuddin (2005) their relationship can be likened to the portions of an iceberg above and below the waterline: the exposed explicit knowledge is supported – given meaning – by the hidden tacit knowledge. In other words, 'tacit and explicit knowledge are not alternatives'; rather, all types of knowledge can have both tacit and explicit elements and the balance between them depends on the nature of each 'item' of knowledge (Edwards, 2008). Likewise, in attempting to illustrate the interdependence of tacit and explicit knowledge, Ryle (1949, p. 32) cited in Brown and Duguid, (2001), has illustrated an example of: *"knowing how*" cannot be defined in terms of "*knowing that*" (Ryle 1949, p. 32). He insists, "*Knowing the rules of chess, does not tell you how to play chess. Know that may be explicit but from Ryle's perspective it is neither actionable nor useful on its own. To make know that useful requires appropriate know how."* Ryle (1949, p. 32) cited in Brown and Duguid, (2001). This example offers the view that explicit knowledge still requires the development of tacit knowledge, such as experience and reflection, for knowledge to create an ability to act (Alexander and Childe, 2012). Considering the two concepts discussed above, and parallel to the interpretive lens, this research considers that tacit knowledge and explicit knowledge are not to be viewed as two separates types of knowledge; but exists along a continuum of tacitness and explicitness, all knowledge has both tacit and explicit components (Jasimuddin et al., 2005).

2.1.5 Defining knowledge transfer

Similar to the approach adopted in defining knowledge, the concept of knowledge transfer has also emerged from two main philosophical positions, that of the functionalist and interpretive approaches that result in diverse theoretical views (Ringberg and Reihlan, 2008). Ringberg and Reihlan (2008) argue, in the functionalist view, that knowledge resides in texts and its successful decoding leads to intelligible and univocal knowledge transfer. For example, Rosli and Rossi's (2015) study argues that the transfer of knowledge in the functionalist view, is

more easily transferrable from one person to another. Hence, knowledge transfer is regarded as a unidirectional and a linear process in which the performance of knowledge transfer is usually based on output-orientation such as the amount or the value of the output that has been transferred. Gupta and Govindarajan's (2000) work on knowledge transfer in multinational firms suggests that knowledge-transfer in this perspective primarily depends on the richness of the communication channel, knowledge asset and the absorptive capacity of the receivers.

As opposed to the functionalist view, the interpretive perspective views knowledge transfer within the context of ongoing practice and relationship (Gergen, 1994; Chiva and Alegre, 2005; Rosli and Rossi, 2015). As such, knowledge exists in codified disembodied systems within organisational rules and practices. Ringberg and Reihlan (2008) argue that this leads to notion that practices, routine within and across the organisation serve as conduits of knowledge transfer. The process also is viewed as an interactive process and results in bi-directional interaction between the knowledge sender and the recipients, in which knowledge is actively constructed rather than simply transmitted (Rosli and Rossi, 2015). The perspective meeting the definition of knowledge transfer is 'the process through which one unit is affected by the experience of the another' (Argote and Ingram, 2000, p. 151).They emphasise that knowledge can be transferred by moving the knowledge repositories, such as individual members, technologies and routines, from one unit of the organisation or from one organisation to another. In addition to this, knowledge is also transferred when there is a modification of these repositories at the recipient site through communication and training (Argote and Ingram, 2000). Based on this definition, knowledge transfer is said to occur when changes happen to the recipients (Argote and Ingram, 2000; Easterby-Smith et al., 2008).

Van Wijk et al., (2008) developed a definition in the context of inter-organisational knowledge transfer, which emphasises that knowledge transfer takes place when it manifests itself through changes in the knowledge bases, in the performance of the recipients, in improving practices, and in increasing levels of innovativeness (Easterby-Smith et al., 2008). Paulin and Suneson's (2012) study of the meaning of knowledge transfer, provides an illustration of knowledge transfer from a subjective viewpoint. They provide an example of the development of Factory Floor, for a Swedish company, IKEA, knowledge transfer involved the process that are developed jointly by the R&D engineer shares their opinion and ideas about the development, with the manufacturing engineer, who in turn shares relevant expertise and providing feedback on about the possible limitations of the system (Paulin and Suneson's, 2012).

It is noteworthy to highlight that in interpretive perspective, knowledge transfer is intrinsically linked to learning process. As knowledge transfer can be seen as 'the process through which one unit is affected by the experience of the other' (Argote and Ingram, 2000, p. 151). This implies that knowledge transfer focus on resulting changes and involved learning. Ko et al., (2012) study the antecedents of knowledge transfer between consultant and their clients, emphasised that knowledge transfer is completed when learning takes place and when the recipients understand that knowledge and apply it. Similarly, Easterby-Smith et al., (2008) states, knowledge transfer only occurs when learning has taken place.

Reviewing the literature, the term of knowledge transfer and knowledge sharing often used interchangeably and lead to confusion (Paulin and Suneson's, 2012). To avoid the confusion between the two terms this study identifies a clear notion between knowledge transfer and knowledge sharing. According to King, (2006, p. 493), knowledge sharing is defined as "the exchange of knowledge between units and the exchange may be focused or unfocused, but it usually does not have a clear a priori objective." In contrast, King, (2006) defines knowledge transfer as the focus with a clear objective to transfer knowledge between units. Thus, based on the provided by King, (2006), the main difference between knowledge transfer and knowledge sharing is that of a clearly focused versus an unfocused objective. Similarly, Carolyn, (2006), defines knowledge sharing as an exchange of knowledge between two individuals: one who communicates knowledge and one who assimilates it. The focus is on the interactions of the individuals. Meanwhile, knowledge transfers focus in which to transform individual knowledge to group knowledge or organisational knowledge in which knowledge built into processes, product or services, (Carolyn, 2006). Thus, Carolyn's, (2006) definition also highlights that knowledge transfer has a bigger objective and focus compared to knowledge sharing.

Following such rationales discussed above and akin to the interpretive perspective of knowledge, this research defines knowledge transfer as the process through which one unit is affected by the experience of another (Argote and Ingram, 2000). It involves a bidirectional approach, purposeful communication and involves learning which results in improving action (Polanyi 1962; Albino et al., 1999; King, 2009; Rosli and Rossi, 2015). Consequently, this definition is considered relevant to the context of partnership between universities and firms as

universities' knowledge transfer activities involve interaction with a wide range of stakeholders (Alexander et al., 2020).

2.1.6 Knowledge-based View (KBV)

It is commonly agreed by scholars that the knowledge-based view (KBV) of the firm is an extension of the resource-based view of the firm (RBV) (Grant, 1996; Roos, 1998; Hoskisson et al., 2000; Huizing and Bouman, 2002; Balogun and Jenkins, 2003). The RBV assumes that a firm is regarded as an organisation with a ''broader set of resources" (Wernerfelt, 1984, pp 171). According to Barney (1991), this 'broader set of resources' includes: physical capital resources, human capital resources and organizational capital resources. Furthermore Barney (1991) argues that the condition for firms to achieve competitive advantages is that the resources must be characterised by non-substitutability, rareness, imperfect, value, imperfect and imitability (Barney, 1991). Consequently, RBV scholars argue that these intangible resources of firms deliver competitive advantages, as their values are difficult for competitors to duplicate and their functions very hard to replace (Hitt et al., 2016; Singh et al., 2019).

However, in the past two decades, knowledge has attracted great interest and has been recognised as the fundamental of economic changes (Curado, 2006). According to Fulk and DeSanctis (1995), the manipulation of knowledge and information has caused majority of developed economies to excel. The KBV of the firm focuses on knowledge as the most strategically important of the firms' resources (Grant, 1996). The primary foundation of the KBV is that competitive advantage and innovation comes from intangible assets such as firm-unique knowledge, tacit knowledge of its employees, as well the capability to generate new knowledge (Grant, 1996; Nonaka and von Krogh, 2009). These perspectives assume that knowledge assets are the prime strategic resources (Grant, 1996; Spender, 1996). Consequently, KBV emphasised the importance for firms to create, transfer and transform knowledge into competitive advantages (Kogut and Zander, 1992; Grant, 2002). In this sense, the identification and application of knowledge is viewed as significant to support and nurture innovation in firms.

For instance, Santoro et al., (2018), investigate the importance of knowledge in enhancing SMEs' innovation performance. Their study, which employed a total of 422 SMEs form different industries in the Piedmont area, indicate that internal and external knowledge leads to

advantages by introducing new products or services. Meanwhile, drawing on a data base collected from 605 innovative SMEs in the Netherlands, Van de Vrande et al., (2009) highlight the importance of enterprises to acquire new knowledge and technologies from outside. They recognise five practices to achieve this: external networking, customer involvement, outsourcing R&D, external participation and licensing of IP.

In a recent study, Grillitsch et al., (2019) investigate the implication of different types of knowledge based on innovation in terms of firms' growth by using a longitudinal micro dataset provided by Statistics Sweden (SCB). Employing SMEs in Sweden as their sample, their study shows that combinations of knowledge bases have by far the strongest effect on innovation and firm growth. Subramaniam and Youndt (2005) linked the interrelation between knowledge and innovation. Their study in a US R&D organisational setting, indicates that knowledge accumulated and utilised influence organisations' innovation capability. This study, hence, strengthens the argument of the current study about the relevance of knowledge transfer in fostering innovation within the partnership.

Whilst previous studies have highlighted the relevance of knowledge in developing innovation, most of them have focused on knowledge outcomes in term of performance and innovativeness (Van Wijk et al., 2008; Santoro et al., 2018; Grillitsch et al., 2019). In terms of innovativeness, the outcome often was measured in the objective view of innovation by limiting the definition in terms of product or process innovation (Cohen and Levinthal, 1990). For example, Van Wijk et al., (2008), emphasised that previous studies had centred the outcomes of knowledge transfer in terms of financial performance, new products introduced and innovativeness. Most of the studies measured innovation from a quantitative perspective and considered the overall concept of innovation on organisational performance. They further stressed that, the outcomes of knowledge transfer are still deficient. As such there is limited research that focuses on the subjective view of innovation as consequences of knowledge transfer. Zheng (2008) emphasises the need for subjective measures to explore the outcome of innovation in future research. In the same vein, Easterby-Smith et al., (2008) argues that there is a need to balance the existing study by implementing the subjective measure for knowledge transfer.

On the other hand, the KBV also view the firm as a social community (Kogut and Zander, 1992) with the objective of integrating and coordinating knowledge as a source of competitive advantage (Grant, 1996).This draws attention to the work of Smith et al., (2005) that

emphasises the individual's role as a resource to influence knowledge creation and thus innovation. Hence, to foster innovation and exploit competitive advantages, individuals need to network and share knowledge through relationships (Nonaka and Takeuchi, 1995; Subramaniam and Youndt, 2005) which support the significance of social capital on influencing the transfer of knowledge for fostering innovation.

2.1.7 Facilitators of knowledge transfer

Following the acknowledgement of KBV theory on the possibility of knowledge transfer to create competitive advantages and, consequently innovation, previous studies have shown an interest in understanding various facilitators of knowledge transfer. Concerning the definition of knowledge transfer of this thesis, the relevant facilitators of knowledge transfer between inter-organisational context are reviewed.

Referring to a recent systematic literature review of a knowledge transfer framework by Battistella et al., (2016), focusing on process-oriented knowledge transfer, they identify actor's capability and absorptive capacity as influencing the process of knowledge transfer. They also highlight that characteristics of relationship in terms of trust, connection intensity, cultural difference, organisation distance, physical distance, distance of knowledge base and normative distance are critical for the process. In addition, they also argue that the properties of knowledge and characteristics of context influence the knowledge transfer process. Despite the usefulness of their work in presenting a framework for inter-organisational knowledge transfer, the elements of each determinant were not empirically tested and the analysis of each of the elements is not carried out in sufficient depth.

Easterby-Smith et al., (2008) present a theoretical framework in order to understand the key antecedents for inter-organisational knowledge transfer. The framework comprises four sets of factors that influence the transfer of knowledge: the characteristics of the knowledge source, the characteristics of the recipients, the nature of the knowledge being transferred and the inter-organisational dynamic. Their study also highlights the importance of relational elements in facilitating knowledge transfer. However, their studies focus on the accessing knowledge for the transfer of knowledge; they do not focus on the influencing determinants during the implementation of knowledge transfer that contribute to innovation outcome. Therefore, they

suggest that future studies should conduct a more comprehensive picture of knowledge transfer by considering its operations from the learning perspective (Easterby-Smith et al., 2008).

Van Wijk et al., (2008) provide a conceptual review of the determinants and outcomes for knowledge transfer in intra and inter organisational context. They classify the determinants that facilitate knowledge transfer into three broad categories: characteristics of knowledge, the organisation and the network characteristic. Their study also highlights the role of absorptive capacity as one of the key determinants that influence the transfer of knowledge. According to Van Wijk et al., (2008) absorptive capacity is the most prominent theme in knowledge transfer literature. The absorptive capacity concept, introduced by Cohen and Levinthal (1990), refers to the ability to recognize, assimilate, and apply new external knowledge (Cohen and Levinthal, 1990; Lane et al., 2006; Zahra and George, 2002). These studies also emphasise the importance of network characteristic by focusing on the social capital framework. However, they stress that there is lack of a comprehensive picture of how the dimension of social capital influences the transfer of knowledge. They add that more studies are needed to assess the influence of the three dimensions of social capital in moderating knowledge transfer.

Cumming and Teng (2006) present a model for knowledge transfer process between R&D projects. They identify several key determinants that influence the process; these concern both R&D units' understanding of where the desired knowledge resides within the source, the extent to which the parties share similar knowledge bases, the extent of interactions between the source and the recipient to transfer the knowledge and finally, participation in an articulation process through which the source's knowledge is made accessible to the recipient. This includes the elements of study absorptive capacity, motivation, trust, the intensity of connections, the physical distance, and the cultural distance between the source and the receiver. The study was based on an empirically conducted survey within more than 15 industries; nevertheless, the downside of this study is its lack of in-depth investigation of how the determinants influence the transfer of knowledge.

On the other hand, Chen et al., (2014) examine the elements that influencing the knowledge transfer in the inter-organisational collaboration. Their study is based on questionnaires distributed to a sample of 226 managers located in Taiwan. Their study found that knowledge transfer performance is positively affected by the develop shared goals, social relational and

trust. Their study has highlighted the significant of relational elements that enhance knowledge transfer and collaborations.

Zhao et al., (2015), conducted a mixed method study to understand factors that influence knowledge transfer across projects of IT firms in China. Their study indicates that the teams' transfer capabilities, project team relationships, task content and team context contribute to the effectiveness of cross-project knowledge transfer. Their study highlights the importance of recipient's absorptive capability and having co-operative relationships between teams to benefit the knowledge transfer project. Although, their study did provide useful insights into the facilitation of knowledge transfer at project level, their findings may be limited as their study focused on effectiveness of knowledge transfer rather than innovation outcomes.

In summary, previous literature has given profound insights into several factors that can affect knowledge transfer. Based on the discussion above, it can be seen that the elements that influence the transfer of knowledge may be categorised into two classes of explanation (Dhanaraj et al., 2013). One class of explanation is based on the cognitive-based theories, which explain the role of absorptive capacity and the complexity of the knowledge being transferred. The other class of explanation concerns the antecedents of knowledge transfer grounded in sociology-based theory in which the importance of cultures and relational network characteristics can be explained.

Although cognitive-based theoretical elements such as absorptive capacity has been understood as significant factors influencing knowledge transfer and for learning and knowledge transfer, scholars argue that the success of absorptive capacity is determined by social interactions and exchanges between partners (Muthusamy and White, 2005). For instance, Levin and Cross, (2004) in their study that investigates the mediating role of trust in knowledge transfer, argue that interpersonal knowledge transfer is the building block for absorptive capacity. Zahra and George's (2002) seminal work on absorptive capacity identify social integration mechanism as one of the influential factors of absorptive capacity.

Hence, this strengthens the argument of the current study regarding the relevance of focusing on social capital as an influential determinant of knowledge transfer in the partnership between universities and TBSFs. Furthermore, the analysis also reveals the lack of in-depth exploration of the elements of relational and cognitive context. This is particularly relevant to the

universities-TBSF partnerships since knowledge transfer is conceptualised as a social process - as interaction between individual partners. Therefore, this research considers that social aspects play an important role in knowledge transfer; therefore, this research focuses on the social aspects of knowledge transfer.

2.1.8 Knowledge transfer between the Universities-Firms

The UK Government has increasingly and intensively encouraged partnership between universities and small firms. They have sought to increase awareness of the significance of knowledge transfer for universities in the UK *(*Lambert Review, 2003). For instance, Research England (2018) has increased the overall budget for the recurrent funding of research and knowledge exchange for the academic year 2018-2019 to £70m (UK Research and Innovation, 2018). This is one of the initiatives implemented by the government to promote and encourage the interactions between the universities and firms. In addition, the introduction of several schemes such as Faraday Partnership, Knowledge Transfer Partnership, Knowledge Exchange, Innovation vouchers highlight government initiatives in relation to promote the interaction between universities and firms for transfer of knowledge in the UK. Moreover, recently, Europe 2020 strategy has introduced 'smart growth' aims at supporting knowledge for innovation by strengthening the connection between research institutions and industries (Europe commission, 2017). Consequently, this underlines the importance of universities as engine of knowledge and crucial to support innovation within firms.

There are many ways in which university knowledge could be transferred from the universities to an external firm. Perkmann and Walsh (2007) have identified seven types of universities-firms links for knowledge transfer which are based on classification according to 'relational involvement' between universities and firms. Relational involvement refers to the level of working together between individuals and teams from the universities and firms (Perkmann & Walsh, 2007). Perkmann and Walsh (2007) have divided the university-firm interactions into three categories which are shown in Table 2.3.

Relationship involvement	Universities-Firms interaction
High	Research partnership
	Research service, consultation
Medium	Academic entrepreneurship
	Human resource transfer
Low	Commercialisation of Intellectual Property (IP)

Table 2.3 Forms of interaction between the universities and firms (Perkmann and Walsh, 2007)

Meanwhile, in the recent review of university and firm relations for knowledge transfer, de Wit-de Vries et al., (2018), has classified the forms of interaction between university and firm in two classes: first, academic entrepreneurship and, second, academic engagement or academic partnership. Their classification of knowledge was building from Perkmann's (2013) seminal work on academic engagement. Which they classified academic entrepreneurship refers to patenting, licensing, joint-ventures, and spin-offs. This type of engagement is usually based on the objective for academic invention and aims to gain financial rewards such as the selling of intellectual property (IP) (de Wit-de Vries et al., 2018; Perkmann et al., 2013). In contrast, academic engagement refers to high relational involvement in situations where individuals and teams from academic and firm contexts work together on specific projects and produce common outputs (Perkmann and Walsh 2007; de Wit-de Vries et al., 2018). This form of engagement focuses on research partnerships, contract research, and consulting (de Wit-de Vries et al., 2018). Alexander et al., (2020) studied the barriers to knowledge transfer in university-industry collaboration such as conflicting and tensions between academic, identifies 13 knowledge transfer channels to access knowledge from UK universities. The channel for knowledge transfer includes; Contract research, Collaborative research, Shared facilities, Training/ CPD, Professional Journal Publications, Joint supervision, Student placements, Joint conference, Secondment, Networks, Patents/Licence, Spin-out, and Joint-Venture.

While it is acknowledged that there are several modes of knowledge transfer available between universities and firms, the current study focuses on academic engagement, particularly on the partnerships between universities and TBSFs. This approach is motivated by previous studies which have highlighted that academic partnerships have received limited attention from scholars. For instance, Perkmann et al., (2013) highlighted that there is a paucity of studies aimed at understanding how individuals engage and sustain collaboration in academic engagements. Similarly, de Wit‑de Vries et al., (2018) in their recent review of knowledge

transfer in the universities-firms engagement, pointed out the lack of research into academic partnerships. They stressed that the literature that focuses on knowledge transfer and management of such collaborations was scarce and recommended that research into academic partnership was urgently required to build theory on knowledge transfer in order to fill this gap.

Furthermore, a systematic review carried out by Rybnicek and Knigsgruber (2019) to review the factors for collaboration success, argue for a different form of collaboration with likely different underlying aspects required for successful knowledge transfer. Agreeing with this statement, Alexander et al., (2020) noted the absence of alternative to a 'one size fits all' type of model, since underlying elements may differ across varying types of knowledge transfer arrangements between universities and firms. Their study presents meta-rules as a solution to aid organisational decision making, to help facilitate knowledge transfer across different types of engagement between universities and industries. They found the importance of organisational context when presenting solutions to knowledge transfer challenges, as different contexts involved different stakeholders and goals. Hence it is significant for the study to focus on the different contexts of universities and industries in knowledge transfer which is in the context of partnership, as the challenges for the partnership context could be different from the other forms of academic engagement.

2.1.9 Challenges and facilitators for knowledge transfer between universities and firms

Knowledge transfer between universities and firms is not without challenges. In fact, a policy report for Higher Education Institutions (HEIs, to support the development of knowledge transfer in the HEIs in the UK, emphasised that knowledge transfer between universities and industries is rarely smooth and easy (PACEC, 2012). Furthermore, the process of knowledge transfer between universities and industries is becoming more complicated as the process involves many more actors and different stakeholders (Alexander et al., 2020). Consequently, there is a need to understand the underlying mechanisms and frameworks that facilitate the transfer of knowledge between universities and industries (Cunningham and O'Reilly, 2018; de Wit-de Vries et al., 2018; Alexzander et al., 2020).

Plewa et al., (2013) investigate the relational success factors in the universities-firms partnership across Australia by doing quantitative survey. According to Plewa et al., (2013),

common barriers to knowledge transfer within the partnership between university and firm are related to the differences in objectives, purposes, cultures, and norms. Using social exchange as a framework, they found that communication, trust, understanding and individuals have positive impacts on the university-firm partnership project. However, this research provided a limited view of the determinants of knowledge transfer to achieve innovation outcome. This research particularly focuses on the continuing engagement or reaching agreement between partners. Thus, this research has not provided an in-depth understanding of knowledge transfer to achieve innovation outcome.

In similar vein, de Wit-de Vries et al., (2018), in their recent review of the barriers and facilitators of knowledge transfer in university-firm engagements, identified that differences in goals and cultural differences were the main barriers to the transfer of knowledge. They identify communication and social capital such as trust and tie strength as facilitating the transfer of knowledge. However, their research has not investigated the element of cognitive capital and has not been empirically tested. Furthermore, some of the elements identified do not fully reflect the transfer of knowledge between universities and firms. Instead, it was mostly built from the collaboration between business and business relationship. This is because there is lack of studies focusing on partnerships between universities and firms. De Wit-de Vries et al., (2018), also highlighted that much of the research was mainly focus on the implementation phase with little attention being given to the actual initiation and collaboration phases.

Bruneel et al., (2010) investigated the factors that diminish the barriers to university-industry partnership by conducting a survey and analysis of public records. They classified the barriers into two types: first, ‘orientation-related barriers’, and, second, ‘transaction-related barriers’. Orientation-related barriers refer to the different institutional norms existing between academics and firm partners. For instance, academics are orientated to academic success by establishing reputations through publications. On the other hand, firms engage in the partnership for economic or commercial success and competitive advantages, in which they prefer the “knowledge” to be disclosed for temporary monopolies (Bruneel et al., 2010). Transaction-related barriers refer to the conflict over IP and problems dealing with university administration (Bruneel et al., 2010). These authors found that, collaboration experience, trust and breadth of interaction facilitated the challenges which they identified. However, this study only focused at the implementation phase; there is lack of studies that focus on the actual initiation and collaboration phase (Bruneel et al., 2010)

Meanwhile, Lockett et al., (2008) has explored the barrier to knowledge transfer between universities and small medium enterprises (SMEs) in the UK. They found that the main barriers to the success of knowledge transfer were lack of time or the different perceptions of timescale, the bias incentives towards publishing research and teaching, and the 'cutting-edge' perception from the SME partners towards university research. This research provides a useful understanding of the challenges confronting the InfoLab21 project at Lancaster University in which they focus on the role of knowledge transfer on the creation of start-ups and spin out companies. However, this study focuses on the academic commercial mode, which is a spin-off rather than an engagement mode of interaction (partnership). This study also focuses on the prediction factors that lead to a successful knowledge transfer rather than concentrating on the underlying facilitators that lead to successful outcome.

Steinmo (2015) examine how the development of social capital between firms and universities in Norway, contributes to mitigate collaborative tensions and thereby enhances collaborative and innovative performances in collaborative research over time. Steinmo (2015) found that the development of both cognitive and relational social capital at the individual, organizational and alliance levels appears significant for effective collaboration in research collaboration. While the study has provided some understanding on the implication of relational and cognitive dimension of social capital, however the study has several limitations. His study has conceptualised knowledge transfer as communication between partners and has conceptualised innovation as new knowledge. This provides limitation on understanding the implication of social capital and knowledge transfer in innovation outcomes. While, this study underlines the significant of relational and cognitive dimension of social capital in facilitating communication between partners in collaborative research, however the study has not focus on the structural dimension. According to Bartkus and Davis (2009), the application two constructs (structural and relational) neither can provide meaningful insight on their own. Investigation of all the constructs is important to understanding social capital's potential implication. Consequently, it has limitation in providing the comprehensive view of the implication of the three dimensions of social capital on knowledge transfer in fostering innovation outcome. Hence the study does not comprehensively investigate the interaction between the three dimensions of social capitals' implication on knowledge transfer across universities and industries.

Thomas and Paul (2019) undertook a critical review on a number of prior studies of universities and industries linkages to understand the implication of social capital in facilitating knowledge transfer between university and industry in diverse countries and sectors. They underline the role structural (network ties), relational (trust), and cognitive (shared goal) to facilitate communication and enhance the transfer of knowledge. Whilst this study has provided some understanding on the role of social capital to facilitate knowledge transfer, however, the study has limitation in understanding the other elements of social capital that could influence the transfer of knowledge. The social capital has not been explored in depth, and the study does not concern on the context and types of collaborations that could have different social capital elements to facilitate knowledge transfer. The study also has not investigated the implication of social capital and knowledge transfer on innovation in more in depth. Their study has limitation view on innovation, which they have only focused on inducing innovation or adapting to technology, rather that explore the implication on innovation outcome.

Reviewing the literature concerning knowledge transfer through partnership between university and firm showed that there are still numbers of limitations that need further investigation. It is noted that most of the study were emphasised on the facilitators to overcome challenges to collaboration at the implementation stage and not focusing at the challenges for fostering innovation outcome in the project. As stated by de Wit-de Vries et al., (2018), much of the research is mainly focus on implementation phase, there is lack of study that focused on the actual initiation and collaboration phase. Thus, there is limited understating underlying elements that's facilitates knowledge transfer to achieve innovation outcome in actual collaboration phases. Furthermore, there is also limitation of study that has focus on the innovation outcome from the subjective view. Considering the possibility that knowledge transfer could foster innovation, this encourage the study to explore the implication of social capital on knowledge transfer through the partnerships between university-TBSF on innovation.

Additionally, most of the study has emphasised on the role of relationship such as trust and tie strength, and communication to facilitate the transfer of knowledge. Consequently, it was found that there is limited research that focus all the three dimensions of social capital together and understand how the three dimensions could be interrelated in fostering innovation. For instance, Moran (2005) investigates the influence of social capital on management

performance, emphasised that the application of structural capital alone does not present the effectiveness of social capital to the theory and claim that social capital needs to focus on multidimensional view. These limitations hence encourage the study to understand the influence of social capital in facilitating the transfer of knowledge to foster innovation.

2.1.10 Technology-based small firm (TBSFs)

Recent studies mainly agree that there is no single definition for technology-based firm or so called high-tech firm (Brown and Mason, 2014; Glasson et al., 2006). This is because the use of different characteristics and criteria has resulted in different definitions (Brown and Mason, 2014). Nonetheless, the definition of technology-based firm is found to be extended within two bounds: industry-based classifications, and characteristics of the firm (Brown and Mason, 2014). A firm characteristic definition is based on the firm or establishment features (Brown and Mason, 2014). For example, the general features of the "technology-based" or "high-technology-based" firm are R&D intensity, new high growth businesses, and success in exploiting emerging or niche markets or technologies (Glasson et al., 2006). Technology-based firms are expected to have most of these features.

The limitation of a firm characteristics definition for the research would be that it requires a massive amount of firm level information, which is difficult to access and may not even exist. Furthermore, the definition is likely weighted towards large firms, whereas R&D expenditure and technology occupations are often under-recorded in small firms (Brown and Mason, 2012). The firm characteristics-based definitions also depend on subjective opinions. For example, Brown and Mason (2012, p. 13) questions the definition of high tech firm by the Sunday Times Fast Track, "as one whose business growth and success is dependent on the development of one or more technologies." They question what is meant by "dependent" and what is meant by "technology" (Brown and Mason, 2012, p. 13). They feel that the definition based on firm characteristics is impractical (Brown and Mason, 2012).

Meanwhile, the alternative approach to defining technology-based firms is by an industry-based definition. This approach was pioneered in the UK by Butchart (1987). Based on the four-digit level of the 1980 Standard Industrial Classification (SIC) he identified high tech industries as those which had higher than average expenditures on R&D as a proportion of sales or employed proportionately more 'qualified scientists and engineers' than other sectors.

The industry classification by Butchart (1987) has been adapted in many researches undertaken in UK. For instance, Siepel et al., (2016) investigated the impact of non-founder human capital on high-tech firms' growth and survival and has classified technology-based small firm according to industry classification. Conducted in the UK, this research adopted the Butchart (1987) definition of 'high-technology', which includes firms in electronics, software, advance materials, telecommunications and biotechnology sectors.

Glasson et al., (2006) defined technology-based small firms based on the Butchart (1987) SIC industry classification. However, Glasson et al., (2006) has extended the Butchart definition and combined it with the definition from the Organisation for Economic Co-operation and Development (OECD) to meet the context being studied. The OECD definition adopted in Glasson et al., (2006) study includes: high-tech and medium-tech. Classification of technology-based firm based on OECD (2007) is listed in Table 2.4.

High technology Industries
Aircraft and spacecraft Pharmaceuticals Office, accounting and computing machinery Radio, TV and communications equipment Medical, precision and optical instruments
Medium high-technology industries
Electrical machinery and apparatus Motor vehicles, trailers and semi-trailers Chemicals excluding pharmaceuticals Railroad equipment and transport equipment Machinery and equipment

Table 2.4 Classification of technology-based firm based on OECD (2007) (Glasson et al., 2006)

In another study by Brown and Mason (2014), high technology based firms are defined on the basis of Butchart (1987) SIC. This definition was extended from the study conducted by Glasson, et al., (2006). The definition of high technology sectors based on sectoral industry classification (SIC 2003) listed by Brown and Mason (2014) is presented in Table 2.5.

SIC Code	Sector
High-tech manufacturing activities	
11.1, 11.2	Energy
22.1, 22.3	Electronic publishing
24.4, 33.1	Life Science
(no specific SIC category)	Biotechnology
25.24, 26.15, 26.82	Composites and other advance materials
28.52 (no specific SIC category)	Precision engineering and precision components
29 (all)	Machinery and equipment not classified elsewhere
30.01, 30.02	Computer Equipment and office machinery
31.1, 31.2, 31.4, 31.62	Electrical equipment
32.1, 32.2, 32.3	Electronic equipment and components
33.1, 33.2, 33.3, 33.4	Medical and surgical equipment
34.10, 34.3	Transport equipment
35.3	Aerospace and related activities
36.5	Manufacture of games and toys
High Tech service activities	
64.2	Telecommunication
72.2	Software development and consultancy
72.6 (no specific SIC category)	Web/internet services
72.1,72.3,72.4,72.5,72.6	Others computer
73.1	R&D (natural sciences and engineering)
74.2	Architectural and engineering activities
74.3	Technical testing and analysis
74.60/2	Security and related activities

Table 2.5 SIC technology-based industry classification (Brown and Mason, 2014; Glasson et al., 2006)

Yli-Renko et al., (2001) provide another definition of technology-based firms as those involved in pharmaceuticals, medical equipment, communications technology, electronics or energy or environmental technology. This definition covers some of the Butchart (1987) high-technology list and covers common sectors studies in inter-organisational relationship research. While many researches have adopted the definition of technology-based firms based on industrial classification, there are several limitations in adopting this definition. For example, this definition assumes homogeneity within the sectors, but not every firm is high technology and it may exclude the high technology firms in other industries (Brown and Mason, 2014).

Despite the limitation, the definition of technology-based firm developed for this research adopts the delineation found in Brown and Mason (2014) as listed on the two tables above. It includes the SIC classification and includes the OECD (2007) definition of technology-based industries, which has been widely used and recognised in the other studies. The definition

covers the elucidation of technology-based firms found in the recent literature, particularly in the UK context. This will allow the researcher to make comparisons and coherent contributions to other study. This definition would also allow the researcher to fully explore the technology-based firms in the UK context, as it is not too narrow to meet the research circumstances.

2.1.11 Defining small firm

The working definition for small firm in this research will be the European Commission (EC) definition, firm that have less than 50 employees. The EC organises definition of Small Medium Enterprises into three level (EC, 2005). Table 2.6 illustrates the definition of SMEs based on Medium, Small, and Micro sizes (EC, 2005).

Organisation category	Employees	Annual turnover	Or	Annual balance sheet total
Medium	<250	≤ €50 million	Or	≤ €50 million
Small	<50	≤ €10 million	Or	≤ €10 million
Micro	<10	≤ €2 million	Or	≤ €2 million

Table 2.6 Definitions of SMEs (European Commission 2005)

The reason to adopt the definition of small firm from EC (2005), is because this definition has been used widely in most of the literature (e.g. (Macpherson and Holt, 2007; McGuirk et al., 2015; Romijn and Albaladejo, 2002) which allow the research to understand the context of small firm in details. Furthermore, this definition is similar to Company Act 2006 (Legislation UK, 2018) in UK, which classifies a small firm as a firm that has less than 50 employees. Thus, it allows the researcher to cross check and validate the size of the firm through referring to the firm's details, which can be accessed through the Company's House webpage, which is available to the public. Thus, the working definition for TBSFs for this research is independently owned firms with less than fifty employees with annual turnover less than ≤ €10 million and operating in high-technology sectors as listed in Tables 2.6 & 2.7. Some of the sectors included are electronic equipment and components, electrical components, software development and medical equipment.

2.2 Section II. Innovation

2.2.1 Defining innovation

Innovation has received a startling amount of attention from scholars over the past few years because innovation has been seen to mitigate climate change, advance sustainable development, and promote social cohesion (Gault, 2018). According to Cohen and Levinthal (1990), competitive advantage lies in part with the firm's capacity to innovate, evaluate, and exploit internal and external knowledge. Another example that points out the importance of a firm to innovate is from the OECD (2010) (cited in Gault, 2018 p. 617) state "innovation drives growth and helps address social challenges". In order to identify the innovation outcome through knowledge transfer within the partnership, it is crucial to understand the definition of innovation.

Within the literature there are two perspectives on innovation that can be considered: innovation process and innovation outcome. The concept of innovation is extensive, each perspective emphasising a different aspect of the term (Crossan and Apaydin, 2010). Viewing innovation as a process, it can be described as the process of development and implementation of new ideas by people who over time engage in transactions with others within an institutional order (Van de Ven, et al., 1999). Tidd and Bessant (2009) provide another example of innovation that focused on the process. They define innovation as "a process of turning opportunity into new ideas and of putting these into widely used practice." (Tidd and Bessant, 2009, p. 16).

Consequently, the definition of innovation that focused on the process it could be understand that there are two main activities involved: I) idea generation and II) implementation phases (Gopalakrishnan and Damanpour, 1997; Quintane et al., 2011). As discussed by Quintane et al., (2011), idea generation includes all the steps from idea creation to the decision to implement the idea (Amabile et al., 1996). On the other hand, the implementation phase is seen as an experimentation process, where trial and error are repeated to achieve an innovative result (Eisenhardt and Tabrizi, 1995; Quintane et al., 2011).

As opposed of viewing innovation as an outcome, innovation is commonly referred to the output. The output typically associates with the introduction of new product and new services

(Kahn, 2018). Schumpeter (1934) who first coined the definition of innovation, who stressed on the novelty aspect, describes innovation into several types of innovation or the introduction of : i) a new product, ii) method/ process, iii)the opening of new market and iv) new organisational structure. Similarly, Utterback (1971, p. 77) defines innovation as "an invention which has reached market, introduction in the case of a new product, or first use in a production process, in the case of a process innovation." (Utterback, 1971, p. 77). Another definition of innovation from the outcome perspective is by Damanpour (1991, p. 556), who describes it as "a new product or service, a new production process technology, a new structure or administrative system, or a new plan of programme pertaining to organizational members".

Consequently, the definition of innovation that focus on the outcome highlight several characteristics that constitutes innovation. One of the characteristics identify is new output. Schumpeter (1934) highlighted the concept of innovation when referring to the need for 'newness' to remain competitive. Whilst the term 'new' seem robust, however, is open to many interpretations. Hence, Damanpour and Wischnevsky (2006) proposed that, "new" in relation to innovation can be considered as new to the individual adopter, to people within the unit of adoption, to the organisation, to most organisations in an organisational population or to the entire world.

However, it is worth note that the term "new" is not sufficient to be taken as innovation outcome. According to Schumpeter (1912, p. 543, cited in Sledzik, 2013), "the pure new idea is not adequate by itself". Following his view, Sledzik (2013) suggests that is not the power of ideas but the power that gets things done. Both arguments emphasised on the significance of value added for innovation to take place. Hansem and Wakonen (1997) underlined that any changes that can add value can be regarded as innovation . Added value is considered as demonstrable usefulness to improve an existing situation (Quintane et al., 2011).

Following Schumpeter (1912;1934), Quintane et al., (2011) highlights, value added is one of the important characteristics of innovation that distinguished an innovation and an invention (Quintane et al., 2011). They underline the differences between invention and innovation. As an invention can be new, but it may not necessarily improve existing processes or situations. This is similar to Schumpeter's (1934) distinction between an innovation and an invention, in which the latter belongs to the realm of ideas whereas an innovation is a practical implementation of these ideas are valuable and improve the existing situation.

Consequently, Quintane et al., (2011) underline several characteristics to identify what constitutes innovation as an outcome: such as being novel, useful, in use, or non-trivial (Jaffe et al., 1993; Levitt, 1960; Schumpeter, 1934; Utterback, 1971). This characteristic of innovation is also taken into account for the purposes of the current study. Further aspects such as 'introduction' also are taken into account (Schumpeter, 1934; Kanten, 1984). This study considered innovation from the outcome perspectives, therefore based on the discussion above, this research defines innovation as the introduction of a new or improved product/ services, or new process, or opening new market or new organisation structure, that is valuable/useful or non-trivial (Schumpeter, 1934; Utterback, 1971; Damanpour, 1991; Quintane et al., 2011).

2.2.2 Types of innovation

To understand the types of innovation that could be derived from the partnership it is essential to have some understanding of different types of innovation output. Following Schumpeter's (1934) classification of innovation, there are four types of innovation identified; product, process, marketing and innovation (Varis and Littunen, 2010). Product innovation is the most common form of innovation, which may involve a new product offering or improvement in an existing product (Oke et al., 2007). Similar to Gault's (2018) definition, product innovation refers to a product made available to potential users, that is new or significantly changed with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics (Gault, 2018). Product innovations can utilize new knowledge or technologies or can be based on new uses or combinations of existing knowledge or technologies (OECD, 2005). Intellectual property (IP) was one of the most common illustration of product innovation highlighted in the knowledge-based literature (Quintane et al., 2011).

A process of innovation is defined as the introduction of new methods of production which involved reduction of the unit costs and increase the quality of the product produced (Tavassoli and Karlsson, 2015; Damanpour, 1991). In the same vein, Gault, (2018), defines process innovation as a new or significantly changed production or delivery process. Gault (2018) points out that process innovation includes significant changes in inputs, infrastructure within the institutional unit and techniques. Utterback and Abernathy (1975) argued that, process

innovation can change task specification, materials input, workforce, changes process equipment and information flow.

Marketing innovation refers to the opening of new markets (Schumpeter, 1934). However, in the modern management literature, marketing innovation refers to improvements of the mix of target market including market segmentation and methods to serve these market (Johne, 1999, cited in Tavassoli and Karlsson, 2015). However, the standard definition of marketing innovation defines it as implementation of a new or significant change in method of promoting products of the one unit. It involves changes in product design or packaging, product placement, product promotion or pricing (Gault, 2018; OECD, 2005). The primary goal of marketing innovation is aimed at better addressing customer needs, opening up new markets, or newly positioning a firm's product on the market, with the objective of increasing the firm's sales (Gault, 2018; OECD, 2005).

In contrast, organisational innovation refers to the implementation of a new or significantly changed organisational method in the business practice, workplace organisation or external relations of the institutional unit (Gault, 2018; OECD, 2005). In similar vein, Tavassoli and Karlsson (2015, p.1887) defined organisational innovation as innovations involving "changes in the routines of firms aiming improving the efficiency, productivity, profitability, flexibility and creativity of a firm using disembodied knowledge". Tavassoli and Karlsson (2015) highlighted several examples of organisational innovation such as: 1) introduction and implementation of new strategy, 2) introduction of new control systems and administrative and processes, 3) introduction of knowledge management systems that improves the skills of employees, 4) introduction of new types of external relationship.

2.2.3 Knowledge transfer and innovation

The innovation outcomes have been considered closely associated with reliance on knowledge. For example, Cohen and Levinthal (1990) is one of the early studies, that linked knowledge with innovation capabilities. Cohen and Levinthal's (1990), Absorptive Capacity Model highlighted prior knowledge as the main function for a firm to achieve innovation. A low level of knowledge can disrupt and make it unfeasible for innovation (Cohen and Levinthal, 1990). The implication of knowledge creation on innovation also was highlighted in Nonaka and Takeuchi (1994) SECI model, which emphasised the role of tacit and explicit types of

knowledge as foundations for innovation. Nonaka and Takeuchi (1994) outline four distinct processes to convert knowledge: 1) Socialisation: tacit to tacit (individual interacting). 2) Externalisation: tacit to explicit (formalise knowledge). 3) Combination: explicit to explicit (combining existing theories). 4) Internalisation: explicit to tacit (translate theories into practice). Their study establishes that the innovation process involves an accumulating and creating of new knowledge. However, their research focus is on the innovation process as opposed to the exploration of the implication of knowledge on the innovation outcome.

Herrera et al., (2010), have considered the significance of external knowledge transfer with references to firm's innovation by underlining that the innovation process is reliant on knowledge. The study of Herrera et al., (2010) is based on a quantitative investigation in the Spanish manufacturing industry, confirms that the mobility of personnel coming from the public R&D system, facilitates the transfer of knowledge for innovation outcome. The study underlines the fact that firms have access to external knowledge, which is complementary to what the firm already possesses, represents a spur for exploiting and applying this new knowledge for innovation. This study confirms that external knowledge transfer has positive influences on both inputs and outputs for innovation. Whilst their study supports the assumption of the implication of knowledge transfer on innovation outcome, the study focuses on the mobility of the public researcher in the firms. The study also has not explored the underlying determinants that facilitate the transfer of knowledge to innovation outcome and the view of innovation outcome limited to the objective view of innovation (patent intensity). Nonetheless, they highlight the important of knowledge transfer for innovation outcome.

Recent research by de Zubielqui et al., (2019) examines the impact of knowledge transfer from supply chain actors on innovation and firm performance. Their study employed a quantitative methodology, using structural equation modelling on 291 SMEs in Australia, and found that knowledge transfer was deemed to be useful knowledge from customers and suppliers which are significantly related to innovativeness and the firm's performance. The study focuses on firm innovativeness based on the objective view of innovation mainly on product and process innovation. While the study highlights the impact of external knowledge transfer on innovation, it does not, however, explore the condition or the elements under which the knowledge transfer could contribute to innovation. Consequently, they recommend that future studies should investigate the conditions under which external knowledge could foster innovation.

Schweisfurth and Herstatt (2016) take the internal and external knowledge into consideration in their study of the contribution of employees knowledge to product innovation. Schweisfurth and Herstatt (2016) deem employees as 'embedded users'; this implies that they are external users of the products developed in their firm, as well as internal users. They found that employees used capabilities and resources through the three main stages of the product innovation activities (ideation, development and marketing). The study underlines the fact that employees use social resources and knowledge for product innovation, which strengthens the influence of social capital on knowledge transfer for innovation.

Whilst, previous studies have underlined the significance of knowledge transfer in fostering innovation outcome, several limitations have been found in these studies. For instance, most of the studies analysed the impact on innovation. However, the concept of innovation outcome particularly focuses on the objective view of innovation (patents, product innovation), and innovation capabilities. Perkmann et al., (2011) point out that in university-firm alliance activities, innovation that may be considered as arising from the alliance includes the design of new or improved product or processes or adoption of new techniques or approaches. They suggested that innovation measures have subjective elements as the benefits may not be immediately apparent therefore, to address this a qualitative approach is suggested to measure innovation (Perkmann et al., 2011).

Another limitation in the previous study is with the understanding of the underlying determinants that facilitate the transfer of knowledge in fostering innovation (Rajalo and Vadi, 2017). Rajalo and Vadi (2017), study the aspects that facilitate innovation in university-industry collaboration through absorptive capacity, argue that there is insufficient knowledge on several aspect that influence collaboration process and stress process of working together between partners is not well understood.

The next section will review the literature on social capital which is the theoretical lens.

2.3 Section III. Social Capital

2.3.1 Conceptualising and defining social capital

In recent years, the concept of social capital has become increasingly popular in many research fields and disciplines such as public health, economy, crime and violence, democracy and governance (Kwon and Adler, 2014). In the business and management research domain, the concept of social capital has also received lots of attention from scholars. The concept of social capital increasingly applied to understanding social relationships in order to realize value to individuals, and organisation (Tsai and Ghoshal, 1998; Burt, 2000; Borgatti and Foster, 2003; Jiang et al., 2010).

Social capital is a sociological concept that deals with the connections of individuals or groups within and between social networks. Since the early 1980's, social capital has been considered by researcher as the concept to explain the relationship between individuals that is used to gain resources and advantages (Gabbay and Leenders, 1999; Maurer and Ebers, 2006). The principle theorist of social capital, Pierre Bourdieu (1986, p. 248) defines social capital as "the aggregate of the actual or potential resources that are linked to possession of a durable network of more or institutionalized correlations of mutual acquaintance and recognition". Bourdieu contends that the networks of social interaction encourage benefits and to deliberately constructing them to create resources. Although the benefits derived from the processes are not essentially economic, he suggests that all forms of capitals subsequently result in economic capital, therefore inferring, on that basis, that social capital provides economic benefits. Bourdieu was interested in explaining how the social elite classes used social capital "as a tool of cultural reproduction" (O' Brien and O' Fathaigh, 2004, p. 6). Subsequently, this results in an inequality of structure.

Like Bourdieu (1986), Coleman (1988), recognised that social capital can deliberately make collective assets which the structure of connections empowers social action. However, Coleman (1988), adopts the theory of 'embedded relationship' introduced by Granovetter (1985), which views social capital as located in the bonding system that is embedded in the structure of relationships between people, which consequently leads to the provision of benefits and resources. This is also known as 'bonding' view. Coleman argues that social capital exists in the strong network where it arises from the network to which a person belongs where strong

bonds exist between the members in that network. Additionally, Coleman (1988) believed that social capital contributed to the public good and collective benefit. Coleman (1990, p.302) defined social capital by its function, sees social capital as "it is not a single entity, but a variety of entities with common characteristics: they all consist of some aspect of a social structure, and they facilitate certain actions of individuals within the structure." This implies that its function is to facilitate individuals' achievement of goals; the form and content are, to that extent, secondary to the function (Tlili and Obsiye, 2014). He further distinguishes social capital into three 'forms' of capital namely; obligation/ expectation, rules and finally social norms.

Contrary with Coleman's argument, Burt (1992) stressed the importance of structural holes of the network. Burt stress on the important of the location of an individual in the network, where it is determined the actions of the individual or business in the network (Hauberer, 2011). According to Burts' concept, social capital exists mainly in the possibility to span structural holes. Burt has introduced the structural holes concept which is referred to open network or less dense network. For example, according to Burt, to gain benefits, the network has to build non-redundant contacts. A structural hole is a relationship of non-redundancy between two contacts. As a result of the hole between them, the two contacts provide network benefits that are to some degree additive rather than overlapping (Burt, 1992). This concept from Burt is also known as the "bridging view" of social capital. Bridging view means that social capital arises in the relationships as individually connected to different networks by brokering structural holes (Filieri et al., 2014). Contrary to Coleman's focus which was on collective resources, Burt's focus is on individual benefits.

Building on the work of Coleman (1988), Putnam (1995) highlighting three components of social capital in his work by defining it as "features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" (Putnam, 1995, p. 167). Putnam focus on the relational content, and stress that relationships matter, and norms and trust are crucial for social capital of societies and groups to thrive. Putnam was interesting to explain the economic and political differences between the south and the north of Italy. Putnam found the north had rich and multiple network, which was an active society. Putnam see that such network increased "the performance of polity and the economy" (Putnam, p. 176). Putnam further emphasised that "life is easier in a community blessed with a substantial stock of social capital" (Putnam, 1995, p.176). However, Putnam's theory has been criticised

by scholars for not being able to be applied at the group level and at individual level as the context is not specific and universal (Hauberer, 2011; Coradini, 2010). Putnam sees social capital theoretically as a "community' or "fraternity" (Braun, 2001), which focusing on social capital at a meso level, such as the level of communities and nation (Putnam, 1995).

Fukuyama (2001) defines social capital from the perspective of a generalised approach, as the component of human capital that allows members of a given society to trust one another and cooperate in the formation of new groups and associations. Fukuyama associate's norms with the notion of reciprocity, which he sees contained within a spectrum that extends from simple friendship to more complex and multifaceted friendship attitudes dependent on cultural, religious and historical elements. His study, based in several countries including Japan, Germany, US, China and France. Fukuyama found that the different between nations are not based on institutional but on cultural.

Nahapiet and Ghoshal (1998) offered an alternative perspective of social capital and reconceptualised it as a multi-dimension of social capital. For instance, Nahapiet and Ghoshal (1998), have identified three dimensions of social capital: structural, cognitive and relational. They believe that the three dimensions represent social capital and play different but complementary in explaining how social capital can influence the outcomes (Nahapiet and Ghoshal, 1998). Nahapiet and Ghoshal (1998, p. 243) consider social capital as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. Social capital thus comprises both the network and the assets that may be mobilized through that network". Their conceptual framework is based on the principle theorist of social capital, Bourdieu (1986). The conceptualisation of social capital within this framework does not limit the scope on the structural dimension only, but the relationship and cognitive feeling that may exist through that network (Nahapiet and Ghoshal, 1998). Nahapiet and Ghoshal (1998) also considered that benefits of social capital are private and collective benefits to actors involved.

The definitions of Nahapiet and Ghoshal (1998), further imply the possibilities that social capital results from the internal forms of social interactions, referred to as 'bonding,' and from external forms of social interactions, referred as 'bridging'. This is in contrast, for instance, with Coleman (1988) and Putnam's (1995) and Fukuyama's (2001) definitions, which only consider the internal ties of the social structure. Based on that, the focus of the study was on

inter-organisational relationships, and thus the definition of Nahapiet and Ghoshal (1998) was appropriate and adopted. Furthermore, Nahapiet and Ghoshal's three dimensions of social capital are appeared to be more appealing. The three dimensions encompass not the only network between actors (structural) but also significant of relationship (relational) between actors well as the nature of their thinking or common interest between them (cognitive). Consequently, it explicitly incorporated the three dimensions of social capital and enabling a details analysis on the implication of social capital on knowledge transfer in fostering innovation in the context of the partnership between universities and TBSFs.

Moreover, reviewed from literature in knowledge transfer suggested that this framework has been adopted by many scholars (e.g. Filieri and Alguezaui, 2014; Inkpen and Tsang, 2005; Wasko and Faraj, 2005; Maurer and Ebers, 2006). This showed that the framework is useful in understanding how social capital could influence knowledge transfer to foster innovation within the partnership between universities and TBSFs. Table 2.7 present the variety of the definition of social capital.

Key author	Definition	Purpose
Bourdieu (1985, p. 248)	"the aggregate of the actual or potential resources that are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition"	Focus on Elite classes, interested in understanding the elite network connection, in which could be converted to economic capital. Focus on the collective approach-network connection among actors within the group
Coleman (1988, p. 302)	"is defined by its function. It is not a single entity but a variety of different entities with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors – whether persons or corporate actors – within the structure"	Proposed social capital as basis for action that governed by social rules, obligation and norms Focusing on structural angle of the relationship, 'Bonding' view and on the collective approach for actors' benefit. He described that social capital can have economic and non-economic benefit.
Burt (1992, p. 8)	"friend, colleagues, and more general contacts through whom you received opportunity to use your financial and human capital'	Focused on structural angle- the influence of structural holes of the network on competition and success.

		Bridging holes offer more access to ideas, and information.
Putnam (1993, p. 167)	"features of social organization, such as trust, norms and networks, that can improve the efficiency of society by facilitating coordinated actions"	Focused on the network of civil society in Italy. Focus on the relational context of the community.
Fukuyama (1995, p. 90)	"the component of human capital that allows members of a given society to trust one another and cooperate in the formation of new groups and associations"	Focussed on to the cultural differences and how it could have influence on the global economy. Focus on the society in Japan, Germany, US, France and China to understand their cultural distinction.

Table 2.7 The variety of definition of Social Capital (Bartkus and Davis, 2009)

2.3.2 Dimensions of social capital

Studies are increasingly perceiving that they ought to give a more encompassing picture of social capital by reflecting its multiple dimensions (Bolino et al., 2002; Hoang and Antoncic, 2003). Previous studies traditionally, conceptualised social capital as on two construct approach- structural construct and relational. Whilst this approach has contributed and introduces the important basis of social capital, however, it has provided a limited view on social capital (Hauberer, 2011). According to Bartkus and Davis (2009), it is important to understand all the constructs together to critically understand the social capital implication. Therefore, this study sought to apply a multidimensional view of social capital suggested from Nahapiet and Ghoshal (1998). A multi-dimensional construct is understood to contribute to a shift from the structuralist approach (Kilduff and Tsai, 2012) and further contribute to social capital theory.

I. Structural dimension

Based from Nahapiet and Ghoshal (1998) social capital dimension, structural dimension is the first construct, whereby the social capital can be gained in any condition depends on the networks of relationship actor have access to. Nahapiet and Ghoshal (1998), suggest that the network established in the organisation provides advantages in developing intellectual capital. The main factor for structural dimension is discussed as following.

Pattern of connection

Nahapiet and Ghoshal (1998) describe the structural dimension of social capital as an overall pattern of connections and networks between actors. Nahapiet and Ghoshal (1998 p. 245) refer

to Burt's (1992) definition which is "who you reach" and "how do you reach them". According to Nahapiet and Ghoshal (1998), the fundamental facets of this dimension are the presence or absence of network ties and the pattern of the network. The presence or absence of the relationship between actors creates a social process or interactive process understood as network ties (Nahapiet and Ghoshal, 1998). The network ties provide access to resources, constitutes a valuable source and benefits available to individual or members within the network. According to Adler and Kwon (2002), network ties are the fundamental aspects of social capital because the members or the actors within the network create the opportunities for social capital transaction. Whilst ties provide the channel for knowledge transfer and information transmission, the development of effective ties is conditional upon the pattern and strength of the ties (Nahapiet and Ghoshal, 1998). The strength of the ties depends on the frequency, intensity and intimacy of that relationship (Burt, 1992).

II. Relational dimension

According to Nahapiet and Ghoshal (1998), relational dimension refers to the kind of personal relationships that people have through their interactions within the network. There are four important elements that are essential within this dimension, which determine the behaviour of the individual within the network. The four elements are trust, norm, obligation and identification.

Trust

Fukuyama (1995, p. 26) defines trust as "the expectation that arises within a community of regular, honest, and cooperative behaviour, based on commonly shared norms, on the part of other members of that community". Based on Mistzals' view, Nahapiet and Ghoshal (1988) envisage trust as the willingness of an actor to engage in a cooperative effort and emanates from four aspects: 1) belief in good intent, 2) belief in partner's competence and capability, 3) belief in partner's reliability and 4) belief in their perceived openness. Nahapiet and Ghoshal (1998), highlight the interplay of trust and cooperation, trust lubricates cooperation, and cooperation itself breeds trust, which in turn increase the willingness to engage in social exchange. Inkpen and Tsang (2005) ascribe trust to the belief that a partner's word or promise is reliable and that a partner will fulfil his obligations in the relationship, found that the interpersonal trust in an industrial network facilitated the transfer of knowledge. Bartsch et al., (2013) found that trust involved actors' perceived competence and acting professionally facilitated the knowledge transfer process among project members.

Norms

Apart from trust, another important element of relational dimension is norm. Fukuyama (1997) describes social capital as the existence of a certain set of informal values or norms shared among members of a group that permit cooperation among the members. Norms guide certain actions and behaviour that are seen as appropriate by a certain group (Nieves and Osorio, 2013; Reagans and Mcevily, 2003). Edelman et al., (2004) identify several categories of norms which are important for social capital. These norms include norms of reciprocity, norms of professionalism, norms of compliance and norms of cooperation. Edelman et al., (2004) suggest that relational norms are important to create a "helpful, trusting, knowledge-sharing environment however, if abused they can induce individuals to closely guard their knowledge and thus, be a disincentive to knowledge dissemination".

Obligation

According to Nahapiet and Ghoshal (1998) obligation refers to a commitment and duty to undertake activity in the future. Obligations may be distinguished from norms, as an obligation can be referred an act or course of action to which a person is morally or legally bound; a duty or commitment (Anon, 2011). Obligations may also be recognised as a reflection of the commonly held view that exchange often brings an element of future commitment. In a university and TBSF partnership context, obligation can be argued as the duty and obligation that individuals must perform to accomplish the partnership goals (Mayerson et al., 1996).

Identification

Nahapiet and Ghoshal (1998, p. 256) refer to identification as "the process whereby individuals see themselves as one with another person or group of people". Identification was found to be facilitate and motivate the anticipation for knowledge transfer and exchange (Nahapiet and Ghoshal, 1998). Akhavan and Mahdi (2015) investigated the team members' identification in relation to knowledge sharing intention and found that identification significantly influenced the individuals' sharing intention to knowledge. This is because, of the fact that individuals would not be encouraged to share knowledge with others unless they could identify themselves with the other people (Akhavan and Mahdi, 2015).

III. Cognitive dimension

Based on Cicoural's (1973) definition, Nahapiet and Ghoshal, (1998), referred to the cognitive dimension as the shared meaning and shared understanding between people. Cognitive capital is defined as the shared vision and common understanding among actors in the network which facilitates the common understanding in achieving collective goals and outcomes (Nahapiet & Ghosal, 1998). Nahapiet and Ghoshal identify shared language and codes as one of the determinants for cognitive dimension. Shared language is the extent that actors share common language and shared similar codes. This could be developed through some overlap in knowledge between actors in the network. Shared narratives, on the other hand, refer to shared myths, stories and metaphors. From the work of Bruner (1990), Nahapiet and Ghoshal proposed two modes of shared narrative, which are 1) through the information or paradigmatic mode and 2) the narrative mode. Key characteristics of social capital are presented in Table 2.8 below.

Social capital	Characteristics	References
Conceptual	Internal and external	Nahapiet and Ghoshal (1998)
	Internal	Coleman (1988); Fukuyama (2001); Putnam (1995)
	External	Bourdieu (1986); Burt (1992); Portes (1998); Partanen et al., (2008)
Structural dimensions	Overall pattern of connection Network ties	Coleman (1988); Nahapiet and Ghoshal; Burt (1992); Granovetter (1973)
	Network configuration and density	Nahapiet and Ghoshal (1998); Burt (1992); Coleman (1988)
Relational dimensions	Trust Belief in partners competence Commitment-duty and obligation Norms of reciprocity Norms of cooperation Norms of compliance Obligation Identification Rules	Granovetter (1973); Putnam (1995); Burt (1992);Coleman (1998); Nahapiet and Ghoshal (1998); Gulati et al., (2000); Fukuyama (2001)
Cognitive dimension	Shared meaning, Share narratives	Bruner (1990); Nahapiet and Ghoshal (1998)

Table 2.8 Key characteristic of social capital

2.3.3 Social capital, knowledge transfer and social capital

With reference to the notion of KBV, it is important to take into account that knowledge transfer is one of the means for fostering innovation outcome. With the understanding that knowledge transfer requires social processes between actors, social capital has emerged as one of the determinants that are important for facilitating knowledge transfer in achieving innovation outcomes (Nahapiet and Ghoshal, 1998; Adler and Kwon, 2002). The relevance of exploring the three elements is increasingly recognised in the literature, which resulted in a growing number of studies that integrated the three elements. For instance, Maurer et al., (2011) examine the connection between social capital, in facilitating knowledge transfer to achieve innovation performance. Their empirical quantitative study in the German engineering industry sector, finds that there is positive implication of social capital in mediating intra-organisational knowledge transfer (conceptualised as mobilisation, assimilation and used of knowledge resources,) to achieve innovation performance (new product development). Despite the fact that the study has contributed to an understanding of the value of intra-organisational knowledge transfer, it has not focused on the value of inter-organisational social capital. Furthermore, the study has provided limited conceptualisation of social capital by only focusing on the structural dimensions of social capital.

Vlaisavljevic et al., (2016), study the role of relational capital moderate the types of knowledge shared among partners for innovation performance in the alliances' project. They conducted a quantitative study with a sample of 90 Spanish biotech companies that established a R&D alliance for innovation projects. Their study found that trust and closeness among partners reduced the challenges when exchanging knowledge and mitigate the fear of opportunistic behaviour. Which then contributed to the achievement of innovation performance. Their study has contributed to understand the role of relational capital in moderating knowledge transfer for innovation performance. However, the study has only focus on the relational dimensions of social capital and has conceptualised innovation performance as introduction of new product and new market. Consequently, their study has limitation in providing comprehensive understanding of the implication of social capital and knowledge transfer in fostering innovation.

Pérez-Luño et al., (2011) analyses the influence of interorganisational links on radical innovation of 143 Spanish manufacturing and service firms. They discover that radical innovation is not fundamentally influenced by social capital; instead, this only occurs when

combined with knowledge, since the transfer of knowledge requires social interaction and communication, which is facilitated by closer relationships. Consequently, their study underlines the significant of relational capital to facilitate the transfer of knowledge for innovation. However, the study has overlooked the other dimensions of social capital.

Filieri and Alguezaui (2014) carried out a systematic review on the role of structural capital for knowledge transfer and innovation. They argue knowledge transfer, social capital, and innovation are complementary. Their study highlighted that there is lack of study that focus on the implication of social capital on knowledge transfer and deemed that knowledge transfer is the missing links in the context of social capital and innovation. They argue that knowledge transfer is often not accounted for and indeed is important to innovation. Their study further suggest that future study should take the time to consider the three bodies of literature together.

Yli-Renko et al., (2001) conduct a survey of 180 entrepreneurial high-technology venture on the effect of social capital with key customers on knowledge acquisitions. The result indicates that social capital is indeed associated with greater knowledge acquisition. However, the study has only focus on the influence of social capital at organisational level on the acquisition of knowledge. Furthermore, the innovation view was limited by focusing on product development, sales costs as well as technological distinctiveness.

Another limitation of previous study is that the implication on innovation was limited mainly focusing on innovation as product innovation or with the reference to organisational learning and performance. For example, Reagans and McEvily (2003), investigate the influence of informal network on knowledge transfer and information diffusion. They indicate that, tie strength eases the transfer of knowledge between people and influence learning, which conceptualised as innovation. In another example, Hu and Randel (2014), study the implication of social capital on knowledge sharing (tacit and explicit) and contribute to team innovation. They conduct a quantitative study with 219 R&D work teams in China. Their study identifies that social capital has potential for enhance the sharing of knowledge between partners, but conceptualised innovation as team ability to innovate a product or applying innovative technology.

Whilst, studies have emphasised the relevance of the three concepts together, there are still limitation towards understanding social capital implication on knowledge transfer in fostering

innovation. Most research treat social capital as a construct with two factors: i) structural- for example, network size, configuration and density, ii) relational- trust, and norms (Bartkus and Davis, 2009). Similarly, Zheng (2010), conduct a comprehensive review of social capital and innovation. He emphasises the three dimensions of social capital has significant influence on innovation. However, the cognitive dimension has been underdeveloped and suggest future study to focus on this dimension. Similarly, Steinmo and Rasmussen (2018) suggest further study need to further refine the understanding of social capital.

2.4 Establishing the gaps of the study

- **Integration of knowledge transfer, innovation and social capital in the context of partnership between university and TBSF**

The KBV theory sees knowledge as the most strategically important of the firms' resources (Grant, 1996). Consequently, this emphasised the importance of creating, transferring and transforming knowledge into competitive advantages (Kogut and Zander, 1992). Whilst, previous studies have underlined the significance of knowledge transfer in fostering innovation outcomes, several limitations have been found. For instance, previous studies particularly focused on the objective view of innovation in term of IP and new product development (e.g. Lockett et al., 2008), organisational learning (e.g. Cohen and Levinthal, 1990; Nonaka and Takeuchi, 1994; Reagans and McEvily, 2003) and organisational performance in term of increase in sales and profit (e.g. Steinmo and Rasmussen, 2018; Tsai, 2001; Herrera et al., 2010). Van Wijk et al., (2008), pointed out that previous studies had centred the outcomes of knowledge transfer in terms of organisational performance such as financial performance. They further stressed that, the overviews of the underlying mechanisms and outcomes of knowledge transfer were still deficient. Thus, is it noted the subjective view of innovation has received less attention from scholars.

Another limitation in previous studies is with the understanding of the underlying determinants that facilitate the transfer of knowledge in fostering innovation (Rajalo and Vadi, 2017). Many scholars admitted that external knowledge transfer forms the foundation for innovation; however, the underlying relationship with other firm activities is still limited (Rajalo and Vadi, 2017). Previous literature has given profound insight into several factors that can affect knowledge transfer, and, among these, social capital has been found as one of the significant facilitators for knowledge transfer (e.g. Van Wijk et al., 2008). However, there is still a lack

of studies that integrate the three concepts. While there are few studies that discussed the concept together, most of the studies has focused on the structural form of capital. Studies are increasingly perceiving that they ought to give a more encompassing picture of social capital by reflecting its multiple dimensions (Bolino et al., 2002; Hoang and Antoncic, 2003. A multi-dimensional approach is understood to contribute to a shift from the structuralist approach (Kilduff and Tsai, 2012). This study sought to apply a multidimensional view of social capital to further contribute to this shift.

Furthermore, the integration of the three concepts is under study in the context of partnership between university and TBSFs. Review from the literature in section 2.2 has highlighted different types of mechanism for knowledge transfer to take place in university-firm engagement. However, it was found that the partnership or collaboration context has been under-researched. The recent review of knowledge transfer in university-industry partnership by de Wit-de Vries et al., (2018), has pointed out that there is a lack of research in the academic engagement or academic partnership. They insist that the literature that focuses on knowledge transfer and management of such collaborations is scarce. According to Perkmann et al., (2013), recent studies have made much of the commercialisation of academic knowledge such as patenting and licensing. This is because the academic commercialisation channels have been understood as an important means for academic research to contribute to the economy and society (Perkmann et al., 2013). However, Cohen et al., (2002) maintain that academic partnership represents an important way in which academic knowledge is transferred into the industrial domain; many firms consider it significantly more valuable than licensing university patents.

Along the same lines, Perkmann et al., (2011), support this view, by pointing out that universities' income from academic partnership is usually a high multiple of the income derived from intellectual property (IP). Furthermore, partnership with a university has been indicated as one of the effective forms of knowledge transfer to take place (Lambert, 2013). Narrowing down the research to the partnership between university and TBSF is a pertinent sphere of inquiry. This is because according to Maine and Garnsey (2006), small high-tech firms in general are a key source of radical innovations, in which this ability to introduce innovation can support the basis for future industrial regeneration and transformation and increase economic wealth and competitiveness (Porter and Ketels, 2005). Furthermore, Laursen and Salter (2004), found that a sector that was highly involved in scientific and

technological activities had a higher propensity to draw from universities' research for their innovation activities. Some of the papers that acknowledge the need for further research development and linking the areas mentioned are given in Table 2.9 below:

Call for Research	Author (s)
The need for future study to explore the role of stakeholders' relationships within knowledge transfer activities in university and firm partnership	McAdam et al., (2010)
Research in the context of partnership between university and firm settings is under-explored	de Wit-de Vries (2018)
Prior studies on university-firm partnership offered relatively small details in characterising social capital	Steinmo and Rasmussen (2018)
The need to establish social capital as a theoretical framework in understanding the relationship between actors that influence the partnership	Bjerregaard (2009)
The understanding of the underlying mechanisms of university and firm interaction between partners is still scare.	Rajalo and Vadi (2017)
Lack of study on different context of knowledge transfer between universities and firms, and stressed the underlying elements may be different across different types of knowledge transfer between universities and firms.	Alexander et al., (2020)

Table 2.9 Listing the acknowledgement of limitation from previous study

2.5 Conclusion

This chapter presented literature on the topic concerning knowledge transfer, innovation and social capital. Overall, the literature review identified theoretical, empirical and methodological needs for the study and established that the relevance to explore the underlying aspects that influence knowledge transfer in fostering innovation outcome. Moreover, the review identified the lack of a theoretical link between knowledge transfer, innovation and social capital the context partnership between the universities and TBSFs in the UK. The next chapter presents the research methodology used in the study.

Chapter 3. Research methodology

3.0 Introduction

The purpose of this chapter is to explain the research methodology and design underlying this study. This chapter begins with the discussion on the general assumptions of research philosophy, followed by the philosophical stance and assumptions adopted by the researcher to inform the research process. This chapter also discusses the research strategy and data collection methods and the justification of the chosen research strategy. The chapter also presents the overall research design for this study and discusses the relevant issues of validation, reality and ethics. Finally, the selected data collection methods and data analysis concludes the chapter. The outline of the chapter is as follows:

- Brief introduction on research philosophy
- Ontology, epistemology and axiological general assumptions are discussed
- A discussion of the adopted philosophical approach of the study
- The discussion on common research approach and methodological choice research
- The methodological choice of the research is presented
- The selected research strategy, research methods are highlighted
- The ethical considerations, research validation and reliability are discussed
- Data analysis techniques are highlighted

3.1 Research Philosophy

Research philosophy is the assumptions and belief of the researcher embarking in developing the new knowledge (Saunders et al., 2019). Research philosophy and assumptions inevitably shape the research how researcher understand about realities encounter in their study and influence the way they develop their research process and how they interpret their findings (Saunders et al., 2019; Crotty, 1998). Research philosophy will help the researcher to design a coherent research projects by guiding researcher in choosing the right set of assumption, well-fitting with the methodological choice, research strategy, data collection methods, and data analysis procedures (Saunders et al., 2019). According to Easterby-Smith et al., (2015), there are four reasons why an understanding of philosophies is very important in the management and business research. First, the researchers will have a clarity about the theory of knowledge related to their field. Second, it helps the researcher to have a clear research design. Third,

understanding philosophies helps research to set boundaries for their approach and lastly, it may also help the researcher to recognise and create research designs which are outside the researcher's experience.

The philosophical assumption usually determines how different researchers view the nature of reality (ontology), how to acquire knowledge (epistemology), how the role of values influences the research (axiological) and how the process of the research should be conducted (methodology) (Saunders et al., 2019). The philosophical assumptions are typically embedded within a research paradigm. A research paradigm is a framework that guides how the researcher should conduct their research, based on their philosophical stance and their assumption about the world (Collis and Hussey, 2014). According to Oates (2008), a research paradigm is a set of shared thinking about aspects of the world.

Traditionally, there are two main research paradigms which are usually discussed within the literature; positivism and interpretivism. Positivism is a paradigm that rooted in the natural sciences (Collis and Hussey, 2014). Positivists rest their beliefs on the assumption that reality is singular and mind-independent. Their research involves experiment and observation which can be scientifically verified. Positivists assume that social reality can be measured and subjected to logical reasoning so that precision, objectivity and rigour underpin their approach (Collis and Hussey, 2014).

According to Saunders et al., (2019), positivism entails working with observable social reality to produce law-like generalisations. A positivist research might use existing theory to develop hypotheses which can be tested to verify or otherwise modify the underlying theory based on the facts and findings of the study. Since positivist consider that social phenomena can be measured, the methods for data collection and data analysis are usually associated with a quantitative approach (Collis and Hussey, 2014). Alternatively, interpretivists believe that social reality is highly subjective and social phenomena should be accessed through interaction with the social world (Collis and Hussey, 2014). Researchers interact with that which is being researched and their interpretations are the key to the findings (Saunders et al., 2019).

Since, the interpretivists' focus is to gain rich understanding, therefore, interpretivists usually adopt a range of qualitative methods of analysis to lead to a broad conclusion. Broadly positivism and interpretivism paradigms suggest different approaches and assumptions to the

research. However, to understand the orientation of the study in detail, the philosophical assumptions under each philosophical assumption such as ontology, epistemology, axiology and methodological assumptions are briefly discussed in the following section.

3.1.1 Ontology, Epistemology and Axiology

There are four basic assumptions that help to define the philosophical stance of the research:

- Ontological (nature of reality)
- Epistemological (different types of knowledge that forms that reality)
- Axiological, (appropriate value within research)
- Methodology (what tools can we use to know that reality)

Ontology refers to our interpretation of the nature of reality and existence (Easterby-Smith et al., 2015). It shapes the way in which the researcher sees and study their research objects (Saunders et al., 2019). There are many varieties of acceptable ontologies from many other academic disciplines. Among the philosophers of natural sciences, the main debate is between the realism and relativism. Easterby-Smith et al., (2015) recognised two varieties of realism; which are transcendental realism and internal realism. Transcendental realism assumes that the object of the research inquiry exists and acts independently of the researcher (Easterby-Smith et al., 2015). On the other hand, internal realism, assumes that there exists a single reality, however, it is obscure, and facts are concrete, and it is only possible to be gathered indirectly. Therefore, it is not possible to obtain full information and understanding of the phenomenon being study as the act of experiment itself will affect the result of the phenomenon studied. In contrast, the relativist position suggests that, there are many realities out there and that facts are dependent on the viewpoint of observer. It must be stated that taken to extremes, relativism can be self-refuting as it leads to the conclusion that there is no objective truth, but this conclusion cannot be sustained due to the relativist assumptions which deny objective truth. However, the acceptance of a particular theory is dependent on the interest between the main protagonists (Easterby-Smith et al., 2015). Ontological assumptions are the major differentiator between qualitative and quantitative research and the starting point of the research from which the epistemological and axiological assumptions logically flow.

Epistemology concerns assumptions about knowledge and what constitute acceptable and valid knowledge (Saunders et al., 2019). Easterby-Smith et al., (2012, p. 126) refer to epistemology

as the “best ways of enquiring into the nature of the world”. Epistemology and ontology are interrelated. Researchers’ ontological beliefs about the nature of reality and their epistemological beliefs concerning the relationship between the researcher and the research will inform the methodological approach (Collis and Hussey, 2014; Saunders et al., 2019).

Epistemological assumptions are underpinned by different worldviews that include positivism and post-positivism, constructivism, contextualism and pragmatism (Babbie, 2007; Creswell, 2007; Braun and Clarke, 2013). Positivism is underpinned by the belief that the reality is independent of individuals’ minds and the goal is the discovery of theories based on observation and experimentation (Collis and Hussey, 2009). In the positivist paradigm the epistemological assumptions regarding knowledge comes from objective evidence and assumes that knowledge could be observable and measurable.

However, from the interpretive stance, it is considered that knowledge comes from subjective evidence from the participant (Collis and Hussey, 2014). To this perspective, the observer is not independent, but this part of the phenomena under study (Collis and Hussey, 2014). Farquhar (2012) emphasised that interpretivism is based on the ideas that humans interpret the world that they inhabit and attribute meanings to this world, arguing further that a researcher is not a detached observer but an active agent in the construction of the world through the specific ideas and themes incorporated in the relevant form of knowledge (Farquhar, 2012). This argument is supported by Creswell (2013) who depicts the central theme of interpretivism as the interaction between the researcher and the object of the research. Therefore, in contemporary research practice, interpretivism means that there is an acknowledgement that facts and values cannot be separated and that our understanding of these concepts is prejudiced as the individual and the event are inter-joined (Cousin, 2005; Elliott and Lukes, 2008). All participants involved in the research, including the researcher, bring their own unique interpretations and construction of the world to the research process and the researcher is required to be open to the attitudes and values of the participants.

Axiology is concerned with the role of values and ethics which the researcher faces during the research process (Saunders et al., 2019). For example, positivist research aims to explain through general laws and seek prediction. They believe that the research process is value free, unbiased, and consider that the researcher is independent from what they are studying (Collis and Hussey, 2014). In contrast, interpretivists aim to understand and interpret research. They

believe that the research process is value laden and these values help them to determine the interpretation of the research (Collis and Hussey, 2014).

3.1.2 The Philosophical Approach of this Study

This study adopted a relativism ontological approach since the researcher does see that reality is not separated from humans. Researcher also sees that reality is subjective and differs from person to person (Guba and Lincoln, 1994) and different people may construct meaning in different ways (Crotty, 1998) but truth is a consensus formed by co-constructors (Pring, 2000). In this study, the relativism approach was supported by each individual within the partnership being seen as operating in a unique environment, which meant that each individual had a different meaning and interpretation of knowledge transfer, innovation, and social capital.

In terms of epistemology, the reason to take the interpretative stance, is because, the current state to understand the implication of social capital upon knowledge transfer within the context of university-TBSF partnership is understudied and required an in-depth understanding. Furthermore, Denzin and Lincoln (2003) advocate that various experiences are best understood through interpretive approaches that bring the researcher closer to research participants and is relevant in developing a better understanding of their experiences. Interpretative stance, therefore, allowed the researcher to uncover the links between different dimensions of social capital and knowledge transfer and innovation, as well as to construct a more comprehensive picture of the structures and perceptions of social capital. More specifically, this research aimed to explore and understand of the interrelation between partners within the partnership. Hence, it is concerned on the individuals' perspective, therefore, interpretive perspective is suitable for this research. This is because this paradigm focuses on subjective individuals experience and human enquiries, rather than directly measuring the phenomena and events (Bryman, 2004).

Furthermore, following Dudwick et al., (2006) guidelines to analysis social capital in a specific context, they argue that social capital exists between people or stakeholders within the partnership. Consequently, asking a different group of people to respond may yield more nuanced information (Dudwick et al., 2006). In term of axiological assumptions, the researcher

believes that the research is value-laden, and bias is presented. This is due to the impact of the nature of data and information collected (Creswell and Poth, 2017).

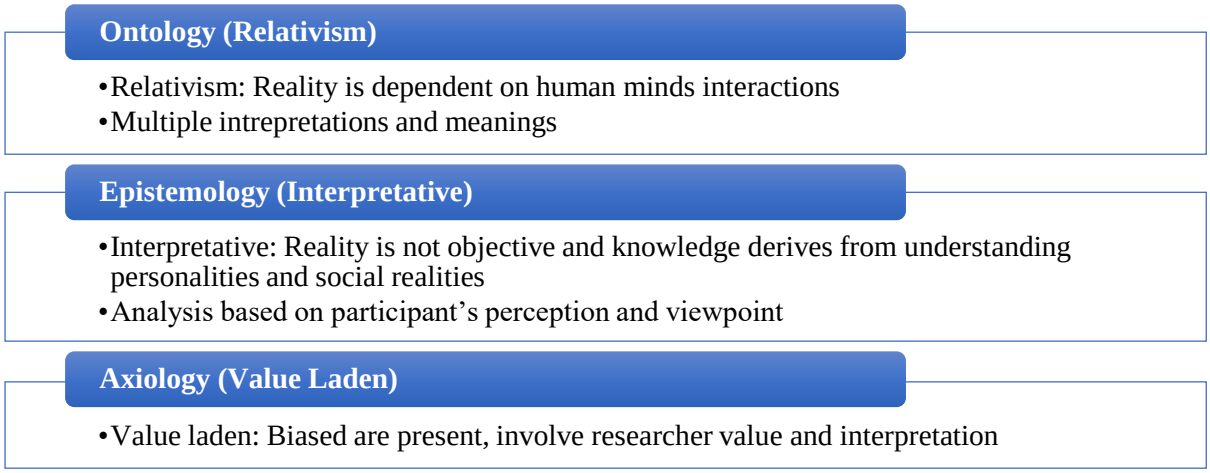

Figure 3.1 The philosophical assumptions of the research

3.2 The Research Approach to Theory Development

Saunders et al., (2019) highlight it is essential to choose the right approach to theory development. Saunders et al., (2019) emphasised that research involves theory, but the difference is that positivist research begins with theory which is to be tested whereas interpretivist research seeks for emergent theory from the data and theory building. Saunders et al., (2019) further listed three types of approaches that can be adopted when designed research, namely, deductive, inductive and abductive.

- Deductive

Deductive approach occurs when the conclusion is derived from the test of series of propositions (Saunders et al., 2019). A deductive approach takes a pre-existing theory as its point of departure and seeks to verify or modify this theory through testing of hypotheses developed from the underlying theory. The researcher develops an appropriate methodology, which is designed specifically to test these hypotheses. Collis and Hussey (2014) states that deductive approach is often located within the positivist research. According to Saunders et al., (2019), the deductive approach tends to apply a rigid design which does not permit alternative explanations of the phenomenon under investigation. It is a reasoning approach for investigating the cause-effect link between variable without an understanding of the way in which humans interpret the meaning of the phenomenon (Saunders et al., 2019).

- Inductive

The inductive approach involves the collection of data which is then analysed, and the findings lead to the development of a theory. An inductive approach enables a topic to be explored, data collected and analysed to get an understanding of the nature of the problem and develop a theoretical position (Saunders et al., 2019). Inductive reasoning uses a 'bottom up' approach as it moves from specific observations to pattern identification, which leads to broader generalisations. The nature of inductive reasoning is more exploratory and is based on understanding the context in which the research takes place. This enables general conclusions to be drawn and the development of an understanding of the meaning that humans attach to their actions (Saunders et al., 2019). This approach is located within the interpretive view that knowledge derives from understanding humans and their social realities (Saunders et al., 2019).

- Abductive

Abductive research is often located within the critical realism. According to Saunders et al., (2019) critical realists often choose to describe their approach, where they would start with a surprise observation that is regarded as a conclusive statement on which hypotheses are developed to explain that statement. Hypotheses consequently found to be true lead to a supposition that is also true. This entails identifying the most likely hypothetical explanations for that statement. Abduction requires inductive and deductive reasoning based on a theory that is tested through the observed statement, which is deductively identified (Van de Ven, 2007; Saunders et al., 2019). Table 3.1 shows the characteristics of deductive, inductive and abductive approach.

Deductive	Inductive	Abductive
When propositions are true the conclusion must also be true	Known proposition generate untested conclusions	Known propositions generate testable conclusions
Theory falsification or verification	Theory generation and building	Theory generation or modification; often through additional data collection
Data collection is used to evaluate a hypothesis related to existing theories	Data collection is used to explore a phenomenon, identify themes and patterns and create a conceptual framework	Data collection is used to explore a phenomenon, identify themes and patterns, locate these in a conceptual framework and test this through subsequent data collection

Table 3.1 Characteristics of deductive and inductive approach (Saunders et al., 2019; Collis and Hussey, 2014)

The characteristics outlined in Table 3.1 helped to highlight that the approach of the study was inductive. The research did not start with a defined theoretical framework for testing, as it sought to identify patterns and develop a conceptual framework that provided a better understanding of the knowledge transfer process considering the social capital, and innovation in partnerships between university and TBSFs. Furthermore, the study sought to contribute to theory generation, which was highlighted as lacking within existing literature, and noted in the literature review. Therefore, the study is underpinned by an inductive approach which allowed the researcher to discover new and unexpected findings for theory building. Furthermore, Collis and Hussey (2014) suggest that the inductive approach is more appropriate for interpretative research. Therefore, it is decided that inductive is the best approach for this study.

3.3 Methodological Choices

In the discipline of management and business research, there are mainly three methodologies related to whether the design adopts quantitative, qualitative or mixed methods. The methodological choices often determined the techniques or ways data are collected and analysed for the research (Collis and Hussey, 2014; Saunders et al., 2019). The different methodological choices are presented in Figure 5.

3.3.1 Quantitative, Qualitative and Mixed methods

- **Quantitative**

One fundamental difference between quantitative and qualitative methods is that the former refers to numeric data and the latter to non-numeric or narrative type data (Saunders et al., 2019). According to Saunders et al., (2019), the aim of quantitative research is to examine relationships between variables, which often uses probability samplings techniques to ensure generalisability. A quantitative approach is often employed in positivist studies because in the positivist paradigm, it is important to have data that are specific and precise (Saunders et al., 2019). Quantitative research may use single data collection techniques such as questionnaires, which is known as mono method. In cases where several quantitative techniques are used to collect data such as questionnaires and structured observations, the two methods are used but remain separate and this is known as multi-method quantitative study (Saunders et al., 2019).

The advantage of using quantitative methods is the result is often to be considered representative, comparable and capable of being generalised to a wider population (Dudwick et al., 2006). Furthermore, quantitative data could help to establish correlations between given variables and an outcome (Dudwick et al., 2006). Despite the advantages of quantitative approach, however, it cannot identify the perception and belief of participants in the context under study. Indeed, this is not what a quantitative study sets out to find. Thus, it does not attempt to gain an in-depth analysis and leaves no room for new discoveries and unexpected findings. Since the context of this research is under study, and one of the main objectives is to explore the issues from the micro-level perspective to yield more understanding of the phenomenon, a quantitative approach is not suitable to be employed in this study. Furthermore, as discussed earlier, many previous researches have been done following a quantitative approach; therefore, to compensate for the limitations and weaknesses in the existing literature, this research will consider a qualitative approach for data collection techniques.

- **Qualitative**

A qualitative approach typically associated with an interpretive paradigm, which is synonymous with data collection methods or data analysis procedures that will generate non-numerical forms of data. Qualitative research is sometimes regarded as naturalistic since researchers need to interact with the natural setting or research context to establish trust, participation and have an in depth understanding (Saunders et al., 2019).Contrary to the quantitative aim of theory testing, qualitative research seeks to develop conceptual frameworks and to contribute to theory by understanding the meanings a particular issue holds for individuals (Braun and Clarke, 2013). One fundamental characteristic of the qualitative approach is the exploration of issues in natural environments and research contexts that are sensitive to individuals which thus enables the establishment of rapport that helps to gain further meaning and in-depth understanding (Creswell, 2007; Saunders et al., 2019). Similar to quantitative research design approach, Saunders et al., (2015) differentiate between the 'mono method qualitative study', where one particular technique, such as semi-structured interviews is used to collect data with a compatible analytical process, and 'multi-method qualitative data', where several qualitative data collection techniques, such as in-depth interviews and diary accounts, can be used with a compatible analytical process. The main characteristics of quantitative and qualitative studies are listed in Table 3-2.

Characteristics	Quantitative	Qualitative
Philosophical assumptions	Objectivity- Positivist perspectives	Subjectivity- Interpretive perspective, socially constructed
Strategies related	Experiments, survey	Case study, ethnography, grounded theory, narratives, phenomenology
Methods	Close-ended questions, predetermined approaches, numeric data	Open-ended questions, text, picture data, or emerging approach
Researcher practices	Test variables, theories Construct variable in hypothesis Observe in numerical and measurable information. Employ statistical procedure	Collect participants meaning Focus on the context under study
Research problem	Identifying factors Test theory and hypothesis	To understand concept or phenomena Researcher has roughly known the ideas of the context being study
Researcher experience	Understanding in technical, scientific, statistic data	Incorporate literary form of writing, or software assisted analysis program

Table 3.2 Main characteristics of Quantitative and Qualitative study.

- **Mixed Method**

Mixed methods relate to both positivist and constructionist epistemologies and entail the use of quantitative and qualitative techniques and procedures to collect and analyse data (Easterby-Smith et al., 2012). Researchers consider reality as objective with the view that understandings and interpretations of that reality are shaped by particular social conditionings (Saunders et al., 2015). The mixed methods approach can apply a deductive, inductive or abductive approach reasoning that a theory can be tested and then further developed or modified. Figure 3.2 presents a simple overview of the methodological choices for research design.

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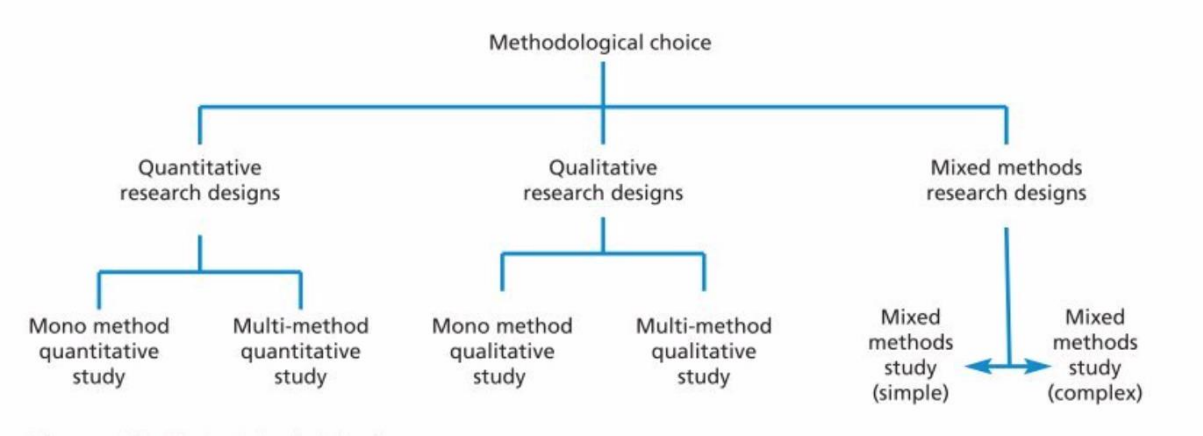

Figure 3.2 Methodological choices (Saunders et al., 2019)

3.3.2 Methodological choices for the study

This research opted for qualitative study over the quantitative study. This was chosen as it is appropriate with the philosophy positions and approach to the theory development of the study (Saunders et al., 2019). The inductive reasoning of the study in developing theory on understanding the influence of social capital upon knowledge transfer within the context of universities-TBSFs partnership in term of fostering innovation. These demonstrate for qualitative approach as Straus and Corbin (1998) suggest that a qualitative approach is undertaken when there is a need to develop an understanding of a phenomenon. The qualitative approach also will further help to "generate or inductively develop theory or pattern meaning" (Cresswell, 2003, p. 9)

Furthermore, the context that being study is under-researched and qualitative data will produce a rich understanding upon the phenomenon under investigate. Review of literature highlighted that studies in knowledge transfer between universities and firm have often focused on the commercialisation channel of academic engagement such as patenting, licensing, and a spin-off (Agrawal, 2001; Shane, 2005; de Wit-de Vries et al., 2018). However, the other form of engagement such as partnership is still under development on theoretical perspectives and need for further conceptualisation (Perkmann et al., 2013; de Wit-de Vries et al., 2018). Therefore, a qualitative study is useful to provide a more relevant and specific conceptualisation of understanding the implications of social capital and knowledge transfer on innovation within the context of the partnership between universities and TBSFs (Dudwick et al., 2006).

Therefore, the qualitative approach is appropriate with the aims and objectives of this research to understand the influence of social capital on knowledge transfer within the context of the partnership between universities-TBSFs. In addition, social capital is multi-dimensional and is exist between people, therefore asking a group of individuals that involved within the partnership, may yield information that is more nuance (Dudwick et al., 2006). Hence, qualitative approach was chosen for the purpose of this study.

Concerning the methodological choices suggested by Saunders et al., (2019) (Figure 3.2), the study adopted a multi-method qualitative approach. The choice of multi-method was based on the objective of the study to understand the influence of social capital upon knowledge transfer in partnership between the university and TBSFs in fostering innovation and to provide consequent recommendations. This drew attention to the need for an additional method that could also remain within the same paradigm. This approach was considered useful to answer the related research question by bringing different data and perspectives (Levy and Kellstadt, 2012) and to have clearer possible grasp of how social capital influence the transfer of knowledge (Saunders et al., 2019).

Besides, in order to overcome weakness of qualitative study, such as reducing bias, and to provide a stronger approach to data collection, analysis and interpretation, the study chose multi-method design. (Bryman and Bell 2011; Saunders et al., 2019). This is because, multi-method qualitative study offers the possibility of data triangulation offered (Patton, 2002). The study also acknowledged Patton's (2002) statement that the main purpose of triangulation is not ensuring automatic data replication to verify the data but bringing further consistency to the research by deepening the understanding of the studied issue.

3.4 Research strategies

After the consideration of the position and methodological approach to the research, the next step is to consider the appropriate research strategy and methods that need to be employ within this research. A research strategy is defined as a general plan for how the researcher will go about answering the research question(s) that have set (Saunders et al., 2019). Similarly, according to definition suggested by Oates (2014), research strategy is the overall approach to answers research questions. Saunders et al., (2019) stressed that the choice of research strategies is guided by the research questions, objectives and consistence with the research

philosophy, approach and purpose. Easterby-Smith et al., (2012) identify different research strategies based on a spectrum of positions on epistemological assumptions, and these are displayed in Figure 3-3.

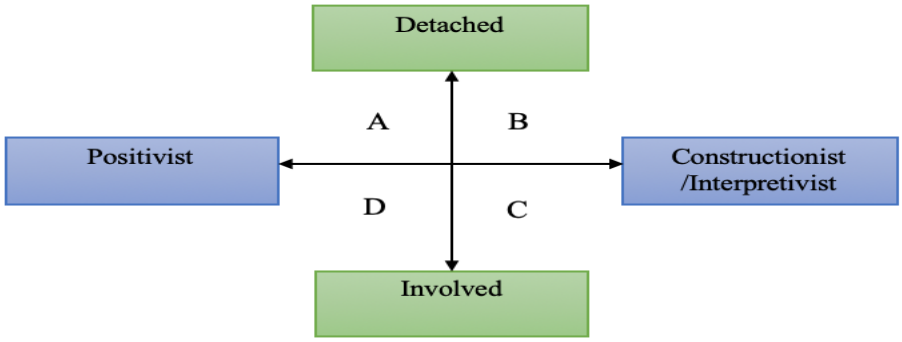

Figure 3.3 Epistemology and research style (Easterby-Smith et al., 2012)

Easterby-Smith et al., (2012) point out to the quadrants A, B, C, D, in which they assign corresponding methodologies.

• Positivist design: Quadrants A and D. Methodologies design includes, experimental, quasi experimental designs, and survey design research
• Constructionist/ Interpretative design: Quadrants B and C. Methodologies designs includes, action research and co-operative enquiry, narrative methods, and ethnography.

Positivist assumption view truth can be measured objectively, and often uses deductive approach to testing theory or hypotheses. Therefore, Babbie (2007) identify that experimental and quasi-experimental designs is appropriate to meet the nature and purpose of positivist study. Survey strategy is often associated with a positivist assumption. However, it can also be implemented for descriptive, exploratory and explanatory purposes, although it is usually used for descriptive research (Saris and Gallhofer, 2007). According to Babbie (2007), surveys is an suitable method to gather original data for the description of wide population, which it is impossible to be observed wholly. Whilst, all of these are separate methods, they are recognised to be overlapping; for example, Saris and Gallhofer (2007) further described that experiments can be performed by means of survey with the support of computer assisted data collection.

On the other hand, constructionist or interpretive research designs are related to the relativist assumptions potentially subject truth and reality are constructed through people interactions

(Easterby-Smith et al., 2012). Some methodologies suggested includes, action research, co-operative inquiry, archival research and ethnographic. These methodologies emphasise the participation of the researcher in the investigation (Easterby-Smith et al., 2012). Action research and co- operative inquiry concern to gain understanding to find solutions to a problem particularly in an organisation with the aim of enhancing effectiveness. According to Stringer (2017), these methods are often used in community-based research where a collaborative approach aims to achieve specific objectives in a productive and harmonious way.

Ethnographic research concern in providing an accurate picture and description from detailed observations of people in their natural and cultural settings, by 'immersing' in a setting. Easter-Smiths et al., (2015) define ethnography as "the methodology in which the researcher immerses him or herself in the study setting and becomes part of the group being studied in order to understand the meanings and significances that people give to their behaviours and others". The aim of ethnography is to interpret the social world as the participant (Collis and Hussey, 2014). Ethnography is one of the earliest qualitative research strategies (Saunders et al., 2016). In interpretive ethnography, the researcher focuses on understanding meanings, with those being observed being treated as participants rather than as subjects (Saunders et al., 2016).

Although this strategy could provide insight of the research undertaken, however, ethnography is not employed in this study. This is because it is only suitable if the researcher has full access to the current knowledge transfer partnership project. As ethnography requires a systematic and sustained engagement with the field (Easterby-Smith et al., 2015). Since knowledge transfer between university-TBSF is confidential, and most of the firms do not agree to have a researcher within their premises in long-term, it is impossible to gain information that would be needed in order to make the research viable.

Grounded theory emphasises on the grounding of theory in actions, interactions and social processes (Strauss and Corbin, 1990). According to Babbie (2007), grounded theory uses inductive approach, in which theory is developed from the analysis of patterns, themes and common categories of data collected from participants throughout the study. Grounded theory is commonly used to develop theoretical explanation of social interactions and process in a context (Saunders et al., 2019). However, the application of grounded theory as a method has different discussions in relation to the meaning and procedures of the methodology, in which depends on the philosophical perspectives adopted (Creswell, 2007).

Case study is a "methodology that is used to explore a single-phenomenon in a natural setting using multiple methods to obtain in-depth knowledge" (Collis and Hussey, 2014, p. 43). The aim of case study is to understand a problem using specific contexts as examples (Creswell, 2007). It is a methodology that is usually used to explore a single phenomenon or case in a natural setting using varied methods to obtain an in-depth knowledge (Collis and Hussey, 2014). The methodology can also be applied to relativist and constructionist perspectives. It is widely used and identify as a useful approach in organisational studies for it allows the exploration of data within its real-life context (Yin, 1994, 2014; Saunders and Lewis, 2012).

3.4.1 Research Strategies of the Study - Case Study

The review of methodologies outlined the different strategies available for the study. Saunders et al., (2019) recommend that the choice of strategy is based on the philosophical position of the researcher, the research questions and objectives of the study, the accessible on the subject studied, the amount of resource and time available. Hence, case study was selected as an appropriate strategy for the study

Prominently, the study is based on the interpretive epistemology, thus methodologies that are based on the positivist epistemology such as survey design and experimental design were considered not appropriate with the study. Besides, the aim of this study is to explore the influence of social capital on knowledge transfer in fostering innovation within the context of university-TBSFs partnership. Thus, the study does not concern with the measurement of the impact of social capital on knowledge transfer in regard to innovation but to enhance the understanding of how social capital influence knowledge transfer in fostering innovation.

On the other hand, methodologies, such as action research, co-operative enquiry, ethnography, and narrative methods, which had strong interpretivist and qualitative features, were not selected as the researcher was not required to become a change agent within the research context. Beside ethnography is only suitable as if the researcher has full access to the knowledge transfer partnership project. Since knowledge transfer between university-TBSF is highly confidential, it is therefore, to gain access to being in the project and spend as much time to make observation and reflection towards the project is not suitable for this research context. Moreover, identifying the characteristics of external social capital in agencies through prolonged periods of observation were not seen as viable within the scope and the timeframe

of the study. Similarly, the particular use of narrative methodology to develop social histories of identity and development was not considered beneficial to the study (Easterby-Smith et al., 2012).

Moreover, grounded theory was not chosen since, despite its basis within inductive reasoning, it does not encourage conducting a review of the literature. This contrasted with the approach of the study where the literature helped to identify the research problem and objectives, provided direct guidance, and influenced the process of data collection. Furthermore, the use of case study was seen as an appropriate approach to answer the exploratory research questions proposed in this study. As suggested by Yin (2009), the advantages of using case study in research over other research methods is applicable when (i) "what" or "how" questions are being proposed, (ii)the researcher has little control over events, and (iii) the focus is on a contemporary phenomenon within a real-life context (Yin, 2009).

Therefore, these indicated that case study suited the exploratory nature of the questions, and study, that sought to better understand the issues and phenomenon as opposed to seeking causal explanation. The focus of case study is to gain a rich, deep insight into the 'life' of the phenomenon within its real-life context (Yin, 2014). Hence, case study also will allow researcher to explore the influence of social capital upon knowledge transfer within its real life setting in depth. The justification for the choice of case study as research strategy are summarised in Table 3.3.

Justification for Case Study
Case study was appropriate choice for the study than other research strategies
Case study meet the interpretative lens of the study
Case study appropriate for inductive reasoning, including guidance of literatures to support the research process
Case study was suitable to the 'how' and 'what' research questions
Case study was appropriate to exploratory research, and aimed at developing the in depth understanding of complex phenomenon; this was appropriate to the study

Table 3.3 Justification for the choice of case study research strategy

3.4.2 Research Strategy of the Study - Expert Interview

- **Different types of expert interview**

The researcher had also identified expert interview as another appropriate methodologies implemented in this research. An expert interview is an interview with a person ascribed the status of an expert. While, expert interview is often regarded as a data collection method in social science, Bogner et al., (2009) emphasise that this term refers instead to a methodological approach that is related to the research design and purpose and suited to the specific characteristics of expert knowledge. Based on this argument, the use of expert interviews as a research method was considered for this study. Besides, this study also considered Lewis and Saunders's et al., (2019) acknowledge, that several methodologies can be applied at different stages of the same study based on their appropriateness to answer research questions and objectives. Therefore, expert interview was undertaken to maximise data triangulation and get a diversity of perspective from people that have practical experience and involvement in KTP project. In addition, the expert interview was undertaken to inform on the one the objectives of the study, which is to inform recommendations regarding the influence of social capital in term of knowledge transfer in fostering innovation; to benefit the partnership between the universities and TBSFs'. This objective implied that there was a need for an additional method to be considered alongside the case study. Indeed, it was considered that data collected from case study would not result enough to achieve this objective.

Furthermore, the study considered Benbasat et al., (1987) and Oates, (2008) claims, that multiple research strategy allow triangulation and enable researcher to capture the contextual complexity on the issues, supplies more information and allows for cross checking of sources of data against other strategy. Through interviews, especially with experts, the gathering of information can be more efficient and concentrated than other methods, such as participatory observation or questionnaires (Bogner et al., 2009). Finally, the result of the interviewing process is the acquisition of rich, detailed answers that can help develop a greater depth in knowledge and understanding (Rubin and Rubin, 2005). Therefore, expert interview was considered as a suitable methodology to provide valuable perspectives on the research objective, based on their knowledge and experiences.

According to Bogner et al., (2009), there are three different types of expert interview that can be used for different purposes namely, a) the exploratory, b) the systematising and c) the theory-generating expert interview.

The exploratory expert interview often applied in little investigated area or used as first orientation in new area for explorative purpose (Bogner et al., 2009). The purpose of explorative expert interview is to gain a clearer idea of the studied problem or to initially identify an insight for the development of an interview guide (Bogner et al., 2009). An exploratory interview can be used in qualitative or quantitative approach and is regarded as effective in providing structure to the subject to enable hypotheses generation. Experts is considered as a complementary source of information through their ability to offer contextual knowledge (Bogner et al., 2009). Additionally, in some situation, they can be referred to the actual group to which the study is investigated.

Meanwhile, systematising expert interview is related to an exploratory variant. It is oriented to retrieve exclusive knowledge of experience and action possesses by the experts that is derived from their practice (Bogner et al., 2009). The aim of this kind of interview is to attain systematic and complete information. Experts are viewed to possess specific knowledge related to the research problem that the researcher does not have. This type would be appropriate for a methodology that emphasises; the expert functions as informants to provide information of the problem investigate (Bogner et al., 2009). This type would be appropriate for a methodology that emphasises the data provided over the individual expert; therefore, it is relevant for the data to be related to the subject of the study. Like the exploratory interview, the systematising interview can also be used in a qualitative or quantitative approach (Bogner et al., 2009).

On the other hand, theory-generating expert interviews (Meuser and Nagel, 2009) seek to elicit the specialized knowledge that acquired from the expert's practised activities as well as the tacit interpretive knowledge that acquired through their practices or experience. The aim is on their tacit knowledge that they gain through the experience, which is use as a basis and starting point for developing theory. The analysis aims to generate broader insights into the structures and functions of expert knowledge and field-specific practices. With regard to this study, the theory-building expert interview was applied, as the purpose was to gain complete information to address the research question. This type was also suited to the qualitative approach of the study (Bogner et al., 2009).

- **What constitutes expert?**

The identification of the types of expert interview needs clarification of the meaning of 'expert'. Although Bogner et al., (2009) believe that defining expert by focusing on the knowledge dimension of expertise, this is unconvincing as it leads to contradiction. They describe that there are three different approach in which the term expert can be defined: (a) sociology of knowledge, (b) voluntaristic and (c) constructivist.

The first approach is by focusing on the sociology of knowledge. This approach views an expert in term of the structure of knowledge which implies that expert knowledge is complex and aligned with a profession, as opposed to general knowledge. This kind of concept characterises an expert as "special knowledge" related to pursuit of profession. However, this approach disregards the fact that knowledge can be access through routine action. The voluntaristic concept starts with the belief that everyone is experienced and holds information. Therefore, this approach considers that everyone can be viewed as an expert. This concept is criticised for inseparable from unspecific asymmetry in knowledge (Meuser and Nagel, 1997, cited in Bogner et al., 2009).

Finally, the constructivist view can be focused on the method-relationship approach or social-representative approach. The method-relationship approach highlights that experts are considered to possess appropriate knowledge on certain subject, based on the researcher's interest, practice and experience (Meuser and Nagel, 1997; Deeke, 1995). This approach can also look successfully for experts at lower levels in the hierarchy within the organisation, as opposed to the leading or public figure of the organisation. Researchers can look for someone who has an established reputation, who is active in the context or attained specific qualification. Meanwhile, the social-representational approach views an expert as anyone who is recognised as such by society.

Based on the Bogner et al., (2009) definition of expert, this research identifies an expert based on the constructivist method-relationship approach. The study selected experts based on individuals who possess appropriate knowledge, experience, practice and interest within the KTP project to foster innovation. All the individual selected were key persons that held important positions within the partnership and had direct practical experience in the project, rather than merely through being public figures. Therefore, this meant that the expert does not necessarily have to be a published author. Bogner et al., (2009) distinguishes between three

dimensions of expert knowledge: a) technical knowledge, b) process knowledge and c) interpretative knowledge. A) "Technical knowledge" is an expert with knowledge which is specific to a certain field. It is explicit knowledge and can be directly gain during the interview. It is identified as the awareness of a specific knowledge in fields that does not relate to everyday knowledge. B) "Process knowledge" is regarded of as practical knowledge acquired through involvement practical activity such as action, routines in past or current activity. C) Finally, "interpretative knowledge" refers to the expert's view, opinion and interpretation of the event, which is the focus of the interviews.

The study sought "process" and "interpretative" knowledge from the expert interviews. This is because this will provide an in-depth understanding from practical experience and involvement in knowledge transfer partnership (KTP) activities. Furthermore, the expert's opinion, interpretation and view were seen as assisting in the recommendations of the study. A summary of the research approach at this point in the research design process is provided in Figure 3-4.

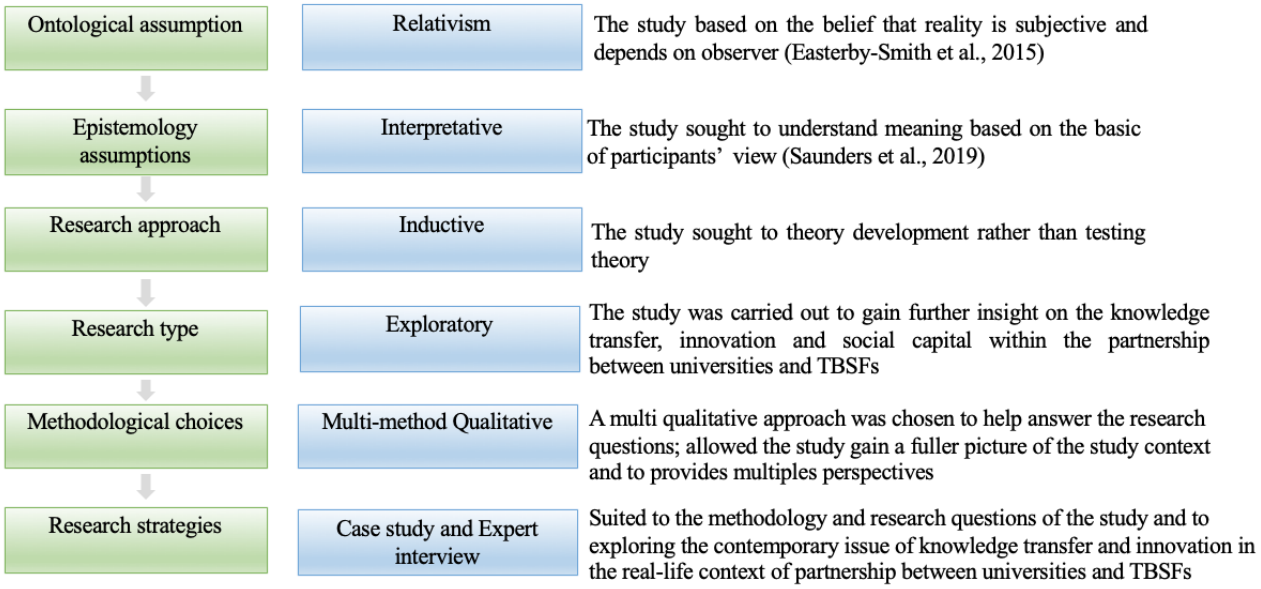

Figure 3.4. A summary of the research approach in the research design process.

3.5 Case study design and selection

3.5.1 Single versus Multiple Cases

According to Stake, (1995) case study is the object that is being studied, and not the choice of methods and techniques). Yin (2014) has distinguishes a case study according to the unit of analysis and draws attention to the notion of single and multiple case studies. A single case study can refer to a study of either one individual or one project (single unit of analysis) or refers to studies of a number of individuals or a number of projects (multiple units of analysis).

According to Yin (2014), there are five motivations for single case design; the case is critical, unusual, common, revelatory or longitudinal case. Similarly, Eisenhardt and Graebner, (2007) state that the choose for single case study is typically suitable to explore a significant phenomenon under rare or extreme circumstances. It is acknowledged that a single case lead to a deeper understanding of the studied phenomenon (O'Gorman et al., 2014). However, a single case approach may lead to some risk of the misjudging of a single event, and of exaggerating easily available data (Lee, 1989).

Meanwhile, multiple case study is described as case study design that contains more than one single case of analysis in the same investigation (Yin, 2014). The evidence from multiple cases study is considered compelling and thereby regarded as being more robust (Herriot & Firestones, 1983). Multiple cases study is also considered relevant in the research which concern on building theory (Eisenhardt and Graebner, 2007). Furthermore, Benbasat et al. (1987) add that multiple case studies yield more general results when compared to single case and are the most useful for description and theory extension.

The research employed multiple-case study approach. The choice of a multiple case study approach was determined by the opportunity for a wider and deeper exploration of the research questions (Eisenhardt, 1991; Miles et al., 2014), and analysis within and across cases; they are therefore regarded as stronger and more grounded in empirical evidences (Miles et al., 2014; O'Gorman et al., 2014). As describe by Eisenhardt and Graebner (2007), the major advantage of using multiple-case study is that the capability to generate insight from intensive into the study of a phenomenon in its real-life context, leading to rich empirical description and the

development of theory. Furthermore, multiple-cases studies add confidence to findings, by enhanced external validity and helping to guard against biases.

Furthermore, based on Yin's (2014) rationale, a single case of a partnership between university and TBSFs with regard to knowledge transfer and innovation would not be infrequent nor represent an extreme or unique example. Similarly, the inductive nature of the study meant that a partnership between university and TBSFs would not represent a critical case aimed at testing a proposition in order to develop or confirm a theory. Moreover, based on research gap identified, Rajalo and Vadi, (2017) suggest that future research should undertake multiple cases study to better understand the underlying process that influence the transfer of the knowledge. They stressed that, there is a need to use multiple case study design, which lead to a more compelling and robust explanations (Eisenhardt and Graebner, 2007). This provided an additional reason for this choice that multiple case study design was chosen over a single case design.

3.5.2 Case Selection

Other issues that researcher need to consider was the number of multiple case study that need to be employed in this research. Various researchers have suggested a different number of cases study to allow a rigour finding (Pare, 2004). For example, Eisenhardt and Graebner (2007), suggests that case study research should have between four to ten cases, in order to capture the complexity of the phenomenon under investigation. Meanwhile, Creswell (1989) argue that, a multiple case study researcher should typically choose no more than four cases in order to capture in much more detail the context within which the phenomenon under research occur. On the other hand, from a positivist position, Yin (2014) proposes up to thirty cases. However, the appropriate number of cases is debateable. According to O'Gorman et al., (2014) the number for case selections is depending on the responsibility of the research. With the respect to the argument above, the study conducted four case studies of TBSFs that partnership with universities for knowledge transfer. This is because the study is concerned with theory development, as thus meeting to the position suggested by Eisenhardt (1981), it allows the application of four cases. The application of four cases is reasonable within the context of partnership between universities and TBSFs, this is because of the restriction to access to the partnership. Further four cases allow the research to capture the complexity of the phenomenon

and not too difficult to process the information (Eisenhardt, 1981). In addition, four cases also allow the researcher to carry out a cross-case analysis as well as within case analysis.

In term of case selection, the selection of cases relied on a criterion strategy (Patton, 1987; Stake, 1995), this is due to the exploratory nature of the study. The selection of the cases relied on which TBSFs to have been partnership with universities for a least one year to ensure that they had established social relationships with the individuals that involve in the processes. To ensure that the partnership project was collaborating with universities in term for knowledge transfer, the partnership was selected from the Knowledge Transfer Partnership Project (KTP). KTP is a relationship formed between a firm and university (knowledge base), which facilitates the transfer of knowledge, to help business in the UK to innovate (Innovate UK, 2018). KTP was also chosen because it is administrated scheme, all the relevant documents, databases and report related to the project is well documented and some could be access by the researcher.

The access to the firm and the willing co-operation of the participants were gained through established contacts with the KTP manager or with the principal of the TBSFs such as managing director or senior manager in the company itself (if the contacts details are available) through email. Voss et al., (2002, p. 200) recommended that a principle informant should be senior enough to be able to open the doors where necessary and to know who best to interview to gather the data required. A principal informant was identified through KTP and Innovate UK websites. Using a standard set of criteria to find relevant firms. In term of TBSFs, following analysis form the literature in Chapter 2, TBSFs is define as independently owned firms with less than fifty employees operating in high-technology sectors as listed in SIC codes (Chapter 2). Some of the sectors included are electronic equipment and components, electrical components, software development, and medical equipment.

Researcher make first contact in writing to ask permission and invite the firm for case study. Information letter were sent to participants by email with the explanation of the study, its aims and objectives, the main themes of the research. and an explanation that stressed the relevance of their participation to the research and contribution to the area.

3.5.3 Data Collection Techniques

3.5.3.1 Interviews

Merriam (2009) claims that a case study does not have a particular data collection technique or data analysis procedure. However, Stake (1995) suggests the use of observation, interview and document review as methods to collect data in qualitative case study research. Whilst there are specific methods to collect information (Silverman, 2005; Easterby-Smith et al., 2012), the focus of this study, which aimed to collect the experiences and opinions of participants, favoured interview and documents review.

The study opted for various data collection methods and multiple sources of evidence to gain a fuller picture of the phenomenon under investigation. The use of documents in conjunction with interviews allowed the researcher to explore and comparing how some participants explained the issues and how they documented it. The application of different data collection methods can increase the robustness of the research results through the cross-validation of data obtained through different methods (Remus and Wiener, 2009). Favour with Eriksson and Kovalainen (2008) claim, case studies are usually considered more accurate, convincing, diverse and rich if they are based on several sources of empirical data.

An interview is a method for collecting data in which participants are asked about their feeling, opinion, and thinking (Collis and Hussey, 2014). Saunders et al., (2019) categorised interviews into three different types of interview, which relate to the research questions, purpose and strategy. Table 3-4 list the types interview and their key features.

Types of Interview	Descriptions
Structure interview	• typically use in quantitative and descriptive types of research • use per-determined, plan in advance, standardised and identical questions for every interviewee. • each interviewee will be asked the same questions in the same order
Semi-structure interview	• typically used in qualitative research • researcher prepares some question in advance guided by themes and key questions and can be vary form one interview to another • the interviewees can speak more details on the topic that the researcher raise.

Unstructured interview	• use in qualitative study • does not require any questions to be prepare before the interview process. • The questions will evolve during the process and the interviewee are talking freely about beliefs, behaviour or the events with minimal interruption from the interviewer.

Table 3.4 List the types of interview and their key features (Collis and Hussey, 2014; Saunders et al., 2019).

The study applied semi-structured interview which was suitable for the qualitative approach of the study. The method was appropriate considering that this study is interpretive in nature; semi-structured interviews allowed access to the interpretations and views of the participants regarding the actions and events that are happening or have already taken place regarding knowledge transfer during the partnership. Semi-structured interviews enable the collection of relevant contextual information and allowed for the probing of participants, which helped to clarify or further understand their meaning with regard to their experiences (Saunders et al., 2015). According to Saunders et al., (2015) this helps in collecting rich and detailed data.

Additionally, the method is more flexible, which constitutes a practical balance between structure interview approach and the unstructured interview approach. This provided flexibility that permitted questions to be asked in a different order with the use of an interview guide approach (Patton, 1987). The use of a guide ensured that specific questions about knowledge transfer, innovation and social capital were raised. Participants were also able to talk openly and flexibly about their experience in their own words without being restricted by a more rigid list of questions (Saunders and Lewis, 2012). This allowed the researcher to investigate deeply to explore participant's response in more depth, and to reveal new information (Easterby-Smith et al., 2008). Finally, the method was suited to the large number of questions that needed to be covered during the interviews with regard to knowledge transfer, innovation and social capital (Saunders et al., 2019).

A total of thirteen interviews were conducted within the four cases that currently working in KTP project. This number was suitable as it fell within the range of the twelve to thirty interviews which were considered appropriate for a qualitative study to gain an overview picture of the phenomenon under study (Guest et al., 1995). The interviews were conducted with the main key stakeholders that involved in KTP such as research associate, business advisor and academic supervisor. These participants were selected based on the purposive sampling technique, which is highly recommended for qualitative case study research

(Neuman, 2003). Snowball sampling technique was also employed in order to get access to other participants who met the criteria of the research objectives (Sarantakos, 2005). An overview of the role of each participant is provided in Table 3-5.

Cases	Interview Code	Role in the KTP
Company A	P01	KTP Associate
	P02	Business Supervisor
	P03	Academic Supervisor
Company B	P04	KTP Associate
	P05	Business Supervisor
	P06	Academic Supervisor
Company C	P07	KTP Associate
	P08	KTP Associate
	P09	Business Supervisor
	P10	Academic Supervisor
Company D	P11	KTP Associate
	P12	Business Supervisor
	P13	Academic Supervisor

Table 3.5 The role of participants in the case studies

- **Design of Interview questions**

The interview questions were designed by adapting questions used in previous knowledge transfer and social capital studies (e.g. Dhanaraj et al., 2013; Tsai, 2001; Yli-Renko et al., 2001). In addition, following data requirement suggested by Saunders et al., (2019) the research also developed interview questions based on the research objective and research questions proposed in the study. Table 3-6 shows the example of data requirement table used by the researcher.

Research objective	**Research question**	**Investigative questions**	**Relation to theory/ key concept in the literature**
x	**x**	**x**	**x**
x	**x**	**x**	**x**

Table 3.6 Example of data requirement table developed by the researcher (Saunders et al., 2019)

Based on the research objectives proposed in the study:

- To investigate the implications of knowledge transfer for innovation within partnerships between universities and TBSFs
- To identify the challenges impeding knowledge transfer in fostering innovation within partnerships between universities and TBSFs

- To explore the implications of social capital for knowledge transfer in fostering innovation within the partnerships between universities and TBSFs
- To arrive at findings that have theoretical and practical relevance and that can inform recommendations to benefit partnerships between universities and TBSFs.

A three-part interview guide that included the three main topics, concerning knowledge transfer, innovation and social capital, and the key questions was developed. This ensured that the questions covered all the topics. A pilot interview was conducted with individuals experience in KTP for knowledge transfer, with the aim of ensuring that questions would be understood. Following this pilot interview, some amendments were made. Each interview lasted between 40 to 45 minutes. In order to enhance the credibility of the study, an information sheet about the study had previously been sent to participants with the key themes and key questions (Saunders et al., 2019).

Prior to the interviews, participants were notified of the aim and the general objectives of the study by issuing the information letter. Then the participants were informed of their right to withdraw from the interview. Letters of consent were issued to participants in relation to participant privacy and confidentiality. The interview started with a brief introduction to the topic about to be explore during the interview. Respondents were first asked about their background, activity and the objective of the project in which they operated. Then, participants were asked more specific questions about their knowledge transfer and innovation, and their social capital. Open questions, such as, "Can you tell me about …", were used to introduce the subject more easily and to avoid bias by not bringing in the interviewee's references (Easterby-Smith et al., 2012). Probing questions, such as "In what way…", were used to refine responses when required and to find additional information. Furthermore, direct questions that used "how" or "what" helped to gather more specific responses.

3.5.3.2 Documents Review

Documentation can be a source of rich information (Yin, 2014) to help understand the knowledge transfer and innovation outcome that occurred within the partnerships. The document review was used as a secondary technique to collect data as it gave opportunities to review some interpretations from the case study interviews, which helped to enhance the reliability of the study (Yin, 2014). While documents can be difficult to access and retrieve and

can also be biased in term of their contents and selectivity, the method is considered valuable and relevant to case studies as to corroborate and augment evidence from the interview (Yin, 2014). According to Gibson and Brown (2009), in case study researchers often supplement interviewing with the gathering and analysing of relevant documents produced in the course of everyday events (Gibson and Brown, 2009). Therefore, the study used document review as another information source to add to, validate and enhance the evidence collected from the interview sources.

Marshall and Rossman (2011) suggest some documents that can be used for document review such as note that minutes of meetings, logs, announcements, formal policy statements, and letters and so on are useful in understanding the phenomenon under investigation. In this study, different kind of documents are collected to provide information main on the implication of knowledge transfer have on fostering innovation. Some documentations that were significant to research such as the minutes of the meeting and online reports were referenced. Each document and source were referenced, some of these references are mentioned in the writing of the findings.

3.5.4 Expert Interviews

Twenty-seven interviews were carried out with experts across the UK. As the study sought process and interpretative knowledge from the expert interviews, this encompassed participants that were had previous practical experienced and involvement in KTP activities. Purposive sampling was used to ensure that participant that are particularly expert for the study. 'Snowball' sampling also is employed for this research. Once the researcher has made initial contact with the expert through purposive sampling, the initial contact will like to recommend and identify other respondents that are similar to themselves (Saunders et al., 2019).

All the participants were selected based on previously had practical experience or involved in partnership between TBSFs and universities for knowledge transfer in KTP. Some of the expert had experienced more than one KTP projects. The participants included KTP Associate, Business Supervisor and Academic Supervisor. Their expert knowledge and interpretation and ideas that would help in the evaluation and recommendations of the study.

Similar to the data collection in the multiple cases, the method of semi-structured interviews was selected. An interview guide was used, which included the key themes of knowledge transfer, innovation, and social capital. The key questions were phrased to match the research question and objectives. Similar to interview questions in multiple cases, open, probing and direct questions were employed. Ethical issues were also acknowledged as experts were asked to complete a consent form to be returned by email or by hand prior the interview. They were guaranteed that names of third parties mentioned during the interview would not be reported. Anonymity was also guaranteed.

Interviews were carried out face to face and some interview were conducted by online, and this decision was based on economic reasons, availability and locations. This was also because of some the experts were based in different parts of the UK (South of England, Northern Ireland, Northern Scotland, Midlands, North of England). The interview took around forty to sixty minutes. To contact the experts, researcher first make approach in writing to ask permission and invite experts for the interview. Information letter were sent to participants by email with the explanation of the study, its aims and objectives, the main themes of the research. and an explanation that stressed the relevance of their participation to the research and contribution to the area. Busse (2003, cited in Bogner et al., 2009) recommends a first call prior to the interview to explain further the study. However, the thorough explanation and information provided in the first email meant that this was not necessary, and the times and dates were effectively agreed by email. Calls were made via Skype platform and the interview were recorded using audio recorder.

The interviews were conducted after the case study. This helped the researcher to gain more understanding of the subject and thus conduct the interviews more competently having thus acquired more expertise in the subject of innovation through partnership universities and TBSFs for knowledge transfer in term of social capital. An overview of the experts' background is provided in Table 3.7:

Expert	Role	Expertise/experience
Expert 1	KTP Associate	PhD in Computer Vision- Software Developer Experience: 2 years KTP (completed 2017) KTP Project: Software Developer
Expert 2	KTP Associate	PhD in Computer Science Experienced: 2 years KTP (completed 2018) KTP Project: Software Developer
Expert 3	KTP Associate	PhD in Engineering Science Experience: 2 years KTP (completed 2019) KTP Project: Software Developer
Expert 4	KTP Associate	MSc in Computer Science Experience: 2 years KTP (completed 2018) KTP Project: Data Analyst
Expert 5	KTP Associate	MSc in Computer Network Security Experience: 2 years KTP (completed 2018) KTP Project: Developing software and hardware
Expert 6	KTP Associate	MSc Digital Marketing Experience: 2 years KTP (completed 2016) KTP Project: Website developer/ E-commerce platform
Expert 7	KTP Associate	PhD in Electrical Engineering Experience: 2 years KTP (completed 2017) KTP Project: Software developer
Expert 8	KTP Associate	MSc In Computer Science Experience: 2 years KTP (completed 2016) KTP Project: Security software development
Expert 9	KTP Associate	PhD in Computing and Information System Experience: 2 years KTP (completed 2018) KTP project: System developer
Expert 10	KTP Associate	MSc in Computer Science Experience: 2 years KTP (completed 2017) KTP Project: Software developer
Expert 11	KTP Associate	PhD in Computer Science Experience: 2 years KTP (completed 2018) KTP Project: Software and hardware development
Expert 12	KTP Associate	PhD in Software Engineering Experience: more than 4 years KTP KTP Project: Software and product development (as KTP Associate and Academic Supervisor)
Expert 13	KTP Associate	MSc in Computer Science Experience: 2 years KTP (completed 2017) KTP Project: System developer

Expert 14	KTP Associate	MSc in Software Engineering Experience: 2 years in KTP KTP Project: Data analyst and developing software
Expert 15	KTP Associate	MSc Software Engineering Experience: 2 years in KTP KTP Project: Software development and machine learning
Expert 16	KTP Associate	MSc in Digital Marketing Experience: 2 years in KTP KTP project: Developing digital marketing platform
Expert 17	Academic Supervisor	University Senior Lecturer in Information System PhD in Computer Science Experience: more than 5 years supervising KTP
Expert 18	Academic Supervisor	University Reader in Cyber Security PhD in Secure Communication System Experience: more than 5 years supervising KTP
Expert 19	Academic Supervisor	University Senior Lecturer in Operating, Logistic and Project Management Experience: more than 3 years supervising KTP
Expert 20	Academic Supervisor	University Lecturer in Digital Business Experience: more than 3 years supervising KTP
Expert 21	Academic Supervisor	University Senior Lecturer at Department of Engineering PhD in Application Wireless Sensor Network (WSN) Experience: more than 5 years supervising KTP
Expert 22	Academic Supervisor	University Reader in Computer Science PhD in Computer Science Experience: more than 5 years supervising KTP
Expert 23	Business Supervisor	Business Director of IT and software solution company Experience: 2 years KTP
Expert 24	Business Supervisor	Business Director of assistive technology company Experience: 2 years KTP
Expert 25	Business Supervisor	Company Director of Computer & Network Security companies Experience: 3 years KTP (completed 2017)
Expert 26	Business Supervisor	Company Director of Telecommunication Experience: 2 years KTP (completed in 2018)
Expert 27	Business Supervisor	Business Director of Software solution company Experience: 2 years in KTP

Table 3.7 List of experts interviewed.

3.5.5 Validation and Reliability

In respect to validation tactics suggested by Saunders et al., (2019), researcher employed multiple sources of data collection methods for case study: semi-structure interview and documentations review. This to permit researcher to achieve triangulation of the data. The triangulation allowed the study to be more accurate and convincing. The initial draft of each of the case study report was emailed to some key participants that took part in the case studies. These helped to achieve their comments, feedbacks and further clarification. As suggestion by Yin (2014), the review of the draft of the case study report, produces further evidence, as participants may remember new materials that they had not remembered during the initial data collection period. The approach is one of the useful means of guarding against the researcher ‘s bias.

In order to demonstrate trustworthiness, the study emphasised the transparency of the research through a detailed step-by-step technique with regard to the selection and access to cases and experts, the interview process, and the recording and analysis of the data. Based on the reliability criteria highlighted by Yin (2014) a case study protocol was developed during the data collection, which involved a similar process for each interview with identical initial questions.

In ensuring validity for the interviews, it is important that the questions must be understood by the respondents in the way intended by the researcher and the answer given by the respondents must be understood by the researcher in the way intended by the respondents (Saunders et al., 2019). To ensure this is achieved, the research conduct a pilot interview with three participants from universities (universities supervisors) and one participant from TBSFs. The aim of conducting the pilot study is to ensure that the interview questions would be understood. Following the pilot interview, some amendments were made to interview questions. Figure 3-5 illustrate the stages occurred to valid the interview question.

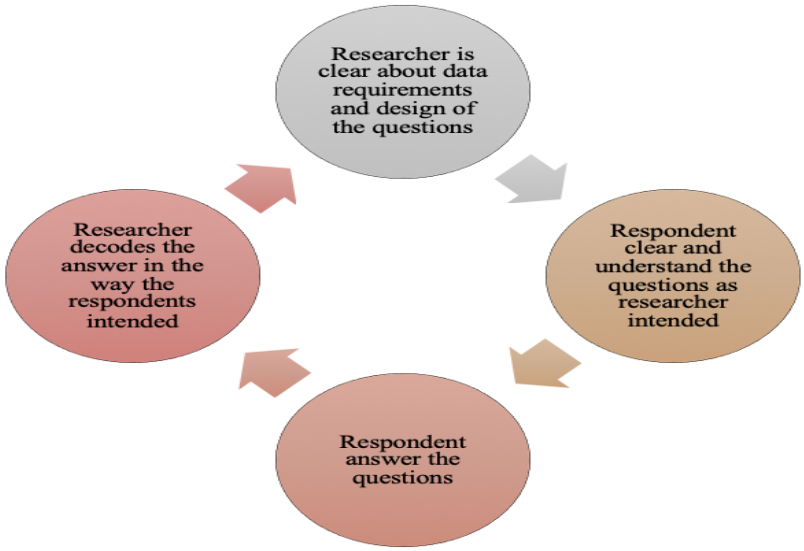

Figure 3.5 Illustrate the stages occurred to valid the interview question (Saunders et al., 2019)

With regards to external validity, generalisation of the findings from case study has been perceived as difficult to different population (Braun and Clarke, 2013). However, in qualitative study, analytical generalisation can be occurred through rigorous inductive analysis and interpretations, together with confirmatory strategies. As described by Thorne et al., (2009, p. 1385, cited in Polit and Beck, 2010) ‘‘When articulated in a manner that is authentic and credible to the reader, (findings) can reflect valid description of sufficient richness and depth that their products warrant a degree of generalizability in relation to a field of understanding’. statement implies that, the reader can generalise through their own interpretation (Braun & Clarke, 2013). However, the generalisation achieve is not statistical but analytical generalisation (Yin, 2014). This research undertook multi-cases study to allowed data to be analytical generalised over several university- industry partnerships (Yin, 2014).

3.5.6 Ethical Consideration

This study undertakes in depth research with human, where the data collections are based on people perceptions, opinions and experience. Therefore, with respect to the ethical consideration, this study, follow Knapik (2002) three ethical considerations: benefit vs. harm, confidentiality and informed consent.

- **Benefit vs. Harm**

The basic ethical principal when collecting data is to ensure that no harm should come to respondents as a result of participating in the research. Since the interviews had been

transcribed by the researcher and had been interpreted by the researcher then it was common practice to give the respondent an opportunity to review and comment on the analysis (Knapik, 2002). Therefore, the researcher offers the participants the opportunity to review the initial case study report.

- **Confidentiality**

To ensure confidentiality was established and maintained, the researcher provided the interviewees with written agreements that their names and any personal information that could identify them would be keep confidential. The researcher was required to sign a confidentiality form before undertaking the participant interview and observation, preventing the researcher from revealing any sensitive matters within the investigation.

- **Informed Consent**

It is important the participants are fully aware of the research they are taking part in and can at any stage, refuse or withdraw from taking part in the research (Saunders et al., 2019). the researcher ensured that participants' information or quotes would not identify them and their organisation; also, they were asked to complete a consent form, which helped to ensure they were fully informed of the way in which their data would be used, and knew they could withdraw at any stage. Furthermore, the interview guide was designed to avoid any questions that might have been commercially sensitive. Finally, to create a safe environment interviews were conducted at the respondents' workplace or at any places of their choice and at a time of their convenience.

3.5 Data Analysis

Data analysis is defined as a systematic process of searching and arranging the data in order to gain understanding and find useful meaning (Boeije, 2010; Burns, 2000). According to Bogdan and Biklen (2006), qualitative data analysis is working with qualitative data, organising them, breaking them into manageable units, synthesising them, searching for patterns, discovering what is important and what is to be learned, and deciding findings. Braun and Clarke (2013) listed four common techniques to qualitative analysis, each with their own established practices: *thematic analysis, interpretative phenomenological analysis, grounded theory, and pattern-based discourse analysis*. The study sought the method of inductive thematic analysis for it is one of the most widely used methods in qualitative data analysis (Boyatzis,

1998; Roulston, 2001). Additionally, it offered flexibility in terms of the data collection methods and sample size (Braun and Clarke, 2013).

While the other analytical approaches were acknowledged, however were not selected as inappropriate for the study. For example, the *interpretative phenomenological* analysis was not appropriate, because it was a study of identifying core structures and features of human experience. The techniques pursue to understand the lived experiences but does not explain why they occur and was deemed to better suited to cognitive psychological studies (Tuffour, 2017). In term to ground theory, it involves the generation of theory through methodological gathering, and usually start with a research questions and likely do not relating to any previous study and theory (Bryant and Charmaz, 2007). Thus, grounded theory was not suitable with the study. This is because, this research was guided by literature review and collects data to understand the phenomenon understudy. Finally, pattern discourse analysis was also eliminated in the study for its particular emphasis on the study of language and it is more appropriate to a linguistic discipline (Alsaawi, 2016).

3.5.1 Thematic Analysis Process

Thematic analysis is defined by Braun and Clarke (2013, p. 174) as, "a method for identifying themes and patterns of meaning across a dataset in relation to a research question". The study followed their process, which includes seven- phase guide as thematic analysis framework (Braun and Clarke, 2013, p. 202):

- Transcription
- Familiarisation with the data
- Coding data
- Review themes
- Define themes
- Write-up

- **Transcription, and familiarisation with the data**

All the interviews (case study and expert interviews) were transcribe in Microsoft Word document. The transcription involved close observation of data through repeated careful listening. Each document was formatted to follow similar presentation in order for data and

themes to be found more easily. The transcription was read several times and any words or expressions that were not sure or were not correct were asked to the participants by emails or were checked against the online and electronic documents to confirm outstanding issues. Notes were taken for marking any preliminary ideas for the codes that can describe the data.

- **Coding Data**

Bryman and Bell (2007, p. 725) define coding as "the process whereby data is broken down into component parts, which are given names". Coding can be considered as the one of the crucial phases in the data analysis, as Basit (2003) claim, coding is one of most significant steps taken during data analysis to help make sense of textual data. The study identified codes prepared a provisional 'starting list' of codes prior to fieldwork, which emanates, literature review and research questions. This was sought in the study as the study was driven by theoretical approach rather than grounded theory approach. This approach was referred as theoretical approach by Braun and Clarke (2013).

In this study, coding is treated as an organic and flexible process, where required engagement with the data. Semantic codes (or descriptive codes) were used in the study. Codes were identified around what participants said and mirroring their meanings. Code emerged from data that have meaning relevant to the research questions were identified by the researcher. The study focused on three main sources to derive names for codes (Straus and Corbin, 1998):

- Utilise terms that emerge from your data,
- Based on actual terms used by your participants,
- Or terms used in existing theory and within the literature

Following the guidance of Braun and Clarke (2013), the researcher also ensured that codes were concise, and reflected precisely the meaning of the quotations. Quotations that were not seen as relevant were not coded. Sometimes a data had been tagged with more than one code and sometimes the other data might not be coded at all, as they have no relevance to the research question (Terry et al., 2017). The study did not use any software for data analysis. After attending few NVivo workshop and practising the software, the researcher believed that it was a tool best for organising and presenting data only. Therefore, the researcher opted for manual data analysis and coding.

- **Themes**

At this phase, the initial coded were sorted into potential themes and collating all the relevant coded data extracts within the identified them. Each theme was then reviewed to identify other potential "subtopics…. contradictory points of views…. new insights... appropriate quotations" (Thomas, 2006, p. 242). To ensure the reliability of the analysis process, some of the procedures carried out by the researcher following the checklist of good thematic analysis suggested by (Braun and Clarke, 2013). Table 3.8 show the criteria of good thematic analysis.

Process	Criteria
Transcription	The data has been transcribed and have been checked against the recordings to ensure no mistakes were made
Coding	Each data item has been given the same procedure throughout the coding process
Themes	Themes have not been generated from a few single data, but instead the coding process has been thorough and comprehensive Themes has been checked with each other
Analysis	Data has been analysed and explained and not just than described and presented
Overall	Enough time and resources have been provided to complete all phases of the analysis
Written Report	The assumptions about, and specific approach to, thematic analysis is clearly explicated There is consistency of the process and what is explained will be done is carried out to the final write up. The language and concepts used in the report are consistent with the epistemological position of the analysis.

Table 3.8 The criteria of good thematic analysis (Source: Braun and Clarke 2006)

3.6 Conclusion

This chapter presented the research methodology adopted and overall research design that was employed in this study. The study was designed according to the philosophical position, research questions and the research objective of the research. The approach of the study, the methodological choices, the research techniques and procedures were extensively discussed and justified in this chapter. Finally, the chapter concluded with a discussion on the quality criteria and techniques to assess the quality of research. The following chapter presents the

research findings from the case studies. The complete research design is illustrated below in Figure 3.6.

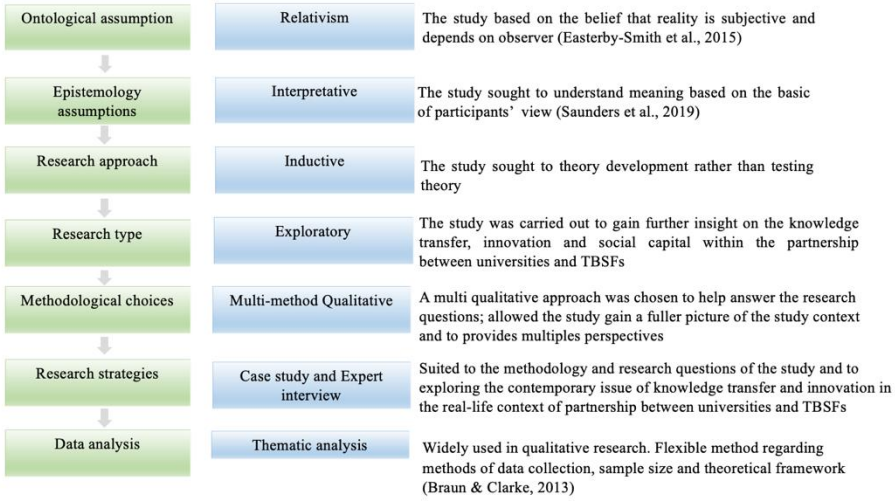

Figure 3.6 summarised the research design employed in the study

Chapter 4. Research Finding - Case Study

4.0 Introduction

The previous chapter ends by touching upon the methodological design undertaken in this research. This chapter reports and discusses the findings from the two research strategies chosen for this study, the case study and the expert interview. The findings of the study are divided into two main sections. The first section discusses findings from the four case studies. For this section, the researcher has initially analysed the data within the cases (to gain a good understanding of the unique properties of each case study). The second section discusses the cross-case analysis, in terms of what has been found across the cases, to determine similarities and differences (Eisenhardt, 1989). Two data sources were used for the case studies, semi-structured interviews and reviews of documentation. The researcher analyses the similarities and differences across these two data sources for the case study (interviews and reviews of documentation) to increase data triangulation and to reduce bias. A total of 13 interviews were conducted for the four case studies with the main stakeholders of the partnerships. Reviews of documentation were undertaken for each case, including published reports, minutes of meetings and KTP overviews.

4.1 Case Study Investigation

4.1.1 Case Study A

4.1.1.1 Background of Case A

Case A is a small software firm that operates in the north of England. The firm was established in 200X, is experienced in software development and web-based development, and currently employs 42 people. According to their website, Case A offers a variety of IT solutions and professional services to their clients, including web application, desktop application, quality control, implementation, and maintenance of deployed software. Case A is determined to be one of the most creative and innovative technology-based small companies in the world (Document 1C). In realising their vision, Case A has a partnership with a university to explore innovative ideas in developing new products and improving its internal process to create a better customer experience (Document 1D).

Case A has received funding from the Innovate UK scheme for its KTP project which started in 201X, expecting to complete it by the end of 202X. Knowledge transfer in the partnership aims to develop the application of artificial intelligence (AI) to advanced techniques and features in order to increase the firm's competitiveness in the worldwide market. The project has involved developing machine learning for incorporation within a customer experience analytics product and for enhancements of existing product offerings. Throughout the two-year partnership, a KTP Associate from the university was present on a daily basis in the company, with responsibility for delivering the project's main tasks and activities. The KTP Associate was supported by an Academic Supervisor and Business Supervisor for additional guidance and mentoring support, including internal links/access to company/academic information.

4.1.1.2 Participants and document details in Case A

The three main stakeholders within the partnership were interviewed. These are the KTP Associate, Academic Supervisor and Business Supervisor. Details of the participants are presented in Table 4.1.

No	Interview ID Code	Role in the KTP	Gender
1	P01	KTP Associate	Male
2	P02	Business Supervisor	Male
3	P03	Academic Supervisor	Male

Table 4.1 Details of participants in Case A

A review of documentation was carried out in addition to the interview. This was to provide further clarification on the partnership between the university and the firm. The list of documents reviewed is presented in Table 4.2.

Documents reviewed	Documents
1A	Minutes of meetings
1B	KTP online databases
1C	Case A company website
1D	KTP university case study

Table 4.2 List of documents reviewed for Case A

4.1.1.3 Analysis of Case A

The following provides an analysis of the Case A. Each theme is analysed based on the sub-theme, which was revealed from the interview and analysis of the documents. Interpretation and quotation of the participants are also provided for each of the theme analysed. The section is ordered by focusing first on the characteristic of knowledge and knowledge transfer. And then the implication of knowledge transfer and social capital on fostering innovation are analysed and interpreted.

4.1.1.3.1 Characteristics of knowledge

- **Providing basis to perform certain action**

In regard to understanding the nature of knowledge, participants in Case A considers knowledge as basis for individuals to performance certain actions. Knowledge has been considered to enhance their capability to undertake a particular activity or to perform certain actions. As highlighted by the Business Supervisor in Case A:

"Knowledge allows you to take understanding and experience of something and apply it to perform certain activities... it is what you know" ... (Business Supervisor, P02)

- **Expertise and technical knowledge**

While this definition seems to be abstract, the academic consider knowledge by classifying it into several types of knowledge such as explicit and tacit knowledge that can inform action. These types of knowledge have been described to be acquired from experience and educations. Whilst the Associate highlighted facts and information as knowledge; however, these need to be accompanied with some experience. Hence it is emphasised the significance of tacit knowledge and practices to support explicit knowledge. Nonetheless, experience and technical knowledge in software development and other technical expertise are recognised as relevant to within the context of the partnership between universities and TBSFs.

"I would consider knowledge as facts, information, and skills acquired through experience and education that can inform action... experience in software development, project management and knowledge from your technical expertise gained through learning is indeed crucial in this partnership" (KTP Associate, P01)

4.1.1.3.2 Characteristics of knowledge transfer

- **Flexible phases approach**

In Case A, the knowledge transfer is aimed at developing machine learning (ML) for incorporation within the customer experience analytics product. This activity was mainly to improve Case A's internal process for delivering a better customer experience. The project also aims to improve existing products with the capability to support and optimise the customer experience scoring model.

According to Document 1A, knowledge transfer activities carried out in Case A were divided into several phases. The first phase involved research and development (R&D) to analyse data and to model the prototype. The second phase of the project focused on the development of the model prototype. The third phase focused on the internal implementation of the prototype (pilot testing), a process which included staff training, a delivery workshop, and conducting of a real-world capacity evaluation of the model. Finally, the model would be launched for full commercial use within the company. The work of the project was planned to be undertaken in a two-year period. However, the process of knowledge transfer activities carried out in Case A, which were to adapt the prototype model in accordance with company requirements, were found to be flexible, as described by the Business Supervisor:

> *"In this knowledge transfer, it is necessary to be flexible where possible and amend plans as the project develops…"* (Business Supervisor, P02)

- **Two-way interaction to sharing expertise, experience and skills**

Knowledge transfer is also highlighted as a two-way interactive process between academics and the company. The types of knowledge that has been described that involved in the interactions between the stakeholders was mainly tacit knowledge which is expertise, experience and skills. Both the academic and the company mentioned experience and skills are mainly transfer in the process. This is described as following:

> *"Knowledge transfer allows a subject matter expert to pass on their experience and skills into another group of people, so they can then go on and gain their own experience and skills"* (Business Supervisor, P02)

"Giving and sharing specific knowledge and expertise from the university as well as from the company...." (KTP Associate, P01)

- **Performing action to solve problem**

While the process is acknowledged as flexible, adapting to changes in accordance with the company priorities, knowledge transfer in this partnership is described as an important source for providing a basis for individuals to perform certain actions. The Business Supervisor in Case A described the knowledge transfer as follows:

"Knowledge transfer allows a subject matter expert to pass on their experience and skills to another group of people, so they can then go on and gain their own experience and skills" (Business Supervisor, P02)

From an academic point of view, knowledge transfer is described as giving specific knowledge to solve a specific problem to the collectively benefit of everyone involved. The academics in the partnership also point out that transfer of knowledge involves sharing, whereby knowledge is viewed as being received both from the university and the company and being shared to solve a specific problem. As mentioned by the academics:

"Giving and sharing specific knowledge and expertise from the university as well as from the company, and applying that particular knowledge to solve a specific problem and to enhance company efficiency" (KTP Associate, P01)

- **Collective benefit**

Knowledge transfer is also described as the process that collectively benefits every stakeholder that involved in the process. As mentioned by the Academic Supervisor:

"The transfer of knowledge between three different parties, the university, the associate, and the company, from one to another… and collectively it benefits all parties" (Academic Supervisor, P03)

Consequently, knowledge transfer in Case A involved sharing of specific knowledge, experience and skills to solve a specific problem potentially enhancing innovation and benefiting everyone within the project

4.1.1.3.3 Implication on innovation outcome

- **Delivering new output such as new prototype, new in-house capability, and new knowledge**

Knowledge transfer in Case A is currently progressing well against the workplan (Document 1A). According to the participants, the development and deployment of the initial model prototype has been completed and it has been launched internally for further evaluation. According to the Business Supervisor:

> *"The KTP has delivered into our Innovation XX sessions, including outputs that are prototypes to show the art of the possible to the product team and wider business... We also have had the unexpected output of the KTP delivering a sentiment engine as part of the ML platform, which will save the company tens of thousands over the coming years, where we don't need to use third party services."* (Business Supervisor, P02)

- **Economical and cost saving**

According to the Academic Supervisor, the project has contributed to improving the capability of company to understand customer experience by introducing a new process to the company. The new solution has been developed in-house with the potential to be more economical.

> *"The knowledge transfer can overall be deemed as innovative…, we managed to develop a new customised tool that was produced in-house. The impact will also be economical within the company in terms of cost savings, compared to buying off-the-shelf."* (Academic Supervisor, P03)

> *"We came up with prototypes and a new solution that led to economic and other types of benefits for the company; the company understood the new knowledge and the performance of the latest models in the research field. In terms of academic impact, we did some new research and a case study on machine learning algorithms…"* (KTP Associate, P01)

- **Enhanced company credibility leading to potential market growth**

The Business Supervisor in Case A also highlighted that the knowledge transfer performed has also helped business growth in terms of enhancing the company's credibility through being seen working with academics. This credibility helps to differentiate them from other competitors and has increased their potential for market growth.

> *"The partnership also enhanced our credibility… to be seen to be working with academics at the leading edge of scientific research… this not only widens our target market, but also differentiates us from our competitors"* (Business Supervisor, P02)

Consequently, it can be reasoned that the main innovative outcome identified from the project was the improvement in the internal process and its impact on the firm's marketing and sales departments, such as providing further insight into the firm products. Furthermore, the knowledge transfer in Case A was found to have resulted in new knowledge and understanding for the company, leading to future capabilities in product development and target market expansion.

4.1.1.3.4 Challenges for knowledge transfer in fostering innovation

- **Managing time-scale expectation**

The knowledge transfer carried out in Case A had a two-year work plan. Throughout the knowledge transfer activities, some of the existing knowledge transfer objectives had to be changed because the firm slightly changed their strategic direction. The two-year work plan for the knowledge transfer was considered to be a long timescale for the firm to make new and improved products commercial. From the company's point of view, the industry moves very fast and the project's initial objective might not turn out to be as valuable when the specific solutions have been developed. According to the Business Supervisor:

> *"The project is progressing well but slightly slower than we hoped. It's quite hard to determine what is possible in two years, due to challenges that arise, and also company priorities and strategic direction can change. We had to follow the relevant product development release process and change control."* (Business Supervisor, P02)

Meanwhile, the Academic Supervisor saw that the firm was being assertive on the timescale and wanted to see a fast result. However, the transfer of knowledge in the partnership was regarded as research oriented and sometimes it would require more time and work in order to implement the solution in a real-world context. Therefore, the academics required more time to make changes and redevelop the solution, and it took some time to show the impact to the firm.

> *"The project is strongly research-oriented… It builds on methods previously published by the academic team. To apply this research in the real business context, it requires some of the tools to be developed and redesigned, so it takes time to see the benefits and the impact of the project."* (Academic Supervisor, P03)

The different perceptions of the timescale between the partners, whereby the university viewed that more time was needed for the knowledge transfer to show an impact while the firm wanted an immediate result, led to a conflict of interest between partners in Case A.

- **Difficulties of the company-based partner in accessing information and resources**

Early in the project, it was found that some Case A staff in other departments were unwilling to collaborate in sharing required information and data on the development of machine learning. According to Document 1A, the lack of vital data to support the development of the model delayed the deployment of the deep learning system. This is supported by the following evidence:

> *"There were some staff who were just not confident in cooperating with the redevelopment of the existing model"* (Business Supervisor, P02)

4.1.1.3.5 Role of structural capital

- **Regular communications lead to a compromise between stakeholders**

In managing different expectations from both parties, regular communication through weekly and monthly meetings between partners were useful for sharing the progression of the project and highlighting challenges. Both the academic and industry partners actively participated in the meetings, discussed their concerns, and proposed suggestions to improve the learning

model for deployment in machine learning. For example, the KTP Associate for Case A mentioned the following:

> *"Usually in the meeting we make sure everyone understands the work situation, problems are highlighted, and both supervisors communicate their solutions… Everybody has different expectations and perceptions of what they want, so it takes time to settle down and compromise, and come up with solutions to make sure that everybody is going in the same direction."* (KTP Associate, P01)

This statement is also supported by the Business Supervisor:

> *"Face-to-face meetings every week and the monthly meeting of the project were useful to keep the project on track and keep the deliverables managed and tracked. Regular communications were useful to share progress, highlight challenges, and provide support towards commercialising the product."* (Business Supervisor, P03)

Regular communication through face-to-face meetings was therefore identified as playing an essential role in managing the different perceptions of the project's timeline. This has helped both parties to compromise and to understand how the other works. Regular communication also gives the team clarity about problems and to brain-storm ideas for solutions. While decisions and agreement did not come easily in Case A, compromise between individuals reduced the difficulties in managing different perceptions and allowed the development of the new machine learning.

- **Online platform provides communication / a link between individuals, and supports the transfer of knowledge**

Participants in Case A also highlighted that online platforms such as email were used between meetings to support and update partners with relevant information and knowledge. This connection through online platforms allowed resources to be shared between partners and provided two-way communication.

"Email was also used in between meetings to update on progress and share relevant information… email was even more useful, I believe, for the KTP Associate to communicate with the academic team, it supports communication between the academics" (Business Supervisor, P02)

"Email is useful, especially with the academic team, since I am based in the company and my Academic Supervisor is in the university… Sending an email is easy, and within a couple of hours my supervisor would respond to my email and help me with any enquiries that I had about the project… My supervisor would also send me academic input through email…" (KTP Associate, P01)

- **Prior professional connection drives rapport between partners**

The Academic Supervisor in Case A mentioned that a prior relationship, which was based on working on several projects before this KTP with the partner, helped the partners to get along well with each other. The influence of the prior connection between the partners reduced difficulties in information flow as the partners understood each other well and their relationship became closer over time. This is reflected in the following statement:

"We have known each other for years and have been working together on a few other projects before this KTP. We also had a few students who did placements in the company. We get along well… so it was quite easy to work together for this project." (Academic Supervisor, P03)

This prior connection also allowed for access to additional information and guidance to support the challenges that the company partners sometimes faced. This is highlighted in the following statement:

"We have worked with our local university for many years; we would certainly refer to the university for help and guidance, specifically with challenges we have sometimes faced, due to the relationship we have built." (Business Supervisor, P02)

4.1.1.3.6 Role of relational capital

- **Trust based on proven capability enables inter-dependencies and resource sharing**

Early in the project, one of the main problems in Case A was to have staff fully collaborating and sharing input to support the development of the model. In managing this, an improvement was made with the KTP Associate being assigned to work as part of the company's innovation development team. Within this team, the KTP Associate supports the team and provides them with any help that they need. Being a part of the team has allowed the KTP Associate to demonstrate his capability, which has led to the Case A staff gaining trust and confidence in him. The staff have therefore been more willing to cooperate and share resources after establishing trust in the company's partners. This access to resources allowed the KTP Associate to identify meaningful data for refining and redeveloping previous software, which led to the full commercial launch of the software. This is supported by the following statement of the KTP Associate:

> *"Being placed with the innovation team offered opportunities for me to interact with other researchers and helped me around the team. They slowly came to depend on me, and I on them... They started to trust in my ability to perform, and this helped me to access the data for the system…"* (KTP Associate, P01)

As for the Business Advisor, he believed that the KTP Associate gained trust after being assigned to work with the innovation team. The KTP Associate managed to deliver some further insight by using some data to change the way a lot of people thought about the project.

> *"There were some staff who were just not confident to cooperate with the redevelopment of the existing model. However, having the Associate as part of a team working on the other innovation project has changed the way a lot of people think. The staff are now more willing to cooperate and work together with the academic which, I think, shows that there's an increased level of trust in the Associate…"* (Business Supervisor, P02)

The above comment highlights that trust was particularly evident in supporting the development and deployment of the new machine learning by enabling inter-dependency between individuals and enabling access to input for the development of the model prototype.

- **Professionally-based relationship offered resource sharing and support**

In Case A, it was identified that the relationships with company partners were established on the basis of professionalism. While both the university and the company have described their relationship as very good, the common ground for that relationship is connected with work on future core business activities. Both partners have sometimes met outside of work (attending seminars or workshop) and have previously known each other; however, this relationship is limited only to business or academic purposes. The relationship between the partners has mainly sought professional benefits, such as guidance and resources to meet challenges that they have faced. However, this relationship has been found to provide direct practical support to the overall development of machine learning within the project. Evidence for this was noted by the Business Supervisor in Case A:

> *"We have a very good relationship with the academic team and we have talked about the project and future projects. They took time to understand our business and understood the challenges we faced at times, and how we had to take some time to address them."* (Business Supervisor, P02)

From the university point of view, they also described their relationship with the company partner as good. This relationship was found to be useful in enhancing knowledge transfer activities by gaining a quick response from the company partners, especially in terms of receiving support for the development and deployment of the model.

> *"My relationship with the company is good. They have offered lots of guidance and help during the KTP… I have been offered continuing work within the business at the end of the KTP, and so I think this demonstrates that we have built a great relationship with the partner."* (KTP Associate, P01)

The above comments have described the relationship between the partners in Case A. It is evident that the relationship between the partners has mainly been established on professional grounds. However, this type of relationship has been found to benefit both partners and provide direct mutual support to assist the development of machine learning in the project.

4.1.1.3.7 Role of cognitive capital

- **Clarity of the project develops shared understanding**

The clarity of the details of the knowledge transfer in the project was found to have developed cooperation between the stakeholders in the development of the software. In Case A, it was noted that the KTP Associate was responsible for delivering presentations as well as completing an 'Executive Summary' for every Local Management Committee (LMC) meeting (Document 1A). Details of the knowledge transfer project were recorded and disseminated to all stakeholders regularly to update and inform everyone on the progress of the project. In Case A, The KTP Associate disseminated progress reports every three months to all stakeholders, to inform them about the project's aims and objectives, and the tasks that were to be undertaken and that had already been performed, as well as the benefits of the project for all stakeholders (Document 1A).

According to participants from the university, clarity about the project has created mutual understanding and facilitated the development of machine learning in Case A to a successful implementation. This is evident, based on the following comments:

> *"We inform about the progression and benefits of the project… We also record the internal impact of the project and disseminate this among a wide range of audiences in the company so that they are aware of the benefits of the project… That's actually helped the project a lot."* (Academic Supervisor, P03)

> *"Apart from the meeting, we always inform about what we are doing, and what can be done and what can't be done, and let them know the outputs of the project... We have project management tools, timelines to inform about the project and have developed a mutual understanding between partners…"* (KTP Associate, P01)

The Business Supervisor noted that the KTP Associate's presentations were clear and they showed full understanding of the overall aim, objectives and benefits of the project. According to the Business supervisor:

> *"XX's (KTP Associate) presentation was very good, and it is clear that we fully understand the project aims, objectives and benefits"* (Business Supervisor, P02)

- **Shared innovative mind set drives cooperation**

In Case A, the company encourages all staff to take innovation seriously, always pushing them to be creative and innovative, and always providing support and training to enable them to be better at the job and to keep preparing for future challenges. The company has also introduced an Innovation XX team, who are responsible for exploring a wide range of ideas and creating something completely new (Document 1C). This mind set for taking innovation seriously has led the company to value knowledge and to cooperate with the university to access technical knowledge for product development.

> *"We believe this area of knowledge is vital to us adding the relevant features and differentiators to our products and services in the future"* (Business Supervisor, P02)

The company's innovative mind set has also inspired the KTP Associate to strive hard to achieve the objective of the project.

> *"They have always been supportive and have encouraged me to think differently… They have, like, an innovation policy here that drives everyone going forward to provide helpful solutions for the company."* (KTP Associate, P01)

4.1.2 Case Study B

4.1.2.1 Background of Case B

Case study B is a small information security consultancy firm located in the north of England. The firm was founded ten years ago by a team of highly experienced IT specialists, who saw the opportunity to use their expertise to help SMEs improve their information security systems. They offer a variety of computer security and service solutions, such as cyber-security, providing consultancy, risk assessment and implementing innovative technologies, including blockchain, Internet of things (IoT), artificial intelligence (AI) and cloud computing. They are a growing firm that works both nationally and internationally. Currently, Case B employs less than ten people, including one KTP Associate from the university.

Case B has received funding from the Innovate UK scheme, allowing them to partner with the university in a KTP project that started in 201X and is expected to be completed in 202X. The

project aims to develop new strategy capabilities in cyber-security to enable it to offer an integrated full-service package for sale to customers both within the UK and internationally. It seeks to build Case B's own brand of generic security auditing toolkits and develop several security software solutions. This will be their first own-brand IoT audit toolkit for commercial security auditing. Throughout the KTP, a research associate was based at the company partner, with the capability to access university facilities. The KTP Associate was assisted by the Company Supervisor with most of the business input, and by the Academic Supervisor at the university, mainly with respect to academic information (Document 2A).

4.1.2.2 Participants and documentation details in Case B

Three interviews were conducted in Case B with the main stakeholders in the transfer of knowledge. All three key participants were actively involved with the project since it started. They are the KTP Associate, the Academic Supervisor and the Business Supervisor, all of whose details are listed in Table 4.3.

No	Interview ID Code	Role in the KTP	Gender
1	P04	KTP Associate	Male
2	P05	Business Supervisor	Male
3	P06	Academic Supervisor	Male

Table 4.3 Details of participants in Case B

A review of written documentation was carried out in addition to the interviews to provide further clarification on the partnership between the university and the firm. The documents reviewed are listed in Table 4.4.

Documents references	Documents
2A	KTP partnership details
2B	Minutes of the meetings
2C	Innovate UK online databases
2D	Case B company website

Table 4.4 List of documents reviewed in Case B

4.1.2.3 Analysis of Case B

The following provides an analysis of the Case B. Each theme is analysed based on the sub-theme, which was revealed from the interview and reviewed documents. Interpretation and quotes of the participants are provided for each of the theme analysed. The section is ordered by focusing first on the characteristic of knowledge and knowledge transfer. And then the implication of knowledge transfer and social capital on fostering innovation are analysed and interpreted.

4.1.2.3.1 Characteristics of knowledge

- **Experience and interaction**

In defining knowledge from business point of view, knowledge is recognised as to be developed from personal experience, interactions and learning. This highlighted that knowledge cannot be separated from practices and requires learning, as well as interactions with other as to solve company problem and leading to new opportunities. This was highlighted in by the Business Supervisor in the following statement:

> *"Knowledge is build based on personal experience, interactions and education...and you can apply knowledge to certain field to solve certain problem. In the technology sector, we need to always update our knowledge, get involves with academics, clients and customers to better understand new opportunities and issues"* (Business Supervisor, P05)

- **Value information**

Agree with the statement, academics considered knowledge as possessing value information, skills and expertise in relation to a given subject matter. Knowledge also has been acquired through learning and experience. This highlighted that it is relevance to have practical involvement to acquire knowledge. This was evident on the following statement:

> *"Knowledge can be understood as possessing value information or skills concerning a given subject matter. This can be acquired through practical experience and theoretical learning...value information includes technical knowledge, market as well as industry knowledge which can be apply to help the business..."* (KTP Associate, P04)

- **Basis for Innovation**

The application of knowledge also is considered as essential for doing a company's activities in more innovative ways. One of the participants highlighted the significant of recent research in the field of technology and interaction as basis for innovation. This highlighted that knowledge is relevant of knowledge as source for innovation. This was evidence on the following statement:

> *"Having recent research and awareness on latest technology is important basis for new innovative ways of doing things around the company, different ways of doing things ...you need to socialise, look things around...find out what's new out there..."* (Academic Supervisor, P06)

4.1.2.3.2 Characteristics of knowledge transfer

- **Flexible phases approach**

The Case B knowledge transfer involved sharing of expertise, skills and experience for a defined purpose and achieved benefits. According to Document 2A, the main objective of the knowledge transfer was to develop new widely-adopted cyber-security solutions, and develop Internet of things (IoT) and other data processing infrastructures to enhance sales domestically and internationally.

According to Document 2A, the transfer of knowledge was divided into several phases. The first phase started with research and development (R&D) on information security toolkits. This was carried out to understand the current situation with cyber-security, modelling of prototypes and design of cyber-security solutions. The second phase of the project included developing an (own-brand) integrated security audit toolkit for commercial auditing. The third phase was to develop IoT, which does not exist within the firm. This development was to be their first own-brand IoT auditing toolkit and software solutions, which are fundamental to secure IoT systems. Finally, the project followed this with developing a training manual for the operation of the newly developed solution and training of appropriate Case B staff in the use of the newly developed solutions (Document 2A). However, the knowledge transfer process involved was flexible; there were minor modifications in some phases, following feedback from partners, to refine and recodify, particularly in terms of prototype development (Document 2B).

- **Sharing knowledge for developing new product and innovative solution with commercial benefits**

Whilst, Document 2A highlighted that transfer of knowledge is conducted in a phased approach with a defined purpose. However, the participants in the interviews referred to knowledge as experience, skills and expertise, as well as research by the participants, when explaining knowledge transfer in Case B. The participants also described knowledge transfer as a sharing process that is conducted for a defined purpose. Participants at the academic level pointed out that the purpose of knowledge transfer was to benefit both the university and the business. This was evident from the following statements:

> *"Sharing of experience, skills and expertise, in information security to the benefit of all parties… The university benefits in generating high quality research and the company will be able to develop new products and services that will give them a competitive advantage in the sector…"* (KTP Associate, P04)

> *"It is essentially transferring the current state of the art in the research field to the company, to improve company productivity and solve company problems, and bring academic research closer to commercial applications"* (Academic Supervisor, P06)

However, at the business level, the main purpose of knowledge transfer was mainly to benefit the company in terms of commercialising products. This showed that businesses have a strong motivation to engage in knowledge transfer, mainly because of its commercial value. According to the Business Supervisor:

> *"Application of knowledge and research to a defined purpose, particularly to commercial products"* (Business Supervisor, P05)

4.1.2.3.3 Implication for innovation outcome

- **Delivering new products and prototypes**

According to Document 2B, it was highlighted that knowledge transfer in Case B had achieved several positive outcomes (Document 2B). It was reported that Case B's new own-brand security audit toolkits and new cyber-security prototype had been developed and tested. The new toolkits and prototype have been proven to have improved existing security audit capabilities, extending the basic security area of the Case B's current product. The prototype had received a positive test result and would soon be launched for commercial security auditing to Case B's clients.

This showed that the knowledge transfer activities in Case B have contributed to fostering product innovation, which will potentially generate income for the company. This implication of knowledge transfer for innovation was also highlighted by all of the participants interviewed, as is evident from the following statement:

> *"So far, the transfer of knowledge has several positive outcomes, such as the host company gaining several new security products, which have potential to generate profit… The university is also benefiting from two substantial publications in international conferences…"* (KTP Associate, P04)

- **Improves practice/ process and enhanced efficiency**

According to the Academic Supervisor, implementation of new products in Case B has eventually changed and improved the practice of the company. The implementation of the new security audit tool has reduced maintenance and other costs, and saved time for the company.

> "*It has contributed to innovation. We had come up with new products and prototypes… The product development improves practices in different ways, in different aspects, in terms of efficiency, cutting time and cost, and even by doing new process or new activities…"* (Academic Supervisor, P06)

- **Enhanced confidence**

The Business Supervisor was also positive about the knowledge transfer activities undertaken in the KTP. The development of the new product not only is identified to advance their product; it also has implication on company confidence to be more competitive and has led to an interest to get involved more in innovative activities. This implies that innovation does not only has an implication on profit, it also has an implication on the confidence level. As mentioned by Business Supervisor:

> *"Knowledge transfer has made a substantial contribution to our existing products. We now have our own brand of security audit toolkit that advances our security services… It has also increased our confidence…"* (Business Supervisor, P05)

Accordingly, knowledge transfer in Case B can be interpreted to have achieved the outcome of product innovation. It is noted as well that the implementation of the new product within the company has also contributed to the process of innovation, in which the process of delivering the new product to customers has been changed, with new activities being introduced into the company. It is also noted that the innovation has significantly reduces cost and increase confidence of the company partner.

4.1.2.3.4 Challenges for knowledge transfer in fostering innovation

- **Managing expectations of partners in terms of timing and scope of the project**

There were several challenges that impeded the development and the implementation of the security solutions within the partnership. These challenges included managing the expectations of the partners. At the beginning of the project, the business partner expected to see the applicability of the solution instantly. They were interested in obtaining an immediate result and felt that the university spent too much time on research rather than on accomplishing the task. As the Business Supervisor experienced it:

> *"The academics spend too much time in getting it done… They like to get it done, but they want it to get it done perfectly… But if you are working with software, it does not have to be perfect at first. It is not a big surprise to start again. But if you get something occasionally and as long it is ready on time... people are happy. Even if it is poor… that will be all right…"* (Business Supervisor, P05)

The KTP Associate also stressed the difficulties in managing the expectations of the business partner, which were mainly to have the security solution developed and delivered in time.

> *"The director actually overestimated the skill set required for the project… They want things to happen fast, and this doesn't happen just like that… it does not work that way. Due to some changes to the product, the company hasn't fully calculated the additional time needed to complete the project."* (KTP Associate, P04)

Meanwhile, the university felt that the company partner's expectations were sometimes beyond the project's scope. The Academic Supervisor described the company partner as always wanting the quickest ways to commercialise the product development, and highlighted that:

> *"We academics follow things and procedure; we do not take short cuts. So, it is always difficult to adjust their mind set, adjust the view of how things should be done. Sometimes there is a conflict of interest…"* (Academic Supervisor, P06)

- **Lack of understanding of the project**

At the beginning of the project, the company partner seemed to have a limited understanding of the knowledge transfer activities that would be undertaken in the project. According to the KTP Associate:

> *"I feel like the director was confused about the project's scope and the product… Hence, there were some changes in project objectives midway through. And some additional work from the company for me to put in… which was very difficult for me…"* (KTP Associate, P04)

According to the Business Supervisor, the project was very unclear in the beginning, mentioning that the roles and responsibilities of the academics were vague:

> *"The project was very vague in the beginning. We got two people from the university, the Supervisor and the Associate, to run the project, but their roles and responsibilities were very vague. We got the partnership details but sometimes we didn't understand what was written there..."* (Business Supervisor, P05)

4.1.2.3.5 Role of structural capital

- **Regular communication promotes shared understanding**

In managing the difficulties in knowledge transfer, there was regular communication through meetings and informal discussion with the stakeholders, which consequently reduced the tension between partners. During the meetings, the process of negotiation and minor adaptations in the project were discussed to achieve the agreement of both partners. Tasks, activities and responsibilities were also identified and clarified during the meetings. This facilitated the transfer of knowledge by inducing understanding and enabling everyone to move in the same direction. This statement is supported by the Business Supervisor:

> *"Regular meetings are useful. It is nice to update and discuss what has been done, and what could be done by the deadline; we understand when we talk and when we sit together."* (Business Supervisor, P05)

According to the academics, meetings allowed issues to be raised and solutions to be found for adapting to changes and refocusing on the project. While meetings and regular communication were found to be important, it was also essential to make sure that everyone understood the discussions. Good communication, such as the use of project management tools like Gantt charts, helps to provide a better understanding within the firm of the security solutions that were in development.

> *"During the meetings, we discussed what the initial plan of the project was, and we outlined the problems and what adjustments we could make to the original plan, and outlined when we would get something out during the plan… I also used a Gantt chart to make the plan transparent, so that the partner would understand better."* (KTP Associate, P04)

- **Proximity developed mutual understanding and facilitated learning**

Having the KTP Associate working in the company partner during the knowledge transfer activities has driven him to gain more understanding of the application of cyber-security research to the practicalities of the real world. In addition, proximity has also allowed the company to monitor the KTP Associate's progression which has helped the project to be delivered on time.

"Having the Associate in-house was certainly helpful… We could check with the Associate and keep him on track… At first, the project was vague. But you learn as you go along. The Associate understands how the industry works and understands the practical challenges, and started to deliver something..." (Business Supervisor, P05)

In this project, the KTP Associate was working with an engineer in Case B to re-engineer the cyber-security system. There were direct interactions involving the actors and this pulled the stakeholders together to help each other in delivering technical expertise in the project to develop the cyber-security solutions.

"I am working with one of the engineers at the firm and we meet daily for this project. We talk about the system design and cyber-security analysis, and work on the challenges and scope out what actually can be done to make the process commercially viable... I sought to get it and understand the commercial challenges interfacing with the company, and I learned more and tried my best to adapt to the need of the company." (KTP Associate, P04)

4.1.2.3.6 Role of relational capital

- **Trust based on capabilities promotes cooperation between partners**

Within Case B, trust grounded on the capabilities of the academics was found to promote the partners working together to innovate. The feeling that the ideas and expertise of the academics would be safe and would not put the firm at risk was considered an essential condition for the knowledge transfer to take place. This is stressed by the Academic Supervisor:

"Industry likes to have more experienced people with the right skills and right knowledge to advance knowledge within the firm… Industry would not easily cooperate to new advance knowledge, maybe if it disturbs their operation, so they might not want to make any change, unless they feel safe with it…" (Academic Supervisor, P06)

- **Trust based on the partners' performance**

Meanwhile, the Business Supervisor has described how the academic's performance in this project has led the company to believe he has the right capabilities for knowledge transfer. As stated by the Business Supervisor:

> *"We have limited knowledge of recent developments in security systems, and this could make our products vulnerable… We know that the academic has more advance knowledge… They know what can be done. We have already worked on some other company business, and that went well. I think we believe that the academic has the capabilities to open up a new business opportunity for the company…"* (Business Supervisor, P05)

- **A friendship-based relationship contributes to a supportive team**

In Case B, the interaction between the partners was found to be sociable and was not limited only to professional grounds. During the partnership, the KTP Associate went out several times with company staff for entertainment and sporting activities. This friendship-based relationship in Case B was found to be beneficial for knowledge transfer and to provide a more open and supportive collaboration between individuals in the KTP. According to the KTP Associate, they shared more advice and tips that helped to support the development of the product.

> *"We went out several times to several events... We went out to a go-karting event… I would consider them as my friends. I would say that this relationship is supportive… We are open and supportive of each other… We share tips and that is useful for the product in development…"* (KTP Associate, P04)

The Business Supervisor described this friendly relationship as helpful in creating a bond with people in the company.

> *"He (the KTP Associate) is friendly, tactful and get on well with other staffs…I guess it is helpful to create a bond with people…"* (Business Supervisor, P05)

- **Committed relationship facilitate in transferring knowledge**

In Case B, it was found that commitment, or a sense of responsibility to make the project a success, was found to facilitate knowledge transfer. Being committed to the project has led the Research Associate to stay on track and dedicate his efforts to accessing more resources in developing the security solution for the company.

> *"I am committed to learning new things and delivering a successful project on time. Hence, I am devoting my personal time to KTP-related self-learning and also to collaborating with some university students to gain more technical resources, so that this project can be delivered within the agreed timescale."* (KTP Associate, P04)

The commitment and dedication of the KTP Associate to the project was also pointed out by the Business Supervisor:

> *"I am pleased with AA's (Research Associate) commitment… He has been willing to give his energy and time for the KTP… He has willingly given weekends to train staff…"* (Business Supervisor, P05)

4.1.2.3.7 Role of cognitive capital

- **Shared common institutional background and common technical knowledge enabling effective communication**

The development of cyber-security solutions in this project involved a lot of discussion and feedback. Nevertheless, to make communication effective, common technical knowledge and a common institutional background between the partners has been seen to be important in creating shared meaning and understanding. In Case B, the Business Supervisor has previously studied in the university, and hence particularly understands how academics work and is capable of taking the academics' point of view, as mentioned in the following statement:

> *"I have an academic background and understand the language used within the world of academia quite well; this has made me see the academic viewpoint and where they are coming from. However, the director did not see this. … He didn't get what academia was doing at that time…"* (Business Supervisor, P05)

In addition to common institutional background, common technical knowledge between partners was found to enhance the transfer of knowledge through more input and feedback for the project. In addition, this enhanced engagement between the partners in participating in the knowledge transfer. This statement has found agreement among the academics, as mentioned by the KTP Associate:

> *"The engineer that I was working with understood cyber-security really well. We shared ideas and discussed the concepts. I feel that we worked well as a team and proactively sought to improve the project."* (KTP Associate, P04)

Similarly, the Academic Supervisor mentioned that having experience in working with industry for many years has given him advantages in communicating and dealing with the business partner.

> *"I have been in the KTP for over five years… I understand the business mentality, their way of looking at the thing. Sometimes, when the project has some challenges, I will speak to the company supervisor, try to pass the message on, and try to resolve it quickly."* (Academic supervisor, P06)

- **Transparency informs a clear and focused project**

In Case B, transparency of the project activities and clear planning have been found to provide effective communication between the team, and to manage the high expectations of the partners. Transparency leads to more focused projects, which allows everyone to move in the same direction toward achieving the goal.

> "*A plan keeps the Associate on track, keeps him in line... and gets stuff done… This makes the project more focused."* (Business Supervisor, P05)

> "*Part of the way to handle the pressure is to make a plan, to clarify to the board your set time, task performance, the actions that will be taken, and to clearly state the benefits for the company… Let the company know what you are doing and let them know the significance for the project."* (KTP Associate, P04)

"It is important to keep everything documented and have the objective clearly defined. A clear mechanism would help to manage expectations and to remain in the scope of the project." (Academic Supervisor, P06)

4.1.3 Case Study C

4.1.3.1 Background of Case C

Case C is a small technology firm based in the north of England. The firm was incorporated in 201X with the objective to be one of the most successful smart apparel businesses. The firm has developed smart textile sensors, electronics and firmware that are capable of detecting the body's biophysical signals and delivering actionable insight to users via mobile apps. The firm's products are claimed to be innovative, as the sensors and electronics that are integrated into the apparel are wireless and have no metal attachments (Document 3B). Case C currently has nine employees, including two Research Associates from the university for the KTP project. The company is currently partnering with university XX for knowledge transfer and the KTP is expected to end in 20XX.

This is the second time that Case C has been in partnership with the university to improve and develop new technology sensors for sport garments. The first knowledge transfer focused on the development of sensors to measure muscle activity. This was the development of electromyography (EMG) signals to measure and evaluate muscle movement (Documents 3A and 3B). The aim of the second project is to integrate a new and unique electronic sensor that can trace healthy and pathological respiration patterns. The development of this sensor will create a new product line for the company which will grow the firm's market share. The new product will also hopefully expand the firm's market share into new markets, such as the medical and military markets. The knowledge transfer reaches until the end phase of the project. The partnership involves two KTP Associates working daily within the firm. The project has also received some support from the Academic Supervisor and the Business Supervisor.

4.1.3.2 Participants and document details in Case C

Four interviews were conducted in Case C with the main stakeholders in the transfer of knowledge. All four key participants were actively involved with the research and development work on the new software solution in the knowledge transfer. These key stakeholders were the

two KTP Associates, the Academic Supervisor and the Business Supervisor. Their details are presented in Table 4.5.

No	Interview ID Code	Role in the KTP	Gender
1	P07	KTP Associate	Male
2	P08	KTP Associate	Female
3	P09	Business Supervisor	Female
4	P10	Academic Supervisor	Male

Table 4.5 Details of participants in Case C

Details of the list of documents reviewed for Case C

A review of documentation was carried out in addition to the interviews to provide further clarification on the partnership between the university and the firm. Three types of documentation were reviewed for Case C. The first of these were the Innovate UK online databases. These briefly explain briefly the partnership information, including the aims and objectives of the knowledge transfer. The second document reviewed was the Case C company website, which gave an overview of the company and the products that they are specialised in. The third document was the case study of the KTP project, published by the university partner. This case study briefly mentioned the projects aims, objectives, solution and benefits. All three documents were used to give a richer understanding of the knowledge transfer process and its outcomes and to provide further clarification on the partnership within Case C. The written documentation reviewed is listed in table 4.6.

Documents reviewed	Documents
3A	KTP online databases
3B	Case C company website
3C	KTP university case study

Table 4.6 List of documents reviewed for Case C

4.1.3.3 Analysis of Case C

The following provides an analysis of Case C. Each theme is analysed based on the sub-theme, which was revealed from the interview and analysis of several documents. The section is ordered by focusing first on the characteristic of knowledge and knowledge transfer. And then

the implication of knowledge transfer and social capital on fostering innovation are analysed and interpreted.

4.1.3.3.1 Characteristics of knowledge

- **Basis for personal and Professional development**

In Case C, knowledge has been considered as basis for personal and professional development. The Associate highlighted that knowledge can assist company problem as well as develop the Associate. It was deemed that knowledge is capable to enhance technical and personal knowledge. With regards to technical knowledge, it is referred to understanding of new system, how new methods work, knowledge in respiration and technology.

> *"Knowledge can be viewed as skills, expertise, and technical knowledge in understanding how new system works, how new methods work, knowledge in respiration and technology.... so, with these we can help the company and I also with these I could enhance my confidence, capability and support me to perform better and take better action in certain situation..."* (KTP Associate, P07)

- **Source for business growth and innovation**

Knowledge was described by the Business Supervisor as having recent research and information related to technical and scientific knowledge of know-how and know-what that is used as source for business growth. Therefore, this emphasised the relevant of the company to invest in collaborating with universities to access knowledge for company growth.

".... by having these knowledges, it allows to expand our company capabilities, helping us to achieve our mission and vision, and support the company growth..." (Business Advisor, P09)

In the same vein, the Academic Supervisor in Case C, stress the important of interpretation of theory and practical experience to drive business growth and innovative. Therefore, emphasised the relevant of knowledge as source for business growth and innovation

"Knowledge is an understanding and interpretation of theory as well as real-world experience that allowed the people to continually develop and for firms it will allow them to create now, more innovative product and sustain in the business..." (Academic Supervisor, P10)

4.1.3.3.2 Characteristics of knowledge transfer

- **Acquiring specific knowledge to achieve specific objective**

Knowledge transfer in Case C involved acquiring specific information and research that related to the latest technology for tracing healthy and pathological respiration patterns. This involves the application of algorithms from the company data to biomechanics in order to determine the principle of the breathing pattern (Document 3C).

> *"I find it to be both partners getting benefits from the partnership, getting specific benefits in terms of the company with new products and upscaling staff… In terms of the university there is new methodology for them as well as new products too. In terms of the company, they get new students coming as staff and new product development as well"* (KTP Associate, P07)

- **Initiated from the strategic needs from both partners**

In term of understanding knowledge transfer, both partners seem to have similar view of knowledge transfer. Most participants highlighted that knowledge transfer were initiated from the strategic need from both partners. This was described by participants as both partners has their own need/interest in the project and the needs have bring the partners together.

> *"So, the way that I understand it... is that the company has some strategic need for some knowledge that they currently do not have in-house… So they partner with the university who have knowledge of the information that they want… Through the project, knowledge is essentially transferred in different forms… of written documents and presentations, and unwritten documents such as training, advice, experience etc."* (KTP Associate, P08)

- **Involve two-way process with mutual benefits**

In Case C, process of knowledge transfer is noted as two-way process, in which both partners support one another to benefits both partners. This indicate that the knowledge transfer between both partners is motivated from the perceptions of getting mutual benefits at the end of the partnership.

> *"It's cooperation in learning between the university and a company, which benefits both partners. The university will have the opportunity to apply and advance their research, with the potential of developing a new product… and the company will have the opportunity of getting new research and commercial benefits."* (Academic Supervisor, P10)

According to the Business Supervisor, the purpose of knowledge transfer is not only to acquire knowledge for their product development, but also for their credibility and reputation, having been seen to in technology and thinking in a specific field when partnering with the university. This shows that the company is not only interested in product development but also values the importance of the university's research.

> *"Acquiring information or skills from a subject matter expert through learning and experience from the university, to help in improving our productivity and delivering insight to our customers that we are advancing scientific respiration research."* (Business Supervisor, P09)

4.1.3.3.3 Implication on Innovation Outcome

- **Development of novel prototype & parameter**

Participants indicated that knowledge transfer has contributed to innovation within the firm. The project has produced a prototype to analyse breathing patterns. While it is still under development, the prototype has been demonstrated to work and has potential commercialisation. This statement is supported by the following evidence:

> *"Knowledge transfer through our partnership with University X is contributing to innovation in product capabilities. Current development of the devices that we are working on has demonstrated the potential use of wearable technology to analyse respiration patterns."* (Business Supervisor, P09)

The implication of knowledge transfer for innovation in Case C was also highlighted by the academics, who described the transfer of knowledge as having implications for innovation in

terms of managing to develop new and novel prototypes and parameters that no one has developed before. This was evident from the following statements:

> *"We develop new parameters that both parties can use, and we upscale staff in the company. We develop prototypes of the devices that we are working on... The prototype is brand new; no one else are done it... Some parameters we have developed are novel, so we are the first to do it..."* (KTP Associate, P08)

> *"I would say, solely, the project created innovation because we are essentially using existing research to provide the company the information… So, essentially, they could have done it themselves but the whole point is they don't have the resources to do it… So that is where the project has stepped in."* (KTP Associate, P07)

> *"The research that we are doing is new and pivotal to the development of new technology in wearable devices. We are embedding our research in getting the product delivered…"* (Academic Supervisor, P10)

- **Eliminate non-value tasks and activities**

In addition to that, one of the KTP Associates in Case C mentioned that the transfer of knowledge has also contributed to process innovation. According to the KTP Associate:

> *In terms of intangible outcomes, there are processes that are used in the company for doing certain things that have been changed in the company..."* (KTP Associate, P08)

Consequently, it could be interpreted that knowledge transfer in Case C has demonstrated product innovation as well as process innovation within the company through this partnership.

4.1.3.3.4 Challenges for knowledge transfer in fostering innovation

- **Lack of proactive engagement**

The transfer of knowledge for the new product development in Case C, however, was not without challenges. The majority of participants in Case C described most of the challenges as happening at the beginning of the project. One of the challenges mentioned by the participants

was the difficulty to pull staff in Case C to take part in and become involved in knowledge transfer. This is mentioned by both KTP Associates:

> *"One of the challenges is trying to get people to get interested in your project, trying to get them to take time away from what they are doing and to listen to you, and trying to spend time on your work. They are not willing to learn from the university."* (KTP Associate, P07)

> *"Approaching the engineering team, who are often the busiest members of staff is quite difficult… Everyone is stretched very thin in the work that they have to do... They've constantly got, like, huge to-do lists."* (KTP Associate, P08)

- **Different institutional objectives**

In addition, participants in Case C described that institutional objectives were one of the challenges that impeded new product development within the partnership. Different institutional objectives have led to difficulties in bonding people together for the project. According to the Business Supervisor:

> *"Initially, the team struggled to appreciate that the objectives of the KTP and the objectives of the company are one and the same. There was a tendency to talk about 'our objectives' and 'their objectives'."* (Business Supervisor, P09)

> *"Because you have different people with different mind sets, different agendas, to bring them together for a common goal was quite tricky at the beginning of the project…"* (Academic Supervisor, P10)

- **Limited capacity and resources for the project**

Furthermore, limited capacity in terms of too heavy a workload has also influenced people's dedication to the activities within the partnership. As a small company, Case C has less than ten employees; therefore, the staff found that it was difficult to allocate time for dedicating to the partnership. This was evidenced by the Business Supervisor, who mentioned:

> *"We are a small team with a large workload; therefore, there is often limited capacity to dedicate to the actual knowledge transfer process."* (Business Supervisor, P09)

Likewise, one of the KTP Associates in Case C stated that one of the main challenges within the project was that limited resources and equipment were available for the project. This was evident in the following statement:

> *"We have limited equipment and resources available to the project…"* (KTP Associate, P08)

4.1.3.3.5 Role of structural capital

- **Regular communication contributed to access to information and resources**

In Case C, some of these challenges were tackled by having regular weekly meetings between both partners. These regular meetings were found to be useful in enhancing cooperation between team members. Participants in Case C described the meetings as allowing interactions between partners to inform about and discuss the development of the new software and electronic devices. Regular communication allowed knowledge transfer to be facilitated, mainly by giving more / additional access to information, ideas and input in order to plan the product development. In addition, analysis of Case C has shown that regular communication drives a shared understanding between partners and balances the partner's different institutional objectives helping them to work as a team.

> *"We have a weekly meeting every Monday… Everyone sits around the desk and we all discuss what is to be our progress in the current week. I used that time to transfer the information that I was supposed to and to give presentations within that time. The meetings could be quite intense in terms of feedback and discussing input into the project. However, it is useful to get everyone's attention… When everyone is there, it is easier to plan things in advance together."* (KTP Associate, P08)

According to the Business Supervisor, having meetings that involved the R&D Director and the academic team helped with the understanding of the project, as the project shared a common goal with the company.

> *"Involving the R&D Director in the KTP meetings with the Associate and Academic Supervisor helped with the understanding that the KTP and company share a common goal."* (Business Supervisor, P09)

Besides regular meetings, analysis of Case C also revealed that daily / informal face-to-face communication influenced the generation of new ideas and problem solving. The Business Supervisor stressed that:

> *"Face-to-face communication is key for exploring new ideas or problem solving."* (Business Supervisor, P09)

- **Online platform for fast access to information**

The analysis in Case C revealed that communication through the online platform was essential to the development of the project. Participants described the online platform to be particularly useful in transferring explicit knowledge, such as documentation, records and other information. According to the Business Supervisor:

> *"Email is preferable as a record of outcomes, decisions and fast access to information."* (Business Supervisor, P09)

According to one of the KTP Associates, communication through online platforms such as email was helpful in transferring technical information from the technical team when they were occupied with other work. This indicated that email was useful in linking the partners together in terms of accessing information and reducing the challenges of limited capacity to work together.

> *"Sometimes when I see the technical staff are doing something that requires 100% of their attention… I would definitely use email to ask them about some important technical questions… Email would allow them to answer your questions when it is convenient for them… They would usually respond to my questions immediately…"* (KTP Associate, P07)

- **Proximity creates familiarity and contributes to better interaction**

Analysis of Case C found that proximity between the KTP Associates and the company partners has influenced the development of the software. In Case C, working in the same area/room as the technical team creates familiarity and contributes to better communication. Both KTP Associates described this proximity as driving them to engage with and be friends with each other. The analysis also showed that this was useful for fast responses and feedback.

> *"The company is good. It is a very small company. Everyone is quite close, and we all are working in the same room… we know each other. It is helpful for exploring new ideas and solving problems."* (KTP Associate, P07)

> *"We are in the same office. It's a pretty open office, where everyone is happy to talk to each other, and if I have any questions or any ad-hoc matter, I would just go straight away to them."* (KTP Associate, P08)

- **Diversity of skills provides different technical resources**

Participants in Case C described how individuals involved in the knowledge transfer have different specialities and expertise. This diversity in terms of different specialities drives the team to appreciate and value the expertise and skill of the other members. This creates synergy between individuals and a willingness to share more resources, leading in turn to a more efficient process.

> *"We have different specialities, and have different degrees; however, the team values the differences… Everyone contributes and we exchange our knowledge… trying to do something together, which is very good…"* (KTP Associate, P07)

4.1.3.3.6 Role of relational capital

- **Friendship-based relationship outside of work leading to open communication**

Analysis of Case C discovered that a friendship-based relationship has driven open communication between the partners. A majority of the academic participants described their relationship with the technical team at Case C in terms of being friends and being close to each other. One of the KTP Associates described this relationship as contributing to open

communication and creating a shared understanding between them. In addition, one of the KTP Associates viewed this relationship as helping in facilitating knowledge transfer by encouraging more constructive feedback and enhancing the exchange of knowledge through brainstorming. This is supported by the following statements:

> *"I called them my friends… We go for drinks after works… and sometimes we discuss ideas for the project. And it gives me the opportunity to brainstorms and create more understanding."* (KTP Associate, P07)

> *"It is a very small company. It is easy to talk about things. We are all friends with each other. Everyone is happy to talk about, like, controversial subjects. And everyone is happy to critique each other and nobody takes it personally. You can lay into someone about a problem and the next minute you are still friends and you still can talk normally; it is nothing personal. There is a lot of joking and making fun of each other in a light-hearted friendly kind of way… so that's really facilitated being able to talk openly and exchange knowledge."* (KTP Associate, P08)

> *"Our relationship is good; we went out together sometimes after work. They are more open to what you are saying. When you get to know them it is easier, and they are more willing to help you out."* (Academic Supervisor, P10)

Likewise, the Business Supervisor in Case C also viewed the relationship as going beyond professional work. This was evident from the following statement:

> *"Our relationship goes beyond the KTP… We are friends and we go for drinks after work. We are fortunate to have a very capable KTP Associate and a proactive Academic Supervisor that continue to drive the project forward even when the company gets distracted by other urgent objectives."* (Business Supervisor, P09)

- **Trust facilitated the execution of work plans**

The Case C analysis found trust to be helpful in facilitating the development of the prototype. One of the KTP Associates described trust as helping to solve problems in relation to the development of the product. The KTP Associate described trust as helping the project to access additional equipment and tools. This was supported by the following evidence:

> *"I would say that trust was very helpful… One time, when we requested some development kit needed for the software… the company fulfilled our request immediately… I understand that the company has limited availability of funds; however, the company trusted us with this and solved the problem immediately… This was really helpful in keeping the project on track."* (KTP Associate P08)

The analysis in Case C also showed that trust served as a basis for the willingness of the partners to cooperate. The company has become more dependent on the university for solutions to their problems. It was identified that the company partner would always refer to the university about the challenges that they face. In addition, the analysis also showed that trust was developed mainly based on individual capability, skills and experience. This was evident from the following statements:

> *"When we have any urgent matters or ad-hoc questions, we will contact the academics… Their experience and expertise is invaluable, and we trust they have the competence to deliver the project…"* (Business Supervisor, P09)

> *"When the project has some urgent problems, the company normally approach me. It depends on composition, depends on your role… The company have a preference to talk to one member of the team compared to the other sometimes. It is not necessarily preference; it is targeting someone who has more expertise on the area. I think the company trusted someone who has more expertise in certain areas, depending on the types of problem…"* (Academic Supervisor, P10)

- **A relationship based on compromise motivates individuals to engage with the partnership**

  In Case C, a relationship based on compromise was found to motivate individual engagement in developing and integrating the software. Also, the KTP Associate described being given priority throughout the project and having the advantage of attending trainings that were useful for the development of the software. A compromise was also evident when the company partners agreed to allocate some time for the KTP Associate to write a research paper on this partnership. Being able to support each other in achieving their goals has led to a relationship of compromise between both parties. This has influenced and

facilitated the transfer of the technical knowledge for the development and deployment of the software. This statement is supported by the following evidence:

> *"We were willing to compromise on what we will get from the project at the end of it… At the start of the project we put a lot of emphasis on producing the task and directly helping them. Along the way, I have also attended several trainings to advance my knowledge related with the development of the software... And now at the very last stage of the project, most of my work has been writing the paper… So, they sought a kind of compromise…"* (KTP Associate, P08)

4.1.3.4 Role of cognitive capital

- **Shared interest outside the project helped to foster a productive partnership**

Even though both partners come from different institutional backgrounds, it was found that they were still a match for one another. According to the Business Supervisor, shared interests outside of the project have helped to foster a productive relationship that has facilitated the transfer of knowledge in developing the new software for Case C. This is evident from the following statement:

> *"I would say that the cultures and backgrounds are very well matched. Our KTP Associate and Academic Supervisor have shared interests outside of the project and this has helped to foster a very productive relationship."* (Business Supervisor, P09)

This statement was also supported from the academic point of view. According to one of the KTP Associates, there were a lot of different personality types and people from different departments that they had to deal with. This was quite difficult to fit in at the beginning of the project. However, finding common ground helped engagement with everyone in the team. According to the KTP Associate, shared interests outside the project was found to have helped with the risk assessment of the project, which contributed to facilitating the development of the software.

> *"There were a lot of different personality types and people from different departments that you had to deal with. You needed to find common ground to speak on the same*

social level… I tried to pick up the lingo that they talked and get used to it… tried to find out their interests outside the project… and just talked. This was helpful to get me to learn from their experience and helped me to recognise if there would be a risk in my ideas." (KTP Associate, P07)

- **Shared goals lead to compromise**

The KTP Associate in Case C mentioned that the shared main goal between the Academic Supervisor and the company supervisors has driven compromise on what both partners can achieve. According to the KTP Associate:

> *"They both saw that the main goals were to facilitate the knowledge transfer, and both were willing to compromise on what they could achieve from the project."* (KTP Associate, P08)

- **Cultural fit with the business environment and aligned goals drive motivation**

In Case C, being able to fit in with the business culture was found to facilitate the development of the devices. While academics and businesses have different objectives for working in partnership, the analysis of Case C found that the academics' beliefs and behaviours were in alignment with company values and culture. These were found to lead the academics to care about the company and to performance better.

> *"It is important to ensure the academic partners' objectives are aligned with the company's… We did this by recruiting the right Associate, who was willing to work and thrive on the company objectives, and to fit into the environment…"* (Business Supervisor, P09)

> *"I am really passionate about the work that the company does… I was really keen to get on board with giving people in the company useful information and achieving success."* (KTP Associate, P07)

> *"It is important to choose the right Associate for the project. The Associate should have both skills and passion to work in the business environment…"* (Academic Supervisor, P10)

4.1.4 Case Study D

4.1.4.1 Background of Case D

Case D is a small mobile network company located in the north west of England. The company has been established since early 19XX and currently has eight employees. Case D's website claims that the company is the world's leading provider of customer quality of experience (CQoE) in mobile networks. The firm's technology allows access to their CQoE from customers' SIM cards, which have been developed by the company. Case D SIM cards are able to access the CQoE, measuring connectivity to the service, location and signal strength, without using the Global Positioning System (GPS). The SIM card allows Case D to report coverage quality in real time. This is one of the alternative approaches to measuring individual mobile service performance (Document 4B). On top of that, Case D also provides solutions for improving voice call recording, cloud call recording, poor voice quality, service disconnection, slow internet connection and poor signal coverage through their Total Analysis Package (TAP) (Document 4B). Case D also offers consultancy to their customers and helps to develop solutions that enable their customers to improve mobile communications.

Case D's partnership with University X in a KTP to overcome challenges that were found with their current products, especially the SIM card. According to the KTP case study documents, the current SIM card and the TAP were found to have an effect on customers' phone batteries, draining them too quickly (Document 4B). Although Case D had tried to find solutions for this problem by using alternative products, this was both too costly and not very effective. Therefore, Case D began working with the academic team to allow knowledge transfer to improve and add value to their existing SIM card and TAP. Through the KTP project, Case D aims to grow and develop new solutions alongside an Academic Supervisor and a KTP Associate from University XX. The project was perceived to have achieved innovation by the key stakeholders (discussed in section 4.2.4.3.1).

4.1.4.2 Participants and document details in Case D

Three interviews were carried out in Case D with the main stakeholders in the transfer of knowledge in the KTP project. All three key participants were actively involved from the start of the project. These were the KTP Associate, the Academic Supervisor and the Business Supervisor, whose details are listed in Table 4.7.

No	Interview ID Code	Role in the KTP	Gender
1	P11	KTP Associate	Male
2	P12	Business Supervisor	Male
3	P13	Academic Supervisor	Male

Table 4.7 Details of participants in Case D

A review of documentation was carried out in addition to the interviews to provide further clarification on the partnership between the university and the firm. Four types of documentation were reviewed for Case D. The first written documentation reviewed was from the Innovate UK online databases, which briefly explained the partnership information, including the aims and objectives of the knowledge transfer. The second document reviewed was the case study of the KTP project, published by the university partner, which briefly mentioned the project aims, objectives, solution and benefits of the project. The third document reviewed was the KTP report, which summarised the project, and informed about the overall activities involved in the partnership and the outcomes of the project. The fourth document was the Case D website, which informed research in terms of an overview of the company and the products that they specialise in. All four documents were used to give a richer understanding of the knowledge transfer process and the outcomes of the project, and to provide further clarification on the partnership within Case D. The list of written documentation reviewed is given in Table 4.8.

Documents reviewed	Documents
4A	KTP online databases
4B	KTP university case study
4C	KTP project report
4D	Case D company website

Table 4.8 List of documents reviewed for Case D

4.1.4.3 Analysis of Case D

The following provides an analysis of the Case D. Each theme is analysed based on the sub-theme, which was revealed from the interview and from the reviewed of documents for further clarifications. The section is ordered by focusing first on the characteristic of knowledge and knowledge transfer. And then the implication of knowledge transfer and social capital on fostering innovation are analysed and interpreted.

4.1.4.3.1 Characteristic of knowledge

- **Interaction to inform action**

The Business Supervisor in Case D deemed that interaction with external could act as source of knowledge that can help company to solve problem and stay up to date. Whilst the Business Supervisor has highlighted several types of knowledges as example however, he has stressed the importance of experience and interaction to acquire knowledge. This highlighted the relevant of interaction process in acquiring knowledge.

" Knowledge is facts, information and skills that can be require through experience, and interaction with people such as clients or with the academic...the ability to understand knowledge is important to inform decision making, and action... and it can be act as a resource for solving company problems and stay up to date..." (Business Supervisor, P12)

- **Technical and industry knowledge**

Whilst knowledge has identified to inform decision and action to situation, it is also noted that knowledge can be exists in several forms such as tacit, explicit knowledge, technical knowledge and industrial knowledge. In term of explicit knowledge, it has been described as knowledge in textbook or technical knowledge such as knowledge in data analysis. However, the explicit knowledge needs to be combined with experience and skills which then can turn out into action. This highlighted the relevance of that explicit knowledge and tacit knowledge is inseparable. This was evidence on the following statement

"Knowledge can be combination of both tacit and explicit knowledge...however tacit knowledge really has the real value, which you can't find in the textbook, it can be specific based on someone experience in industry, that help to understand the real problem better and provide solution to that particular problem" (KTP Associate, P11)

"As a having right information about skills and being able to use that information to inform industry or to help industry...your knowledge such as technical knowledge such as knowledge in data or data analysis that can be used to help the company...that information can be out into action..." (Academic Supervisor, 13)

4.1.4.3.2 Characteristic of knowledge transfer

- **Flexible phased approaches involved learning**

The knowledge transfer carried out in Case D was to improve the firm's existing SIM card by using a cloud source approach to improve estimation of both a mobile phone user's location and evaluation of mobile phone network coverage without draining the battery (Document 4B). Knowledge transfer in Case D encompasses several activities, such as research and development on the software solution, deployment of the software, and provision of training to staff in the company to use the software created by the Associate (Document 4C). According to the KTP Associate, while the project has a clear work plan, the process has sometimes involved a few changes to adapt to the company's direction. This is described by the KTP Associate as follows:

> *"Everything in the initial work plan was fairly well planned. However, throughout the project, the company added slightly more items to the plan that were not set at the beginning. Sometimes we have to roadmap for alternative options and revise the work plan."* (KTP Associate, P11)

- **Transferred technical knowledge with specific objectives, continuous two-way interaction**

The knowledge transfer activities for the development of the new software solutions involved continuous interaction between partners and the transfer of different types of knowledge between one another. According to the KTP Associate, the knowledge transferred included R&D knowledge, ideas and related technical skills and experience to develop a new software solution for Case D. From the academics' point of view, the knowledge transfer in Case D involved two-way interactions between three main individuals, namely the Academic Supervisor, the KTP Associate and the Business Supervisor. The development of the new software solution required different types of knowledge from the university and business and for these to be applied to solving the problem. This is evident from the following statement:

> *"As such, you have the Supervisor and Associate from university, and the Business Supervisor from the company… They all have different kinds of experience and technical*

skills… and the idea of knowledge transfer is that you can take resources and knowledge from university and apply that to solve the problem in the company, and you can take the experiences of the line manager from the company as well and apply this to solve the problem…" (KTP Associate, P11)

- **Involved learning**

Along with the two-ways interactions between partners involved in transferring the knowledge, participants also view that the transfer of knowledge involved learning, which drives to solve company problem and even for the development of commercial products.

> *"Knowledge transfer in the KTP allows the three stakeholders, the Associate, Academic Supervisor and Business Supervisor, to learn from one another and improve understanding of a certain subject area to solve the business problem…"* (Academic Supervisor, P13)

This statement was also aligned with the business point of view. According to the Business Supervisor in Case D, the process of knowledge transfer was bi-directional, whereby the participants learn from one another with the objective of commercial development.

> *"As Associate, he is technically capable in an academic sense… We learned from him; we know much more about our problem that we want to get solved… He is learning some from us as well. He has learned how to engage with customers and partners, and how to work in a team… He has got a more rounded view of what it is like to work on a project which leads to commercial development. It is definitely bidirectional..."* (Business Supervisor, P12)

4.1.4.3.3 Implication on innovation outcome

In Case D, knowledge transfer activities and continuous interactions between the partners, whether on the technical side or the commercial side, have enabled the firm to launch two new prototypes that have been proved to work and to also commercialise one of the software packages with a client of the firm (Document 4C). Some of the other outcomes from partnering with the university in the knowledge transfer are (as listed in Document 4C):

1) the first version of the XXX positioning engine, called XX, were launched to customers;
2) prototypes of AA and BB were demonstrated to customers, which attracted potential business opportunities (new product development and new opportunities arising from customers).

These show that the transfer of knowledge within the partnership has contributed mainly towards product innovation. This is supported by the following evidence:

> *"We managed to come out with two new prototypes, and they have been demonstrated to customers and proved to be working… One of the software packages is already commercialised with a customer…"* (KTP Associate, P11)

> *"It's definitely innovation. We had some few new products… a new ICT patent, and it was a successful project…"* (Academic Supervisor, P13)

> *"Significantly, we realised the ideas… We have created a new solution to the problem that we had. Before, it did not exist; now it does... We managed to come out with new products and we made some business deals with our customers…"* (Business Supervisor, P12)

4.1.4.3.4 Challenges for knowledge transfer in fostering innovation

- **Managing organisational expectations**

In developing the new software solution, the activities carried out in Case D faced several challenges. One of the main challenges was the different expectations of the partners.

> *"Every one of the three parties, they might have three different agendas, such as the Academic Supervisor, the company and myself have different agendas… Academics are mainly interested in research papers and publications. However, the business, they care about money and profit..."* (KTP Associate, P11)

"The challenges are generally with managing the company's expectations. They expect us to contribute beyond the project and sometimes we had to work outside of the project's scope…" (Academic Supervisor, P13)

- **Institutional differences**

The Business Supervisor's view was relatively similar to the academics' point of view. However, he stressed that the challenges were more of an organisational nature. According to the Business Supervisor, the academic environment is slightly unstructured compared to business. The analysis revealed that the academics were found to be 'a bit loose' in terms of operating and planning the activities involved in the development of the new software. Consequently, this difference in organisational norms has contributed toward the different styles of managing the knowledge transfer activities.

"We do details… Academics, they do grant-funded research and entertain themselves… Everything we do, we have to think of making money. So, we are a bit more disciplined than they are. The university is a little bit loose in terms of how they operate… I don't see that anybody inside the university is driven by schedule..." (Business Supervisor, P12)

4.1.4.3.5 Role of structural capital

- **Previously established connections lead to understanding**

There are several challenges that have been identified for knowledge transfer to achieve innovation in Case D. However, there were several elements of social capital that were found to have facilitated the project. In terms of the structural dimension, the participants mentioned a previously established connection between the partners as part of other professional activities, which meant they knew each other well and made it easier to understand each other's priorities. This is pointed out in the following:

"*We did two innovation vouchers before the KTP. I contacted him six years ago, and we have done a few small projects previously. We know each other very well and it is helpful…"* (Business Supervisor, P12)

"My Supervisor has had a previous relationship with the company for the past six years. They have known each other, and they understand each other well… This makes the communication with the company better and that helps to form solutions that benefit everyone in the project…" (KTP Associate, P11)

"I have known the company director for quite a while. We had worked together previously on some other innovation projects. I think this improved my communication with them… because I understand what, actually, they wanted and how, actually, the business worked." (Academic Supervisor, P13)

Consequently, the previous connection between the partners and their past working experiences enhanced the shared understanding between the partners in managing different expectations and organisational challenges for the knowledge transfer.

- **Regular and good communication enables clear goals and shared understanding**

The analysis of Case D identified regular communication through formal activities, such as meetings and everyday interactions at work, as one of the key components in problem solving and decision making for the knowledge transfer. Regular communication provided updated information, milestones and the outcomes of the project. Extensive communication contributed to a shared understanding between the partners. It also improved the activities involved in the development of the software solution by giving out clear guidance to make sure the project meets the objectives. Furthermore, the use of presentation applications, such as power point, spreadsheets, tangible benefit logs, enhanced the efficiency of the communication (Document 4C).

"Regular communication through formal meetings is helpful… Good communication is the key. As long as you communicate very well and very clearly… things can work." (Business Supervisor, P12)

"*Usually, most of the challenges were solved at partnership meetings and by discussion with the stakeholders… We have face-to-face meetings every four months, LMC… I spend three days in the company… and two days in the university. I meet my boss every day during those days. We chat together; during the meetings we talk about the project,*

update on the project… develop clear goals… what the project is about…" (KTP Associate, P11)

"With strong communication we ensured the product development met all the needs of the project." (Research Supervisor, P13)

- **Face-to-face interactions enable resource sharing**

The KTP Associate described how, during the development activities, the project needed to rely on the company partner more for input and communication. He stressed face-to-face communication as enabling the project to gain more resources / input for developing the software.

"Some projects need more input from the university… if it is really a research project… However, if it is a practical project…if it is developing something, such as software, you don't need much input from the university… Mostly, you need more input from the company… and to be able to communicate face-to-face with the company is helpful for the project…" (KTP Associate, P11)

4.1.4.3.6 Role of relational capital

- **A trusted relationship contributes to resource sharing**

In Case D, the development of the solutions required much confidential data input from the company. A relationship based on trust was found to have facilitated the passing of confidential data to the Associate to work with.

"We have trusted the Associate with the data; there are very sensitive data. We have a trusting relationship, so we provide the data for the Associate to work with." (Business Supervisor, P12)

"I believe that we trust each other; there isn't any problem with trust… I have no problem in accessing all the input and equipment needed for the project." (KTP Associate, P11)

The Academic Supervisor described how the company may have built trust with academics before the project started, and how this was linked with its good reputation for previously delivering quality innovation projects.

> *"In this case, I think the company trust us very much… The university had performed really well on the other innovation projects and I think this helped build the company's confidence and trust in the university… and is helpful for the Associate's work in this project."* (Academic Supervisor, P12)

- **Friendship-based relationship leads to teamwork**

In Case D, the participants highlighted that their relationship was fundamental to the knowledge transfer activities, building effective teamwork and willingness to share technical knowledge that contributed to the development of the innovation solution.

> *"They are my friends, and indeed it is helpful for knowledge transfer. A good relationship means we share more information and we help each other, and this makes the project significantly more successful."* (KTP Associate, P11)

> *"The associate kind of built up the relationship with people. We kind of socialise with him. I think it is a friendship relationship and it has developed while he has been working with us. And I think it makes everybody enthusiastic about the work and we share more knowledge about the project…"* (Business Supervisor, P12)

- **A reciprocal relationship enables sharing intentions and sustaining mutual cooperation**

Participants in Case D also viewed that their relationship had a reciprocal basis. Both partners viewed their relationship to be two-way, helping each other by giving each other advantages at the end of the activities. A reciprocally based relationship has driven the individual partners to be committed to delivering knowledge for the development of the new software application in Case D.

> *"The key thing is you need to be able to work with people for about two years. You need to be driven with the right goals and align with the business goals… I got something to*

give… you got something to give, and what you want to get in return, there's got to be something for everybody…" (Business Supervisor, P12)

"There was genuine need from the company for a solution that was based on academic research. On the other side, the university had the expertise and knowledge. However, they had a genuine need for real field data to help the research… This formed a basis for an efficient project…" (Academic Supervisor, P13)

4.1.4.3.7 Role of cognitive capital

- **Shared technical language developed clear communication**

In Case D, most of the company staff were basically from a university background. This shared educational background with the academics has contributed to more easily understanding the codes and programming language (Document 4C). This is also supported by the KTP Associate:

"Most of the business team are engineers and professors so, in particular, we speak the same language, and this is helpful in finding the solution for the problem we had…" (KTP Associate, P11)

"We understand the subject matter that we were working on. The activities involved were quite technical, and we have a similar education and went to university. I think this was helpful to understand the terms and language used during discussion…" (Business Supervisor, P12)

- **Being business-driven enhances motivation**

The analysis of Case D showed that success in the development and deployment of the software was also driven by the shared vision and shared ambition of the partners. While it was found that every individual has different objectives in engaging with the knowledge transfer, the academic partner is keen to commercialise their research and benefit the company.

> *"So I am self-motivated. My first priority is benefiting the company. I am very interested in helping the company to actually come out with a solution that has commercial value, so I make the maximum effort."* (KTP Associate, P11)

According to the Business Supervisor, the KTP Associate showed some interest in the business during the interview, and is not purely academically driven. This helped a lot with the knowledge transfer overall, as the Associate is motivated to work. This was evidenced from the following statement:

> *"I was involved in the interview process. We agreed that I participated in the interview to choose the right associate for my business. We have A (the Associate). He is a very robust guy, sociable; he has got business acumen, very business-driven, not purely academic… being successful comes from interest in what you are doing…"* (Business Supervisor, P12)

The Academic Supervisor also explained that the KTP Associate was very motivated to achieve the main objectives of the project, and applied research to the business world.

> *"He has a genuine interest in business. It is a motivation for him to work hard on his ideas and research and to actually make it successful…"* (Academic Supervisor, P13)

Consequently, in Case D, the KTP Associate being business-driven facilitated the transfer of knowledge to realise the innovation outcome. The shared vision of the business world has motivated the Associate to engage in the project and delivered the desired outcomes.

- **Open policy drives cooperation between members**

Case D analysis also revealed that the company has an open communication environment that enhanced cooperation between members in terms of learning and sharing technical information for the development of the SIM card solutions. This open communication policy helped the academic partner to feel more comfortable in expressing thoughts and exchanging knowledge. According to the KTP Associate:

"The company has a very good open communication policy… You can easily have any kind of communication with everyone... It is helpful; you can talk to someone openly and exchange knowledge…" (KTP Associate, P11)

4.3 Summary and key themes of the case study

This section provides a summary of the case study in relations to understanding the characteristics of the knowledge and knowledge transfer as well as the implication of knowledge transfer on innovations outcomes, (Table 4.9), the key role of social capital in facilitating knowledge transfer in fostering innovation (Table 4.10) identified from the interviews.

Case	Knowledge	Knowledge transfer	Implication of knowledge transfer on innovation outcome
A	Understanding that lead to action Expertise and technical knowledge	Knowledge transfer for developing Machine Learning, for incorporation within customers experience analytical product Expertise, skills, experience, technical knowledge, training manual for machine learning, algorithms Flexible phased approach: R&D for modelling the prototype, development of the model prototype, pilot testing (soft launch), training staff, and full commercial launch Two-way interaction between academic and the company Leading into action; solving a specific problem; collectively benefitting both parties	Delivering new output; new prototype; improve in understanding of the customer experience (internal process); process innovation New in-house customised tool; economic impact; do not dependent on third party New understanding/knowledge on machine learning Credibility from working with the university; differentiation from competitors and expansion of target market.
B	Experience and interaction Value information Basis for innovation	Developing new own-brand cyber security solutions and toolkits. Transfer of information security expertise, skills, experience and research Flexible phases approach: R&D for modelling security toolkits, developing IoT and other software solutions, developing a training manual and training appropriate staff	Delivering new own-brand security audit toolkits. Delivering new cyber-security solutions with proven capabilities; product innovation. Improving practice in terms of reducing cost and cutting time; process innovation. Increase in confidence

C	Basis for personal and professional development Source for business growth and innovation	Developing a new electronic sensor that traces respiration patterns; related to the latest technology in tracing healthy and pathological respiration patterns. Acquiring specific knowledge for particular objectives, such as new product development and for credibility. Involving a two-way process with mutual benefits, initiated from the strategic needs of both partners.	New prototype model to analyse breathing pattern; product innovation. Development of novel parameter. New research and development (R&D) in wearable devices. New process innovation; changes in certain activities within the company; process innovation Potential new market; medical and military market; market innovation
D	Interaction to inform action Technical and industry knowledge	New software solutions to improve mobile SIM card capability Transfer of ideas and related technical skills and experience with specific objectives; development of new software solution; improving understanding and solving problems. continuous two-way interaction between partner, Involved learnings Flexible phased approach: research and development on the software solution, deployment of the software, and provision of training to staff in the company in use of the software created by the Associate	New prototypes modelled. Commercialising software. New ICT patterns. Realisation of new ideas with newly commercialised products; product innovation

Table 4.9 Knowledge transfer and innovation outcomes for each of the case studies

Case	Role of Social capital in facilitating knowledge transfer to foster innovation
A	**Structural Capital:** **Regular communication lead to a compromise between stakeholder:** Structural (strength of ties, based on regular communication)→ Cognitive (mutual compromise) **Prior professional connection drives rapport:** Structural (ties build from past professional experience) → Structural (Bonding) → Cognitive (Shared understanding) **Online platform provides communication/link between individuals and support the transfer of knowledge:** Structural (connectivity through online platform)
	Relational Capital: **Trust based on capability and inter-dependencies allowed resource sharing:** Relational (trust-based capability) → Relational (interdependencies) **Professionally based relationship offers resource sharing and support:** Relational (relationship based on professional grounds)
	Cognitive Capital: **Clarity of the project develops shared understanding:** Cognitive (clarity) → Cognitive (shared understanding) → Structural (teamwork) **Shared innovative mind set drives cooperation:** Cognitive (shared mindset) → Structural (teamwork)
B	**Structural Capital:** **Regular communication promotes shared understanding:** Structural (tie strength, based on regular communication) → Cognitive (shared understanding) **Proximity developed mutual understanding and facilitates learning**: Structural (proximity between partners) → Cognitive (shared understanding)
	Relational Capital: **Trust based on capabilities promotes cooperation between partners:** Relational (trust based on capabilities) → Structural (teamwork) **Trust based on partners' performance drive engagement for knowledge transfer:** Relational (trust based on performance) → Structural (teamwork) **Friendship-based relationship contribute to a supportive team:** Relational (friendship) → Structural (teamwork) **Committed relationship facilitate transfer of knowledge:** Relational (commitment/duty/responsibility)

	Cognitive Capital: **Shared common institutional background and common technical knowledge enable effective communication:** Cognitive (common knowledge) → Cognitive (shared understanding) **Transparency informs a clear direction:** Cognitive (transparency) → Cognitive (shared interpretation)
C	**Structural Capital:** **Regular communication enables access to information and shared understanding** Structural (tie strength, based on regular communication) → Cognitive (shared understanding) → Structural (teamwork) **Online platform for fast access to information** Structural (connectivity through online platform) **Proximity creates familiarity and contributes to better interaction:** Structural (proximity) → Cognitive (familiarity) → Relational (friendship) **Diversity of network structure provides different technical resources:** Structural (diversity) → Structural (teamwork)
	Relational Capital: **Friendship-based relationship outside of work leads to open communication:** Relational (Friendship contribute to a supportive team) → Cognitive (shared understanding) **Trust facilitates the execution of work plans:** Relational (Trust based on capability) → Structural (teamwork) **A relationship based on compromise motivates individuals to engage with the partnership:** Relational (compromise) → Structural (teamwork)
	Cognitive Capital: **Shared interests outside the project help to foster a productive partnership:** Cognitive (shared interest outside project) → Structural (teamwork) **Shared goals lead to a relationship based on compromise:** Cognitive (shared main goals) → Relational (compromise) **Cultural fit with the business environment and aligned goals drive motivation:** Cognitive (cultural fit) → Structural (teamwork)
D	**Structural Capital:** **Previously established connections lead to understanding:** Structural (previous connection) → Cognitive (shared understanding)

	Regular communication contributes to problem solving: Structural (strength of ties based on regular communication) → Cognitive (shared understanding **Direct face-to-face interactions enable resource sharing:** Structural (connectivity through face-to-face communication)
	Relational Capital: **Trusted relationship contributes to resource sharing:** Relational (trust based on credibility; past performance) → Structural (teamwork) **Friendship-based relationship leads to teamwork:** Relational (friendship) → Structural (teamwork) **A reciprocally based relationship enables sharing of intentions and sustains mutual cooperation** Relational (reciprocal) → Structural (teamwork)
	Cognitive Capital: **Shared technical language develops clear communication:** Cognitive (shared language) → Structural (teamwork) **Being business-driven enhances motivation:** Cognitive (shared vision) → Structural (teamwork) **Open policy drives cooperation between members:** Cognitive (open policy) → Structural (teamwork)

Table 4.10 Role of social capital in knowledge transfer for each of the case studies

4.4 Cross case analysis

4.4.1 Characteristic of knowledge

- **Leading to perform action, expertise and technical knowledge, experience and interaction, value information, basis for business growth, innovation, personal and professional development**

The cross-case analysis identified several characteristics of knowledge described by the participants. Many participants view that knowledge can consist of explicit and tacit of knowledge: namely expertise, skill, technical knowledge, market knowledge, industry knowledge and experiences. Participants see that these knowledges allowed people to take action and assist in decision making. Some of the participants also highlighted that knowledge

allows for business growth and innovation. This was evidence in Case B and Case C, in which having recent and updated knowledge in technology field or related fields is importance as source for business growth and innovation. They also highlighted the importance of interactions as one of the ways to acquire knowledge for TBSFs. Consequently, this highlighted the relevant to partnership with universities as one of the medium to acquire knowledge. Alongside, innovation and business growth, knowledge is also deemed as basis for professional development and professional development. In Case C, the Associate sees that knowledge is not only assist business, but also help individuals to develop themselves. Table 4.11 summarised the nature of knowledge within the partnership in the studied case

Characteristics of knowledge within the partnership	A	B	C	D
• Leading to action	√			√
• Explicit and tacit	√			√
• Experience and interaction		√		√
• Value information		√		
• Basis for business growth and innovation		√	√	
• Basis for personal and professional development			√	

Table 4.11 Characteristic of knowledge within the partnerships in the cases studied

4.4.2 Characteristic of knowledge transfer

Cross-case analysis has revealed that knowledge transfer activities occurred within the partnerships were broken down into different phases or stages. The common stages described in most cases were: firstly R&D activities, including analysing data, interpreting data, designing and modelling the prototype; secondly, developing the prototypes, including testing and evaluating them; thirdly, implementation of the prototype or system, including training the appropriate staff within the company to use the new system or products created by the university; finally, commercialisation of the product or launch of the system within the company.

Although the transfer of the knowledge within the partnership has defined the work plan or stages, cross-case analysis has found that, in most cases, the activities have occurred within a flexible approach. This flexibility refers to the capability of the work plan to be amended and

revised in meeting company priorities and requirements. For instance, the work planned could be revised by considering alternative options based on the feedback from the university and company partners. This was shown within Case B and Case D, in which it was found that there were some minor modifications made in the work plan, following feedback and requests from the company partner. Meanwhile, in Case A, the Business Supervisor revealed that flexibility was necessary to support the transfer of knowledge in fostering the innovation outcome.

Cross-case analysis also confirmed that the other key characteristic of knowledge transfer was a two-way or bi-directional process. The transfer of expertise, technical expertise and experience requires continuous interactions between the university and the company partners. Both partners bringing their expertise and technical information was useful for development activities. In most cases, the development of the new solutions or products within the company required different types of knowledge from both partners, which were complementary with each other.

The majority of the participant in all four case studies also acknowledged that knowledge transfer was carried out with defined objectives. The cross-case analysis has identified that one of the purposes of knowledge transfer was to apply research in the real business context to solve specific business problems. It was also noted that all four case studies aimed to achieve innovation outcomes, mainly to develop new technical or software solutions and to extend or improve the companies' existing products with new features or functions to increase their competitive advantages. This shows that knowledge transfer is undertaken with particular defined purposes and is mainly focused on achieving innovation outcomes.

Interestingly, the cross-case analysis also noted that knowledge transfer was initiated due to the strategic needs of both partners. The company partner needed knowledge and new technical information that they did not have. Meanwhile, the university needed a real business context in which to apply and advance their research. This was clearly highlighted in Case C, in which most of the participants described how both partners had their own needs and interests in the project and how the strategic needs of both partners had brought them to work together.

Furthermore, the cross-case analysis found that one of the key characteristics of knowledge transfer was its collective benefits for all parties, although most cases highlighted that the main objective for knowledge transfer is its business value. However, the transfer of the knowledge

was also of benefit to both the university and the company. The cross-case analysis also found that there were some differences in viewing the benefits of the project, whereby the companies were looking more towards commercial value, while the university was looking at benefits for academics, such as research papers, conference papers, as well as training along the way in the process of achieving benefits for the company. However, in most cases, the partners agreed that the project collectively benefited them both. Table 4.11 summarises the nature of knowledge transfer within the partnerships in the cases studied.

Characteristics of the knowledge transfer within the partnership	A	B	C	D
• Flexible process based on company priorities	√	√		√
• A two-way interaction process with continuous feedback and input from both partners	√		√	√
• Focus on applied research to develop innovative solutions for specific business problems	√	√	√	√
• Benefits mainly focusing on commercial value	√	√	√	√
• Collective benefits from knowledge transfer for university and company partners	√		√	√
• Initiated due to strategic needs			√	

Table 4.11 Characteristics of knowledge transfer within the partnerships in the cases studied

4.4.3 Implication on innovation outcome

- **Delivering new prototype, new solutions, new internal processes, market innovation**

The cross-case analysis found that in all four cases studied knowledge transfer within the partnerships was considered to have had positive implications for innovation outcomes. These outcomes were commonly described by all participants as new and improvised products / services and internal company processes. The innovation outcomes were new to either the companies or their customers and created growth for their markets. A majority of the participants in all four cases recognised innovation as something novel, different or new or something that improved existing activities or products, having positive impacts, such as cost reduction or reduced working hours.

There were several types of innovation outcome emerging from knowledge transfer. For various participants, one of the common pieces of evidence for product innovation outcomes was reference to new prototypes, tools and patterns that were new or significantly improved features of existing products or services offered by the company. This included improvements in technical specifications of existing products or services through incorporating new software and AI applications into them.

Process innovation was also discovered as one of the implications of knowledge transfer as performed in these partnerships. A majority of the participants highlighted that process innovation resulted from the transfer of knowledge. One of the common features of process innovation described by these participants includes improvement in company activities and practices in terms of efficiency, reduced time and cost through the introduction of new technology / new prototypes incorporating new software. In Case A and Case B, the development of new technology has allowed the company to perform some activities independently, no longer having to depend on third-party services. Furthermore, on a few occasions, process innovation was also identified as one of the outcomes emerging from the development of new products within the knowledge transfer. For instance, in Case B and Case C, while the main objectives of the projects were to develop new technology and products for commercialisation purposes, the development of new products has also had a significant impact on the internal process and activities carried out within these companies.

On a few occasions, the knowledge transfer performed was also found to have achieved marketing innovation. In Case A, the credibility of being seen to be in partnership with the university helped the company to differentiate itself from their competitors and this enhanced its capability to expand their target market. Meanwhile, in Case C, the product development is currently working towards expanding the firm's reach into the medical and military markets. Table 4.12 summarises the innovation outcomes across the cases studied.

Innovation outcomes	A	B	C	D
Delivering new technology solutions that improved existing products or developed new products (Product innovation)		√	√	√
Delivering new prototypes / tools that improved internal processes (Process Innovation)	√			

Development of new technological solutions to improve existing products as well as internal processes (Product innovation & Process innovation)		√	√
New knowledge and research improve marketing strategy / differentiates from competitors potentially opening of new markets (Market innovation)	√		√

Table 4.12 Innovation outcomes across the cases studied

4.4.4 Challenges for knowledge transfer in fostering innovation

The cross-case analysis found that there were several challenges that impeded the transfer of knowledge in fostering innovation. In most cases, managing different expectations between partners has been found to be challenging to fostering innovation within the partnerships. The case studies highlighted the main differences in terms of expectations, mainly on timescales and project objectives. For example, in Case A and Case B, different perceptions on timescales were challenges, with TBSFs perhaps looking for instant or quick innovation development and solutions to their problems. Meanwhile, the academic partners stressed the need of more time for research before the development work. In Case C and Case D, the different expectations were based on different institutional objectives or agendas. For example, a different agenda could perhaps involve academics looking towards academic achievements in terms of research papers and publications, while TBSFs are more interested in commercialisation value.

Lack of resources was found to be challenging in these projects. Lack of capacity in terms of time, attention and information provided by members of company staff was found to be challenging to the fostering of innovation. Case A had limitations in resources due to people lacking interest in engaging in the project. Case C highlighted lack of capacity and resources resulting from heavy workloads and lack of equipment for the project.

Lack of shared understanding of projects occurred when the projects did not have clearly described roles and responsibilities for the academics. In Case B, the business partner's view was that the written project details were sometimes hard to understand. In addition, the challenges in obtaining proactive engagement by members of staff have been viewed as one of the barriers to knowledge transfer in fostering innovation. In Case C, it was found that, at the beginning of the project, it was difficult to encourage people from the company to engage and participate in the transfer of knowledge. This led to a lack of resources and shared input in the project.

Finally, the case studies revealed that different institutional backgrounds and objectives have led to different ways of working between the partners. In Case D, it was found that the academics have paid less attention to the cost of the project, while it was important for this to have been taken care of from the business point of view. Table 4.13 summarises the challenges for knowledge transfer in fostering innovation in the four cases.

Challenges for knowledge transfer	A	B	C	D
Managing different expectations, timescales and objectives	√	√	√	√
Limited resources and capacity	√		√	
Lack of understanding of the project		√		
Lack of proactive engagement (lack of openness)			√	
Different institutional backgrounds				√

Table 4.13 Challenges for knowledge transfer in fostering innovation

4.4.5 Role of Social Capital within Knowledge Transfer in Fostering Innovation Outcomes

4.4.5.1 Role of structural capital

The cross-case analysis revealed that there were five elements of structural capital that had an influence on the knowledge transfer process in fostering innovation outcomes. Table 4.14 provides a summary of the elements of structural capital. This has been taken from the cross-case study and is followed by the interpretations of the themes that have been found.

Structural Capital	A	B	C	D
Regular communication through meetings and daily face-to-face interaction	√	√	√	√
Online platforms provide a link for communication	√		√	
Prior professional connection	√			√
Proximity between partners		√	√	
Diversity of skills			√	

Table 4.14 Summary of structural capital found across the cases studied

- **Regular communication through meetings and daily face-to-face interaction**

In all four cases, it has been described how regular communication was significant in supporting knowledge transfer to achieve innovative solutions within the companies. In Case A, regular communication through face-to-face meetings enabled the different expectations of both parties to be managed. Similarly, in Case B, regular communication was helpful to discussing issues and problems they faced during for the development of the security software. By having regular communication both parties acquired new understanding and new ideas to enhance their current knowledge. Collective understanding provided the capability to reduce barriers to knowledge transfer, such as managing and balancing expectations between partners. Meanwhile, In Case C and Case D, regular communication supported the generation of new ideas and additional input for the development of the new software solutions within these projects. The additional inputs generated new ideas and new information to refine and revise academic research and to aid in the development of technical solutions for application in real-world practice.

Participants expressed that there were two channels through which they could interact with their partners, formal meetings and daily face-to-face interaction. In all four cases, it was stressed that regular communication mostly developed through formal meetings, which were conducted at least once a week (academic team and company team) and once every four months (Local Management Committee). In some cases, everyday face-to-face interactions were also described as important for enabling resource sharing. In Case D, the face-to-face communication enabled the project to gain more resources and input for development of the software. Overall, it was concluded that regular communication is important to be seen as a vehicle for gaining and accessing information and managing expectations between partners.

- **Online platforms providing communication links and reducing distance between partners**

The cross-case analysis revealed that online platforms were found to be important in supporting subsequent interactions between partners. This helped to reinforce some information and support additional information needed in the projects. In addition to that, online communication was found to be useful when there was a geographical distance between individuals. In Case A, an online platform was used when the participants were in different geographical locations. This was helpful for the academic team to communicate and share information, as the KTP Associate was based in the company partner while the Academic Supervisor was based in the university. The online platform was useful for providing fast communication even though there was a geographical distance between individuals. This allowed the KTP Associate to communicate with the Academic Supervisor in sharing and accessing information related to the project. Meanwhile, in Case C, an online platform was useful for subsequent interactions and quick access to additional input in developing the innovative solution within the company partner. Further, in Case C, the online platform was helpful in managing situations in which the members of staff were occupied with other tasks. When a face-to-face approach was impossible, online communication was found to be useful in supporting interaction between individuals within the project.

- **Prior professional connection**

The cross-case analysis showed that prior professional connections facilitated knowledge transfer in developing the innovative solutions within the companies by reducing the difficulty in information flow between partners. In Case A, a prior connection based on experience of working on other projects helped the partners to get along and influenced the information flow. Similarly, in Case D, a prior professional connection drove shared understanding between the partners. This helps to increase the quality of communication between partners, enhancing the information flows and allowing for more input, and exchange of ideas and opinions to help make better decisions.

- **Proximity between partners**

The cross-case analysis of structural capital also highlighted that proximity between partners drives consistency in knowledge transfer by providing a shared understanding between the

partners. In Case B, having the KTP Associate within the company was helpful as the company could monitor the progression of activities allowing the project to be delivered in time. Apart from that, in Case B, proximity was found to drive direct interaction between all the stakeholders, helping them to create understanding of the project, particularly in terms of the tasks. In addition, proximity in Case B was found to support bi-directional information flow between the partners that helped to facilitate learning and deliver technical expertise and feedback in the development of the software solution within the company. In Case C, proximity was found to have created familiarity, helped to contribute to better communication, and supported bi-directional knowledge flow by encouraging fast responses and feedback. Apart from that, proximity in Case C helped to access new ideas from the partners to help solve problems.

- **Diversity of skill drives additional resources**

The analysis also revealed that a network based on different expertise and professional backgrounds enhanced the efficiency of the process. While this was only found in Case C, the relevance of having a combination of skills is that it was found to have facilitated knowledge transfer. In Case C, the combination and exchange of different expertise between the partners helped provide additional technical and creative resources for the project. Table 4.15 summarises the role of structural capital in facilitating knowledge transfer to foster innovation within the partnerships in the cases studied.

Role of structural capital in knowledge transfer	A	B	C	D
Gaining access to information and additional resources	√	√	√	√
Creating rapport in the relationship - sharing intentions / willingness to collaborate	√		√	√
Consistency of the knowledge transfer process - mutual understanding	√	√	√	√
Supporting bi-directional knowledge flows	√	√	√	√
Balancing organisational differences	√	√	√	√

Table 4.15 Role of structural capital across the cases studied

4.4.5.2 Role of relational capital

The cross-case analysis revealed that there are seven elements of relational capital that have had an influence on the knowledge transfer process in fostering innovation outcomes. Table 4.16 summarises the elements of relational capital that have been identified in the cross-case study.

Relational capital	A	B	C	D
Trust based on capability		√	√	
Trust based on proven performance	√	√		√
Professional relationship	√			
Friendship-based relationship		√	√	√
Committed		√		
Compromise			√	
Reciprocal relationship leading to shared intentions and development of cooperation				√

Table 4.16 Summary of relational capital found in cross cases studied

- **Two different views on trust**

All four companies certainly responded with respect to trust as an influence on the development of innovative solutions within these partnerships. Trust between the partners for most of the companies appeared to enable resource sharing and relationships of interdependency between the partners to lead to innovative solutions. In reviewing trust, it was found that there were two different views on it within the analysis of the case studies: 1) trust based on capability; 2) trust based on proven performance. In Case B and Case C, trust was identified as developing from the identification of individual capability, expertise, qualifications and know-how. In Case B, trust based on individual experience, skills and expertise has influenced the access to knowledge from the university in the development of innovation within the company. Meanwhile, in Case C, trust based on capability was found to be helpful in enabling the use of additional equipment and tools needed for product development. This was helpful for the Research Associate to conduct activities in the process of developing the security solution within the company. In addition, trust was also found to be a basis for the willingness of the company partners to cooperate.

The second view of trust, which was based on proven performance, appeared to facilitate knowledge transfer in Cases A, B and C. In Case A, trust based on proven performance and capability enabled a relationship of interdependency and access to additional input for the project. Members of staff in the company partner were more dependent on the Research Associate and were willing to share technical resources with the Research Associate. Similarly, in Case D, trust enabled confidential data needed for the project to be obtained. Meanwhile, in Case B, proven past performance led the company to partner with the university for knowledge transfer. The Business Supervisor in Case B felt confident in relying on the university for innovation. The Research Associate's abilities to consistently perform and proven past performance delivered the basis for trust. In most cases, proven performance during past working experience has been identified as developing relationships of trust between the partners.

- **Professional relationship**

Cross-case analysis has identified the importance of a professional relationship in enhancing the transfer of knowledge to achieve development of innovative solutions within companies. There were two main categories of relationship described by the participants across the four cases studied: a professionally based relationship and a friendship-based relationship. A professionally based relationship was viewed as one in which the partners are limited to professional activities. Case A has highlighted the importance of professionally based relationships. The university and the company partners in Case A have built a relationship that seeks professional guidance and resources to benefit both parties. While both partners described their relationship as good, the analysis revealed that it was limited only to professional activities. However, the relationship in Case A was found to have given direct practical support to the development of the solutions by allowing guidance and feedback from the partners.

- **Friendship-based relationship**

The majority of participants support the view that friendship-based relationships contributed to facilitating knowledge transfer. Friendship-based relationships were described mainly as allowing more interactions between the partners than professional activities. Such partners had more activities outside of work, such as going out for sport or casual drinks. Interaction also involved sharing personal matters and personal problems. In Case B, the friendship-based

relationship was found to have helped with the improvement of the product development and sustained relationships with staff in the company partner. Input and feedback from the company partner was found to be helpful in designing and developing the software solution. In Case B, the friendship-based relationship was also found to have created a supportive environment, in which the partners were open to sharing tips and ideas on the product development. Similarly, in Case C, the friendship-based relationship was found to have enabled open communication, brainstorming to generate ideas, and the creation of a supportive team. Likewise, in Case D, the relationship of trust was found to have facilitated confidential data input for the development of the software solutions.

- **Committed**

Interestingly, the cross-case analysis highlighted another contributing element of relational capital, which was a committed relationship. A committed relationship was only found in Case B; however, from the interview, this appeared to have facilitated knowledge transfer. The sense of responsibility to perform the KTP tasks and be devoted to the project drove the KTP Associate to stay on track and dedicate his efforts to accessing more resources in developing the security solution for the company. This, therefore, can be interpreted as a committed relationship that could influence and determine the effort spent on the transfer of knowledge.

- **Compromise**

A relationship based on compromise has appeared to balance differences in institutional objectives between the university and the company. In Case C, this type of relationship developed to confirm the support and training that the KTP Associate would receive throughout the project. The compromise-based relationship between the academics and the university led to the sharing of intentions and bonded the partners together by balancing the institutional objectives. This relationship was built through much negotiation by both partners to keep themselves satisfied with the whole process.

- **Reciprocal relationship forming shared intentions and developing cooperation**

Another element of relational capital that appeared to have an influence was the reciprocal relationship. Participants in Case D viewed reciprocity as the transfer of knowledge that is perceived to be fair by both parties. Reciprocity was also viewed as the mutual give-and-take of knowledge transfer between partners. In Case D, the relationship based on reciprocity was

found to have enabled the sharing of intentions and to have sustained cooperation between the partners.

Table 4.17 summarises the role of relational capital in facilitating knowledge transfer to foster innovation within the partnerships in the cases studied.

Role of Relational Capital	A	B	C	D
Interdependence on the process	√	√		
Access to resources and input for the project	√	√	√	√
Creating a supportive environment between partners (quick response)		√	√	
Being responsible with tasks		√		
Enhanced efficiency of the process	√	√	√	√
Sustaining of the relationship between partners			√	√
Balancing organisational expectations			√	

Table 4.17 Role of relational capital across the cases studied

4.4.5.3 Role of cognitive capital

The cross-case analysis revealed that there were six elements of cognitive capital that had an influence on the knowledge transfer process in fostering the innovation outcomes. Table 4.18 provides a summary of the elements of cognitive capital, which have been identified from the cross-case study. Following this table each theme is then analysed and interpretations are provided.

Cognitive Capital	A	B	C	D
Clarity and shared understanding	√	√		
Shared innovation mind set	√			√
Common knowledge and institutional background		√		√
Shared interests outside the project			√	
Shared goals			√	
Cultural fit / business-driven			√	√
Open communication policy				√

Table 4.18 Summary of cognitive capital across the cases studied

- **Clarity and shared understanding**

The cross-case analysis revealed that clarity and transparency of the project drives the shared understanding between partners and leads to cooperation and bonding. In both Case A and Case B, there was emphasis on the clarity of the activities, responsibility and progression of the project which led to a more focused project and enhanced communication between the partners. The transparency of the project also helped in balancing the high expectations of the company partners and made sure that everyone was going in the same direction towards achieving the goal. In Case A, keeping the partners informed using project management tools, timelines and presentation tools gave the partners clarity about the process undertaken in developing the solution within the project. Meanwhile, in Case B, proper documentation and plans, such as an action plan, helped to inform the partners about the project.

- **Shared innovation mind set**

A shared innovation mind set was found in Case A. The interviews with the participants in Case A suggested that the company partners had taken several initiatives to drive members of staff to be creative and innovative. The company had a mind set or belief that knowledge is an important source for innovation and therefore created a willingness to cooperate with the university. The innovation policy in Case A that supported learning and improvement, prepared for challenges, and supported creativity and innovation, also drove the KTP Associate to be enthusiastic in pursuing the software development.

- **Shared institutional background and technical knowledge**

Shared institutional background was also identified as influencing knowledge transfer in Case B and Case D. In Case B, shared institutional background drove the shared understanding between the partners and enhanced the efficiency of knowledge transfer. The company partner was identified as understanding the academic point of view better as he had an academic background. This helped to influence the efficiency of the knowledge transfer flow. In addition, in Case B, shared technical knowledge led to more input, sharing of ideas and willingness to cooperate within the partnership. Similarly, in Case D, the common educational background drove similar interpretations between the partners and enhanced communication quality. This was helpful particularly in decision making and discussion in providing the solution for the problems they had.

- **Shared interests outside the project**

The analysis revealed that shared interests outside the project facilitated the development of software by building more productive relationships. In Case C, shared interests outside the project supported learning by enabling access to additional ideas and feedback upon the development of the software. This was deemed as useful by the KTP Associate in reducing any possible risk related with the development of the software prototype. In addition, Case C also highlighted that shared interests outside the project drove the fostering of a productive relationship between the partners.

- **Shared goal**

In Case C, shared goals were found to have influenced the overall development of the software and the prototype. Both partners shared goals in terms of which priorities would ensure that the knowledge transfer would manage to achieve innovation. This led to a compromise-based relationship between the partners and helped develop the willingness of both parties to cooperate.

- **Cultural fit / business-driven**

The cross-case analysis revealed that cultural fit / being business-driven encouraged and drove the university partner to engage with the knowledge transfer. Participants in Case C highlighted that cultural fit is one of the important criteria that helping company objectives to thrive. Cultural fit was referred to by the participants in Case C as having a passion for business and

having a goal that is aligned with the business. In Case C, cultural fit was viewed as important from both the business and academic points of view in facilitating the development of the product in the KTP. Similarly, in Case D, the business-driven self-interest of the KTP Associate was found to have improved the efficiency of knowledge transfer through full engagement with the project.

- **Open communication policy**

The cross-case analysis also found that an open communication policy created an open environment in which the partners felt more comfortable in expressing their thoughts and exchanging knowledge. This open policy was found in Case D, in which it improved the learning and sharing activities for the development of the innovation solution within the company.

Table 4.19 summarises the role of cognitive capital in facilitating knowledge transfer to foster innovation within the partnerships examined in the cross-case analysis.

Role of cognitive capital	A	B	C	D
Clear and focused project	√	√		
Enhanced communication quality between partners	√	√		√
Access to ideas and input		√	√	√
Balancing of high expectations from company partners	√	√		
Valuing the importance of knowledge			√	
Increased willingness to cooperate		√	√	√
Productive relationship		√	√	

Table 4.19 Role of cognitive capital across the cases studied

4.5 Conclusion

This chapter presents the findings of the within-case of four partnership between university and TBSFs. For each case, key characteristics of knowledge and knowledge transfer were identified. The implication of knowledge transfer and social capital for fostering innovation was also analysed and presented. Additionally, the chapter presents the cross-case analysis,

which underlined the differences and similarities in patterns identified across the four cases studies. The following chapter discuss the research finding from the expert interview.

Chapter 5. Research Findings - Expert interview

5.0 Introduction

Previous sections have presented the findings of the individual case studies and the cross-case analysis of the four TBSFs in partnership with the university in knowledge transfer projects. This section presents the findings from the expert interviews. These expert interviews were conducted with the aim of maximising data triangulation and obtaining a diversity of perspectives from people that have practical experience and involvement in KTP projects. In addition, the expert interviews were conducted with reference to informing recommendations regarding the influence of social capital in terms of knowledge transfer in fostering innovation, and the benefits for partnerships between universities and TBSFs'. In total, 27 experts were interviewed, with each interview lasting approximately 45-60 minutes. Interviews were undertaken in person or over the phone depending on availability and location. The interviews are presented in two main sections: firstly, an overview of the experts' backgrounds is presented, including details of each participant and their relevant experience in KTP; secondly, the analysis of the interview data is presented, highlighting the main themes identified across the interviews.

5.1 Overview of the Participants in Expert Interview

Based on their practical experience and involvement with KTP projects, 27 experts were chosen. An overview of the experts' background is provided in Table 5.1.

Expert	Role	Expertise/experience
Expert 1	KTP Associate	PhD in Computer Vision- Software Developer Experience: 2 years KTP (completed 2017) KTP Project: Software Developer
Expert 2	KTP Associate	PhD in Computer Science Experienced: 2 years KTP (completed 2018) KTP Project: Software Developer
Expert 3	KTP Associate	PhD in Engineering Science Experience: 2 years KTP (completed 2019) KTP Project: Software Developer
Expert 4	KTP Associate	MSc in Computer Science Experience: 2 years KTP (completed 2018) KTP Project: Data Analyst

Expert 5	KTP Associate	MSc in Computer Network Security Experience: 2 years KTP (completed 2018) KTP Project: Developing software and hardware
Expert 6	KTP Associate	MSc Digital Marketing Experience: 2 years KTP (completed 2016) KTP Project: Website developer/ E-commerce platform
Expert 7	KTP Associate	PhD in Electrical Engineering Experience: 2 years KTP (completed 2017) KTP Project: Software developer
Expert 8	KTP Associate	MSc In Computer Science Experience: 2 years KTP (completed 2016) KTP Project: Security software development
Expert 9	KTP Associate	PhD in Computing and Information System Experience: more than 2 years KTP (completed 2017) KTP project: System developer
Expert 10	KTP Associate	MSc in Computer Science Experience: 2 years KTP (completed 2017) KTP Project: Software developer
Expert 11	KTP Associate	PhD in Computer Science Experience: 2 years KTP (completed 2018) KTP Project: Software and hardware development
Expert 12	KTP Associate	PhD in Software Engineering Experience: more than 4 years KTP KTP Project: Software and product development
Expert 13	KTP Associate	MSc in Computer Science Experience: 2 years KTP (completed 2017) KTP Project: System developer
Expert 14	KTP Associate	MSc in Software Engineering Experience: 2 years in KTP KTP Project: Data analyst and developing software
Expert 15	KTP Associate	MSc Software Engineering Experience: 2 years in KTP KTP Project: Software development and machine learning
Expert 16	KTP Associate	MSc in Digital Marketing Experience: 2 years in KTP KTP project: Developing digital marketing platform
Expert 17	Academic Supervisor	University Senior Lecturer in Information System PhD in Computer Science Experience: more than 5 years supervising KTP
Expert 18	Academic Supervisor	University Reader in Cyber Security PhD in Secure Communication System Experience: more than 5 years supervising KTP

Expert 19	Academic Supervisor	University Senior Lecturer in Operating, Logistic and Project Management Experience: more than 3 years supervising KTP
Expert 20	Academic Supervisor	University Lecturer in Digital Business Experience: more than 3 years supervising KTP
Expert 21	Academic Supervisor	University Senior Lecturer at Department of Engineering PhD in Application Wireless Sensor Network (WSN) Experience: more than 5 years supervising KTP
Expert 22	Academic Supervisor	University Reader in Computer Science PhD in Computer Science Experience: more than 5 years supervising KTP
Expert 23	Business Supervisor	Business Director of IT and software solution company Experience: 2 years KTP
Expert 24	Business Supervisor	Business Director of assistive technology company Experience: 2 years KTP
Expert 25	Business Supervisor	Company Director of Computer & Network Security companies Experience: 3 years KTP (completed 2017)
Expert 26	Business Supervisor	Company Director of Telecommunication Experience: 2 years KTP (completed in 2018)
Expert 27	Business Supervisor	Business Director of Software solution company Experience: 2 years in KTP

Table 5.1 List of experts interviewed

5.2 Analysis of the Expert Interview

Having produced the background information for the participants in the expert interview. The following provides an analysis of the expert interview. Each theme is analysed based on the sub-theme, which was revealed from the interview. Interpretation and quotes of the participants are provided for each of the theme analysed. The section is ordered by focusing first on the characteristic of knowledge and knowledge transfer. And then the implication of knowledge transfer and social capital on fostering innovation are analysed and interpreted.

5.2.1 Characteristic of knowledge

Characteristic of knowledge
Leading to perform action
Form of understanding
Technical knowledge & expertise
Experience and skills
Can be source externally
Basis for business growth and innovation
Knowledge is not absolute

Table 5.2 Characteristics of knowledge ss viewed by the experts

Most of the expert view knowledge as an understanding that can lead to action. Participants mentioned that knowledge allowed for decision making, performing activities, solving problem and shape their understanding and interpretation of a situation. In addition, participants also mentioned that having the right knowledge will aid business to growth and eventually innovate.

Several types of knowledge have been highlighted as crucial within the partnership between universities and TBSFs. Most of the expert highlighted expertise, technical knowledge, skills and experience as important in TBSFs for fostering innovation. In term of technical knowledge, knowledge related to software development, such as data, language programming, digital knowledge and others related knowledge in technology and information system, is important for them to do work around. Beside technical knowledge, it is also crucial to have awareness on market and industrial knowledge. Recognising the market needs, customers feedbacks, competitors, and trends help to informed company to make the right decision with their products and services forward. Along with that, there is also evidence that expertise based on experience and skills are also viewed as important to the company. Experience and skills were deemed to strengthen and support the interpretation as well as the understanding of the technical knowledge. The analysis highlighted the important of knowledge as source for business innovation and growth. Many of the participant agree, knowledge is important for business to improve and develop.

Beside highlighting the important of knowledge, the experts also stressed that knowledge can be sourced externally and internally. Interacting with universities, clients and customers can supply the company with latest information, research and getting diverse knowledge that limited internally. This underlines that knowledge can be outsource externally to complement internal knowledge and underlines the significant to collaborate with university in fostering innovation. Few experts also highlighted that knowledge is endless, or not absolute. It is therefore, underlined the importance learning and develop.

Quotes of the participants
"*knowledge is an understanding that can lead to perform an activity or solve a problem. In the partnership, I think knowledge such as technical knowledge, which is based on academic education is important, however, it needs to be supported with some commercial knowledge, skills such as people skills, leadership, engage with people, market trends, to get a more understanding to solve a problem and to develop a better or even a new product or services..."***(Expert 7, KTP Associate)**
"having knowledge and expertise is important, knowledge let individuals understand the technical stuff... and the educational background help them to perform their tasks and work. However, it is also important to have experience as experience can support the application of knowledge..." **(Expert 12, KTP Associate)**
"knowledge is some form of our understanding...or a component of how the world works and how people within it behave it, close to link with understanding and application. Knowledge in the business sense, as expertise relevant to business...and with the input of academic research, can develop knowledge...knowledge is not absolute is continuing to develop..." **(Expert 18, Academic Supervisor)**
"the academic, we have various knowledge and ways on how to do the certain task, in academic we have different approaches, we have technical knowledge supported with education and research, which may not know by the commercial world...I think this knowledge is useful for business.."**(Expert 19, Academic Supervisor)**
"in the technology sector, knowledge is always changing, and we need to be always updated with what's going on around us...up-to-date knowledge help to ensure that the company familiar with the environments and help us to serve customers with better services and products..." **(Expert 23, Business Supervisor)**
"we have worked with universities on several projects, we go to the conference, meet peoples... these are some of the ways for us to keep informed and updated...so if there are conferences, we will go and get the newest information, and helps us to get some ideas..." **(Expert 26, Business Supervisor)**
"Knowledge is explicit and tacit. In term of explicit, with the university we are getting direction in regards with business strategy, we get input in regards how we market ourselves, in regards how we use various social media skills, we get input on organisation setup, how various option available, in term of tacit...we are getting their skills and experience to improve us better, knowledge is endless...hence, we always need to learning to improve..." **(Expert 27, Business Supervisor)**

Table 5.3 Quotes from the expert interview on knowledge

5.2.2 Characteristic of knowledge transfer

Characteristics of knowledge transfer
Two-way process, combining of learning sharing processes
Initiated with a specific objective: i) solutions for companies' existing problems; ii) new product development that is innovative or due to working independently, leader / influencer
Embedding specific knowledge within firms' products
Collectively benefits both partners
Flexible for modification based upon on the agreement of both partners
Formal knowledge transfer process with structured work plan

Table 5.4 Characteristics of knowledge transfer as viewed by the experts

Analysis of the expert interviews shows several characteristics of knowledge transfer. Some of the participants described knowledge transfer as a two-way transfer between the university and the company from working together, and the integration and application of that knowledge that has implications for innovation within the company partners. The two-way transfer was described as an interactive process to which both partners bring their different expertise, engaging in achieving project objectives. Most of the participants described how the university mainly brings their expertise in terms of new research and new knowledge in the area, while the company brings relevant expertise from the business context.

Cooperation in learning and the sharing of the two different types of knowledge lead to the development of solutions that bring great benefits to both partners. The majority of the experts described the two-way process involved as the sharing, providing and giving of specific knowledge that is useful to developing solutions to solve specific problems within the company partners. Specific knowledge was referred to as knowledge that would be useful in achieving the defined objectives set out for the project. Participants described specific knowledge, such as the transfer of new software knowledge, technical skills, exclusive academic knowledge, and engineering and computer science knowledge from the academics.

The analysis of the interviews also informs that the knowledge transfer in KTP projects is particularly aimed at achieving a defined objective. The main defined objective of knowledge transfer was to develop solutions prior to addressing the needs and demands of the company

partners. The analysis of the expert interviews found that there are two main needs of the company partners in knowledge transfer. Firstly, the majority of the participants emphasised that one of the main objectives of knowledge transfer is to solve the company's problem to increase efficiency, such as saving costs or upscaling the company partner's business. Secondly, participants mentioned that company partners need to come up with new innovative solutions, mainly by developing new or improving existing products or processes that will have a positive impact for the company partners, such as by making them experts and leaders within the industry. The experts emphasised that the purpose of knowledge transfer is to transform the company into a leader or influencer in terms of technology. This was also emphasised as being able to work independently for the development of new products in future. The analysis of the expert interviews further suggested that development not only benefits the companies but also benefits the academic partners. The academic partners gain benefits from the partnership in terms of learning business skills, management skills and other practical skills.

Further to the characteristics highlighted, participants also described knowledge transfer as a structured process that involves several phases. The experts interviewed explained that the transfer of knowledge in a KTP is broken down into different stages. Some of the processes highlighted by the experts involved research, analysis, reporting of key insights, development and implementing new technical solutions in companies. While the process was described as structured or formal, it was also noted that some of the participants explained that projects are still flexible and moveable, provided both of the partners agree to changes and the new goals are not beyond the project scope or the capability and skills of the Associate, and can be met by the availability of resources.

Table 5.5 offers a summary of some of the quotes from the interviews to support the characteristics of knowledge transfer mentioned.

Evidence – quotes from the participants	Characteristics
"Giving and passing on new software knowledge, new language, new design, transferring, like, practical knowledge, and how to use that knowledge. To get what the company want or need to do... Addressing their particular problem and need… I have passed that knowledge on and I learned as well... I got a few trainings and definitely learned some business skill." **(Expert 2, KTP Associate)**	*Two-way process* *Embedding knowledge* *Defined objective* *Collective benefit*

"Sharing specific and technical information that is useful for the company and also helps you to make better decisions. I got to know the industry side and I certainly understood and learned things, giving confidence…" **(Expert 9, KTP Associate)**	*Two-way process* *Collective benefit*
"Using our academic experience to solve their problem: that definitely aimed to bring a new solution, proposed a new solution to the company partner that will bring success for their business… The process is quite structured, which involves several phases. For example, my project started with research, mainly on data analysis, then followed by reporting the key insights from what we found in the project. Then we developed solutions and implemented the knowledge." **(Expert 13, KTP Associate)**	*Formal structure* *Embedding knowledge* *Defined objective* *Structured process*
"Provide the new solution which benefits the industry as well as the university and the associate itself. The project included a formal knowledge transfer plan. Several stages in the plan were involved; I had input on statistical knowledge which I can put into the company… and inform the team of the particular role they are playing... and produce the report." **(Expert 14, KTP Associate)**	*Defined objective* *Collective benefit* *Formal structure*
"I would say there is cooperation in learning between the university and the company. The university supplied expertise in terms of new research and new knowledge. On the other hand, the company provided expertise relevant to the business problem. The cooperation led to solutions that don't exist elsewhere, but can be developed through working on the project." **(Expert 17, Academic Supervisor)**	*Two-way process* *Defined objective*
"Transferring and sharing academic expertise, core skills of R&D, soft skills and advising how to manage the company problem… The knowledge transfer also received skills and a support mechanism from the research manager to support the project." **(Expert 19, Academic Supervisor)**	*Two-way process* *Defined objective*
"It is usually a two-year project. The project is broken down into different stages, with defined goals. However, the goal posts are moveable, provided both the host and Associate agree to formal changes and the goals are not outside the scope of the KTP and not beyond the skills of the Associate. It involves continuous relationships between all parties, creating a hybrid relationship, embedding academic knowledge in the company partner. Both partners get benefit from the project." **(Expert 20, Academic Supervisor)**	*Flexible* *Two-way process* *Defined objective* *Collective benefit* *Embedding knowledge*
"Giving out and receiving information and putting new solutions to the benefit of one another… Imparting that knowledge and upscaling people and the company…" **(Expert 23, Business Supervisor)**	*Two-way process* *Embedding knowledge* *Collective benefit*
"I see it as sharing new knowledge and embedding that particular knowledge in the company to solve the company's problem and to have positive implications for company growth." **(Expert 24 Business Advisor)**	*Embedding knowledge* *Two-way process* *Defined objective*
"Sharing of the knowledge that both partners had, to set an objective: developing new security software. It is a structured process	*Two-way process* *Defined objective*

but quite flexible to some modification… We got quite a lot of support and it was quite good." **(Expert 25, Business Advisor)**	*Collective benefit* *Flexible structure*
"The project is all about changing the company from being a follower with regards to delivery of technology to customers to being more like a leader or influencer. We want some refreshment and to move from traditional to up-to-date technology specifically." **(Expert 26, Business Advisor)**	*Defined objective*
"Connection between the research and development activities of the university and the activities in the business, and how the implementation of the activities might impact the company by giving the company a new perspective, new product development, a new innovative solution." **(Expert 27, Business Advisor)**	*Two-way process* *Structured process* *Defined objective* *Embedding*

Table 5.5 Quotes from the expert interview on knowledge transfer

5.2.3 Implications on Innovation Outcomes

Knowledge transfer was found to have some implications for the innovation outcomes of the partner TBSFs. Table 5.4 summarises the implications of knowledge transfer on the innovation outcomes within the partnerships.

Implications for innovation outcomes
New knowledge and new ideas led to new product development
New solutions introduced new ways of working
The Advanced technological knowledge led to new ways of marketing the companies' products
New understanding led to the development of new R&D units
New knowledge and changes to technology led to new reputations within the companies

Table 5.6 Summary of the innovation outcomes from the expert interviews

- **New knowledge and new ideas led to new product development**

The analysis of the expert interviews identified several types of innovation resulting from the transfer of knowledge within the partnerships. One of the common types of output mentioned by the experts was that new knowledge, new ideas and new advanced technology were adopted leading to new product development within the companies. Participants viewed these as new resources within the companies, mostly contributing to product innovation within the companies.

Knowledge transfer through partnership with the university partners supplied new technical and advanced knowledge, which was particularly fundamental for TBSFs whose technical skills were limited. In combination with the company partners' experience and competence, this led to the new resources developing new products within these companies. The analysis of the interviews revealed that there were two types of product innovation identified from the knowledge transfer. Firstly, there are new and novel products, and secondly, there is improvement in existing products. New product development, such as new bespoke software, new prototypes, and improvement in a company's existing products were mentioned by the experts as contributing to a significant impact within companies. The development of new innovative products was found to have improved companies' financial outcomes, such as by reducing cost or increasing sales, amongst the employees. In one instance, one of the experts described a new product introduced by the company, with new technology specifications embedded within it, was received very well in the market. Furthermore, the implementation of the new bespoke software by the company, has enabled it to offer a better service to their clients, having introduced better unique selling points, as their competitors did not have similar software. Thus, the company partner feels that they have become more competitive and a leader in the industry.

Quotes from the participants
"We developed new software tools that improved the content of their product. We developed some new emotional features for their existing product..." **(Expert 2, KTP Associate)**
"We implemented the newest technology in the company... We created a new programme from which we managed to come out with prototypes... and commercialised it for their customers." **(Expert 7, KTP Associate)**
"We managed to translate our new research into a product... We developed some new products and modifications to existing products..." **(Expert 11, KTP Associate)**
"We managed to develop new bespoke software for the company... The new software offers a better service to their clients, and helps provide a specific solution for their customers' needs..." **(Expert 17, KTP Associate)**
"We have achieved innovation; we look after customers' IT... What has happened is the industry has been moved to cloud technology and it has happened a lot faster than anyone thought it would. So, the company had transformed... We don't sell servers to clients anymore… Everything is in the cloud system." **(Expert 23, Business Supervisor)**

Table 5.7 Quotes from the expert interview

- **New solutions introduced new ways of working**

The new technical resources from partnership relationships with the university also contributed to process innovation within the companies. Process innovation was particularly identified when the companies changed their traditional processes for new working processes introduced by the academics. Some of the innovation process highlighted by the participants was the change from manual processes to automated processes. Some of the participants highlighted that these changes have helped companies to work in a better way in terms of reducing working hours, reducing costs and increasing job satisfaction amongst employees. The transfer of knowledge has contributed to new creative solutions and new techniques for enhancing working practices.

Similarly, to the cross-case study, some of the experts also emphasised that some of the new product development by the companies has also contributed to process innovation. For instance, the implementation of new bespoke software in companies has integrated various tools from different suppliers into just one software package. This process was described as more efficient and faster.

Quotes from the participants
"They have adopted new solutions and new knowledge. So, what we do is, we make software in labs. We got a lot of instruments. They keep testing a lot of samples. One problem in labs house... you get instruments from different manufacturers… Using one language software is helpful. We create new bespoke software that makes it easier and quicker and a lot better." **(Expert 9, KTP Associate)**
"We changed the criteria from the traditional process to a new solution that we provided, a new computer-based solution. We sort of changed their manual process to automation. It saves more money." **(Expert 13, KTP Associate)**
"We developed a new automated system within the company, for their management product and stand-alone product..." **(Expert 15, KTP Associate)**
"Most were with technology-based SMEs, which did not have many written processes before. So, we improved the documentation, their understanding of the wider context, and their products and services offering." **(Expert 20, Academic Supervisor)**
"The transfer of knowledge contributes to the development of a new product and a massive change from the firm's usual work cycle in adapting to new products..." **(Expert, 27, Business Supervisor)**

Table 5.8 Quotes from the expert interview

- **Advanced technology knowledge led to new ways of marketing products**

The analysis of the expert interviews also revealed that knowledge transfer within the partnerships contributed to new ways of promoting company services and products (marketing innovation). A few experts described market innovation output as mainly being achieved in terms of developing new marketing / digital platforms to advertise their products. In fact, the analysis of the expert interviews significantly highlighted the achievement of market innovation through the fact that company partners were moving from being face-to-face or just consultancies to engaging with digital platforms in promoting / marketing their products.

Quotes from the participants
"We brought new technology to the company, and developed their e-commerce system platform to increase sales in the new market..." **(Expert 6, KTP Associate)**
"It did lead to some innovation; we did manage to develop new digital advertising. We also provided them with better tools and techniques to help them do their business activities in a better way..." **(Expert 16, KTP Associate)**
"The fact that we were moving from just being face-to-face, just consultancy basically, to engaging in a digital platform, is a big innovation for us… Before, we almost exclusively gained clients through word of mouth or referral by other people. We now actually could advertise it on the digital platform." **(Expert 24, Business Supervisor)**

Table 5.9 Quotes from the expert interview

- **New understanding led to the development of a new R&D unit**

Interestingly, the analysis of the expert interviews found that knowledge transfer through partnering with the university led to a new understanding of the importance of research for company growth. One of the experts emphasised that partnership has brought more research interests from within the company. The company previously did not have any research function in-house, but knowledge transfer through the KTP has now helped the company to set up a new R&D department. The new R&D unit functions to help the company to be more scientific in developing their products, rather than using the trial and error process they had adapted before the knowledge transfer.

Quote from a participant
"The changes were quite significant, and the new product was made in-house, they are more interested in research and development on the product… The product went crazy... We helped them with the development of the new research team in-house. They have a new R&D department; it made

them realise the role of research in the company... Research functions in-house and that was one of the outcomes. They have more scientific research now..." **(Expert 10, KTP Associate)**

Table 5.10 Quotes from the expert interview

- **New knowledge and changes to technology led to a new reputation for a company**

The analysis of the expert interviews also revealed that reputation was one of the outcomes perceived as innovation by some of the experts. Reputation was found to have given one company a significant impact. According to one of the experts, the outcome from partnering with the university has a change in the company profile to become a frontrunner in technology within its sector. The company's customers were described to be more confident with the company's technology. Having the latest knowledge and advanced technology through the partnership has been found to have raised the company's profile and subsequently they have become better established.

Quote from a participant
"It did. In regard to how we are now influencing more outcomes with regards to our prospects and customers, I mean the technology that we are using is pretty new, so giving people the confidence to move to it has been difficult but has been helped by the programme." **(Expert 25, Business Supervisor)**

Table 5.11 Quotes from the expert interview

5.2.4 Key Challenges for Knowledge Transfer in Fostering Innovation

Challenges for knowledge transfer in fostering innovation
Managing expectations between partners due to cultural / institutional differences
Lack of predefined objectives and risk assessment
Fear of risk in adopting new solution
Difficulties in recognising the outcome
Recruiting suitable Associate and partners
Diverting from the project focus
Geographical issues leading to difficulties in communication / access to knowledge

Table 5.12 Challenges for knowledge transfer in fostering innovation

- **Managing different expectations between partners**

The analysis of the expert interviews found that managing expectations between partners was challenging for knowledge transfer to foster innovation outcomes. Both types of institution have different ways of working based on their organisational cultures and norms. The analysis revealed several main differences between the academic and business partners. These were mainly in terms of different perceptions between the partners regarding time scales, aims and objectives of the knowledge transfer. Different perceptions of timescales were seen challenging, with the academics perhaps looking for research work to continue for longer with relaxed timing, while the businesses wanted instant outcomes. In term of aims and objectives, the academics were more interested in a research orientation and looked forward to academic output such as the publication of papers. Meanwhile, the business partners were interested in commercial value and were profit-oriented.

Quotes from the participants
"The company wanted everything to be done at a quicker pace… They wanted faster turnover... For example, the company expected and estimated that the process of support would take about a week… However, for the university, because they have other commitments, term breaks or because of another risk assessment, availability of the machine or safety factor, it usually would take about a month. Sometimes, it took four times longer than the expectation of the company… and that always turned the company off... they paid the money but didn't get the service they expected. This is always raised up as an argument between the company and academics." **(Expert 14, KTP Associate)**
"I would say managing different views and perceptions is challenging. Academic staff had a different view, and people from the company, they have a business view and a commercial view. We think about research details. They think about manufacturing. Business thinks about profit…" **(Expert 17, Academic Supervisor)**
"The company is mainly interested in cold hard numbers, while we academics are more interested in research output... I would say this is a slight culture clash... because they want to make money, focus on returns on investment... and academics more on writing papers and getting research from the project." **(Expert 20, Academic Supervisor)**
"Because you have different people with different mind sets, different agendas, to bring them together for a common goal is quite a tricky challenge. Managing expectations from all the parties is most difficult." **(Expert 21, Academic Supervisor)**
"The university has structured work, but a lack of business output. The management team expected development work along with the project, and to produce something along the way…" **(Expert 23, Business Supervisor)**

Table 5.13 Quotes from the expert interview

- **Lack of predefined objectives and risk assessment**

According to the experts, one of the challenges for knowledge transfer to foster innovation was that there was a lack of risk assessment and there were no clear predefined problems and objective for the projects. According to some experts, it is difficult to understand the unique problem that needed to be solved in any particular company. The company partner would sometimes have difficulties in understanding what they wanted out of the project. Sometimes the project was described as too 'ambitious', and sometimes the university and business partners would overestimate the resources available, in terms of knowledge and capacity. This is identified as a risk for innovation and a possible cause of delay in projects. Further, some experts stressed that a project sometimes needs to be adjusted to adapt to the market need, as there was lack of research on market adaptation. Experts also revealed that project details, such as tasks, responsibilities and outcomes were written 'beautifully' for the 'bidding' process, but sometimes they did not fit with the businesses' thinking.

Quotes from the participants
"The company assumed they walked in with 100k to spend and could just get what they want from us... but we are not selling a product here... We are not here for that reason. The project needs to be redefined carefully, and communicated clearly to the business partners to establish clear understanding." **(Expert 18, Academic Supervisor)**
"The project was too ambitious. The researcher also got fascinated with the idea. But if the risk is not properly analysed, and there is no proper assessment of the technology, if the expectations are not fully analysed, in the mid-point of the project then it might not be possible to deliver the expectations. Sometimes the knowledge does not exist yet, for the complexity of the problem." **(Expert 19, Academic Supervisor)**
"The key challenges are to understand the unique problem. Organisations have different specific problems. The university research needs to adapt to the market, to be agile and adapt to market requirements, so that what you do will make sense." **(Expert 24, Business Supervisor)**
"The plan was accepted but it didn't make a lot of sense. For example, the output was, like, the KTP will provide ten jobs for our centre; it didn't say what the jobs are, what the jobs would be doing. It was, like, ten new desks, if it was really to happen. It was unrealistic for the business." **(Expert 27, Business Supervisor)**

Table 5.14 Quotes from the expert interview

- **Fear of risk in adopting new solutions**

The experts highlighted that fear of risk in adopting new solutions suggested by the university has reduced willingness to engage in the projects. In some cases, the research has not been tested in the industry, therefore the business sometimes might not agree with academics'

suggestions and opinions due to the fear of taking a risk that could affect business operations. This situation usually applies to the TBSFs that are involved in changing their traditional operating systems to a new operating system. In addition, the fear of changes also contributes to lack of engagement from staff members in implementing and embedding the new solutions within the company. Some of the members of the firms were reluctant to cooperate and share information with the academics. Fear of risk was also were identified among the academics, when developments have not been trialled along the way to test whether they are working or not.

Quotes from the participants
"A key challenge is probably the generic environment that the industry has, such as workflows that the industry has been following for many years. So, then these projects start, and they definitely bring new solutions, proposed new solutions. So, sometimes you convince the industry that the project will bring new success in terms of their business. These transformations are very challenging." **(Expert 7, KTP Associate)**
"One of the difficulties is the people in the company resisted change. It is difficult when you have to embed it in people..." **(Expert 18, Academic Supervisor)**
"So, some of the challenges that we had to face were that, when you look at this from the pure academic point of view, it has not been tried and tested in the industry. So, it has been a challenge regarding whether we are adopting the advice or not, at the risk of the impact on our business." **(Expert 25, Business Supervisor)**

Table 5.15 Quotes from the expert interview

- **Difficulties in recognising intangible outcomes**

The experts also highlighted the difficulties in recognising intangible outcomes from projects. This was commonly described for software development projects, when sometimes it was quite hard for the business partners to recognise performance because they had different knowledge backgrounds from the academics. In addition to monitoring performance in software development, some experts also emphasised the difficulties of capturing outcomes other than financial outcomes, such as satisfaction, and reduction and minimisation of employees' tasks that come along with the development of innovative solutions. The difficulties in recognising outcomes have been problematic with regard to academics proving certain levels of performance to the business partners. This could lead to lack of trust and frustration on the part of the business partners.

Quotes from the participants
"I struggle on the outcome... The project focused on the financial amount... We managed to contribute to low cost production and save costs... but in terms of intangible outcomes, such as satisfaction, that you create, the staff work less. This is hard to identify..." **(Expert 6, KTP Associate)**
"In developing software, sometimes even the changes or improvement on one thing takes one month. This would be difficult to explain to company partners if they don't understand or have knowledge about software..." **(Expert 10, KTP Associate)**
"Some of the things you tend to do are intangible, such as software. It is itself intangible. You have to make it look tangible, and show progression in your work... People will be confident in you..." **(Expert 22, Academic Supervisor)**

Table 5.16 Quotes from the expert interview

- **Diverting from / disrupting the project focus**

One of the problems highlighted in fostering innovation is to ensure that both partners will not be diverted from the project focus. In some cases, projects have difficulty in fostering innovation outcomes as the researcher or the academics are too focused on research activities and give less attention to development work. Also, the company may sometimes take advantage of the academics by asking for additional work, consultation and other activities that are beyond the project scope. This has led to projects being disrupted and a lack of attention being given to the development of the innovation solution. Lack of clarification and understanding of the role of the academics and the project's objectives were found to contribute to this problem.

Quotes from the participants
"Sometimes, it is challenging to balance my time. I don't have enough time for my research. The academic output was quite low..." **(Expert 4, KTP Associate)**
"One of the challenges is the Associate trying to do many things at the same time." **(Expert 17, Academic Supervisor)**
"Although the KTP Associate is employed on the KTP project, and is deadline-driven, the Associate sometimes ends up working for another project." **(Expert 18, Academic Supervisor)**
"They always try to squeeze it out, getting free consultancy from the university. They need to be clear. The academic teams should not get involved in consultancy... keep away from consultancy... this isn't consultancy." **(Expert 20, Academic Supervisor)**
"At first, the academics focused too much on research and other commitments. It is quite challenging for them to prioritise work..." **(Expert 24, Business Supervisor)**

Table 5.17 Quotes from the expert interview

- **Geographical issues leading to difficulties in communication and access to knowledge**

Geographical issues have been highlighted as challenging for the transfer of knowledge to achieve innovation. According to the experts, geographical distance leads to difficulties in communication including promotion of two-way communication. This usually applies to cases in which the university is situated in a different location to the business partners. Different locations sometimes lead to a lack of proactive engagement by the Academic Supervisor as it is difficult to commute. This could lead to low academic output from the Academic Supervisor. In addition, geographical barriers could lead to minor culture clashes between partners.

Quotes from the participants
"Some of the members are working remotely and are not in the building. Thus, it was quite a challenge to embed knowledge within people..." **(Expert 2, KTP Associate)**
"At the beginning of the project, I worked closely with the members of the firm… I worked in the company. However, because of the organisational change, I have had to work remotely from the project. It has been a bit challenging because we didn't get to have more interactions, and it has been difficult to demonstrate and train the staff on how to use the new product / system." **(Expert 5, KTP Associate)**
"The project was based in London. Because of the distance, there was a lack of clear direction and guidance from my Academic Supervisor. It would be nice if the advisor could spend a day in the office." **(Expert 9, KTP Associate)**
"Geographical barriers, there is an issue with the long commute there and understanding the company culture, because they are a traditional company that hires local people to the company, and slight cultural clashes and difficulties in communicating..." **(Expert 20, Academic Supervisor)**

Table 5.18 Quotes from the expert interview

- **Recruiting the right Associate**

One of the problems highlighted by the partners is having the right Associate for the project. While this problem is described for the early stages of projects, it is crucial for fostering innovation. The university and the company need to hire the right Associate that can fit into the culture of the business. The Associate needs to have project management skills and must adapt quickly to the business environment. Dual identity is important for the Associate to enable engagement with both partners. An associate failing to adapt to the business environment could lead to no innovation outcomes.

Quotes from the participants
"Hiring the wrong Associate, not willing to learn and not making progress; the Associate has skill, but this is not the problem… But not willing to adapt, be open and understand the knowledge in the business." **(Expert 18, Academic Supervisor)** *"The Associate is in the spotlight in the project. It is a challenge to find one that can get along with the members of the firm... Inability to find the right Associate will lead to pressure on the Associate."* **(Expert 19, Academic Supervisor)** *"Finding the right Associate that puts the company first and works hard, for example an Associate who wants to get more training than what he should. The Associate needs to remain within the scope of the project."* **(Expert 21, Academic Supervisor)**

Table 5.19 Quotes from the expert interview

5.2.5 Role of Structural Capital

Role of social capital
Regular communication through: 1) meeting at a point to join together and allow most of the knowledge transfer; 2) day-to-day communication drives more knowledge to be transferred
Informal communication leading to instant feedback and decision making (newly emerged)
Proximity between partners influences access to knowledge
Online platform providing close network configuration and fast access to information
Small number of team members with less formal hierarchy (newly emerged)
Prior professional connection that links the partners giving access to more knowledge (newly emerged)
A diversity of skills gives creative input and solutions for the transfer of knowledge (newly emerged)

Table 5.20 Summary of the role of social capital from the expert interviews

- **Regularity of communication through meetings or day-to-day communication drives more knowledge to be transferred**

The experts interviewed described how regular communication is one of the main aspects of facilitating the transfer of knowledge in fostering innovation. The analysis of the interviews identified that there are two mediums for partners to have regular communication: firstly, through formal meetings of all the key stakeholders; secondly, through day-to-day conversations during working hours in the company. Regular communication through formal meetings was identified as managing the expectations of the company partners. Formal

meetings basically allowed challenges to be discussed between the partners, sharing input and feedback to help develop a shared understanding between the partners. One of the experts emphasised that meetings allowed the KTP Associate, the Academic Supervisor and the Business Advisor to meet and work together on any problem that they had. Further, the experts described the meeting to be the starting point that brings both partners together, which allows two-way knowledge transfer to take place. In addition, the majority of experts described how regular meetings ensured that any challenges or major issues with the knowledge transfer activities were discussed and solutions were provided as soon as possible. Besides that, some of the experts described how regular meetings helped to give them a better perspective on the overall project.

Besides regular formal meetings, daily face-to-face conversations during working hours were also helpful in supporting the transfer of knowledge in developing an innovative solution for the company. This was mainly helpful in embedding knowledge within the company, by clarifying and explaining the technical information that sometimes require intense face-to-face communication. The majority of the experts at the Associate level described that these mediums were useful because they allowed more continuous interaction between the Associate and the members of staff and allowed the sharing of knowledge to be more effective, with more input and practical knowledge being embedded. In addition, regular daily conversations were found to be helpful in convincing people to engage with a project.

Quotes from the participants
"Regular meetings with the Academic Supervisor and Business supervisor were a big help. Any issues and challenges related with the project were discussed; we discussed the main goal of the project and the main goal of the Company Supervisor. Even though we have had slight changes to our main goal, we developed a shared understanding of the goal of the project through communication during the meetings." **(Expert 3, KTP Associate)**
"Regular meetings: the weekly meeting with the Company Supervisor and the meeting every four months, the big meeting, were a massive help. We talked about issues and I got lots of input and feedback from the company. Everyone engaged during discussion and it was quite good. It certainly helped to develop the solutions meeting the company's needs…" **(Expert 6, KTP Associate)**
"Through regular meetings… meetings ensured any issues were discussed and solutions could be made as soon as possible." **(Expert 14, KTP Associate)**

"I would say having that regularity of meetings is really important because, otherwise, if you are not working together on this all the way through, then effectively you would be working as a contract researcher for the organisation… where you will just end up by giving a research paper at the end of it. The fact that you are embedding knowledge in the firm as you go… meetings, therefore, are the starting point that joins them together. It has to be a genuine two-way project. Academics provide them the insight which allowed the transfer… Clients see the day-to-day work, how it can be embedded with the knowledge transfer into the organisation... They are getting the theory of that, which allowed the main knowledge transfer to be embedded..." **(Expert 18, Academic Supervisor)**

"Mostly, we managed the challenges in a classic way. We talked and discussed things during the meetings, the monthly meetings, such as the KTP meeting and LMC meeting where we have the Associate and the Academic Supervisor. We talk so they will look and understand the business view." **(Expert 23, Business Advisor)**

"We have the LMC meeting… We discussed and informed the management what would work or not. During the meeting we discussed. Our CEO would present what our problem is to make sure the business would still align with the KTP plan. During the meetings we also have academics' presentations. We make sure cost control was on schedule, to make sure the company's needs would be addressed, and to make sure the project benefits all parties… This is useful to give a good perspective on the project." **(Expert 25, Business Advisor)**

"I helped him (staff). We always sat down and did it (the work) together and I talked to them and convinced them to change… and it was helpful to start to understand the project more… and start to help me as well…" **(Expert 1, KTP Associate)**

"Some members do remote working and some members are in the building. Those in the building, we meet regularly and talk face-to-face, and for the remote ones, we talk through email. Face-to-face communication definitely helps with the transfer of knowledge, especially with software, when you want to explain and show stuff..." **(Expert 2, KTP Associate)**

"I think the higher the frequency of communication, the more knowledge that could be transferred… There is one guy who comes over seven or eight times a day to me. I feel I have transferred more understanding to him, and he has managed to use the new system we just made for the company." **(Expert 8, KTP Associate)**

"Basically, we don't really have a problem in terms of delivering the technical knowledge. This is because I work in the same office. I frequently communicate with them face-to-face…" **(Expert 16, KTP Associate)**

"During the KTP, to develop and to solve or improve the problem within the company, we put the KTP Associate in the company. The Associate would have day-to-day involvement and have massive communication with the company, and that contributed enormous input within the company." **(Expert 19, Academic Supervisor)**

"We need plenty of discussion with the client. We do physical face-to-face communication… We go down there and show what we are doing... It is far more effective..." **(Expert 20, Academic Supervisor)**

"We mostly have direct communication with the Associate… We have the Associate in the company, and we get continuous interaction with him and it is helpful to make sure the Associate understands our point of view." **(Expert 24, Business Advisor)**

Table 5.21 Quotes from the expert interview

- **Informal communication leading to instant feedback and decision making**

The analysis of the expert interviews also identified that informal communication reduced tension and frustration between the partners and allowed for better decision making in the projects. According to the experts, informal communication contributed to a relaxed and stable environment. This was found to be useful in resolving some of the major conflicts discussed during the LMC and formal meetings. As one of the experts described, sometimes decisions were made when they were having drinks afterwards. Informal or casual communication was also useful for giving further clarification on the progress of development. Further, some of the experts also mentioned that this was useful especially in solving minor conflicts that they did not bring to the formal meetings. The informal structure was also identified as heling in contributing to the close relationship between the partners.

Quotes from the participants
"It is essential and crucial to identify the problem. Have discussion with stakeholders in a formal or informal way to identify the challenges and problems at the beginning of the project. This will reduce frustration in the project and make it more stable. Some people don't like a problem to be escalated to a formal level. They like to resolve it before the formal meeting. As such, informal communication could help to solve problems, like small technical problems, miscommunication and arrangements. In my experience, I casually approach them and resolve the problem during lunch or teatime." **(Expert 7, KTP Associate)**
"We had formal meetings but most of the deals were done when we went for drinks afterwards… or deals were made during a cup of tea or a sandwich… This was a nice and relaxed environment… through informal chat… and also the relationship kind of grew this way." **(Expert 20, Academic Supervisor)**
"Have a nice and good conversation with everybody. I think that is the way to do that. Some companies like an informal way... It depends on the company… The academic has to adapt to the environment. Having informal conversation is quite relaxing and people are usually calmer… and that is helpful to discuss over something." **(Expert 22, Academic Supervisor)**
"If I would need some update from the Associate, I would just talk to him. Sometimes we talked about the project when I saw him in the kitchen area, like a five-minute talk during the rest hour. We discussed and I got clarification during this time. So, sometimes it is good to have informal communication." **(Expert 26, Business Advisor)**

Table 5.22 Quotes from the expert interview

- **Proximity between partners influenced access to knowledge**

The expert interviews also stressed the importance of proximity between the KTP Associate and members of company staff. The experts described how proximity allowed longer and more bi-directional interactions between the partners, hence a better chance to come up with a good

solution for the project. Some of the experts described how proximity also allowed more feedback and input from the company. This is because it is easier to reach everyone in the company. This was particularly useful during the development stages, as the partners' ideas and feedback could improve the fit of the solution within the company. In addition, being close to the company allowed the KTP Associate to better learn the company culture and the business itself. This was also found to have built a relationship of rapport between the partners. One of the experts at the KTP Associate level mentioned that his project was difficult at its end phase because there had been some organisational change within a client company, and the Associate was required to work remotely. This was quite challenging for him in conducting training with the product that had recently been developed.

In addition, the distance between the KTP Associate and the Academic Supervisor was also important for facilitating the development of solutions within companies. The experts highlighted that being close to the university meant it was much easier to have the Supervisor visit the company or vice versa. This is important for the academics to be more involved and engaged in the project.

Quotes from the participants
"At the beginning of the project, I worked closely with the members of the firm… I worked in the company. However, because of the organisational change, I have to work remotely from the project. It has been a bit challenging because we don't get to have more interactions, and it is difficult to demonstrate and train the staff on how to use the new product / system. Practically, it is more effective to stay close to the company for knowledge transfer…" **(Expert 5, KTP Associate)**
"Practically, it is effective to stay close to the company for knowledge transfer... This is because I work closely with the members of the firm. I work in the office. I frequently communicate with them face-to-face... Being close to the company enables quick minor changes to the solution during the development. We get quick feedback, opinions and ideas from the partners and that is very helpful for the project…" **(Expert 9, KTP Associate)**
"I did meet my supervisor once a week in the university… The university is not far from the company that I worked with… which I think was an advantage, as I could always go to the university and meet up with my supervisor… and that's allowed me to have more academic input from my supervisor…" **(Expert 10, KTP Associate)**
"I worked very closely with one of the developers. We basically sat next to each other… She helped me learn Sequel, for example… and I kind of often explained things about data… She knows how to code, and I knew data. We shared a lot together and it was really helpful…" **(Expert 15, KTP Associate)**
"The academic lead working closely with the Associate and having all the meetings that they needed with the organisation would be helpful…. Working closely with the Associate helps to push the

Associate and give proper guidance… Even the associate has the plan... The Associate cannot be left alone... **(Expert 17, Academic Supervisor)**

"Geographical issues have been one of the things that needs to be considered. Being local to the company is important. This is helpful to reduce cultural challenges." **(Expert 20, Academic Supervisor)**

"Having the Associate close to the partners was essential... as, suppose the Associate might be quite different to the company… Being close to the company allowed the Associate to learn more about the company culture and allowed them to build a relationship with them... and the Associate also has got more understanding of the requirements of the project." **(Expert 21, Academic Supervisor)**

"We had got one Associate placed in the company and having the Associate in-house was useful. We got to monitor the project closely, and sometimes the director of the company was keen to know everything about the Associate's tasks and processes performed… Having the Associate close was definitely useful to ensure everything was working out right." **(Expert 23, Business** Super**visor)**

Table 5.23 Quotes from the expert interview

- **Online platform creating a close network configuration, fast access to information and enhanced transparency**

The experts viewed online platforms as necessary to complement knowledge transfer mainly in two ways. Firstly, the use of an online platform drives close networking between individuals in the project, as the system enables the academics and the company partner to connect with or reach everyone to share resources to perform the development of innovative solutions. Secondly, some of the experts mentioned that they used email, SLACK, GIT HUB Protocol, and group messages to communicate when working in the team to enable fast access to information. According to the experts, these systems contribute reliable platforms for sharing documents, technical knowledge and other software transfer. Experts described how these have also helped to increase transparency of projects and keep everyone in the same loop. This helped to provide consistency within projects and drew attention to the fact that online platforms could be implemented during knowledge transfer projects to foster innovative outcomes within companies.

Quotes from the participants
"We used SLACK; we use Microsoft team to enhance communication with team members..." **(Expert 2, KTP Associate)**
"SLACK, it is software or an online platform for commercial application, like a group message, and we use email. These are some of the common ways for communications. And we use GIT HUB protocol; this is a platform to hand out software or transfer technical knowledge for engineers, such as source code, designs and reports… These were useful for transferring technical knowledge,

helping to inform about the project and increase transparency of the project." **(Expert 4, KTP Associate)**
*"The project was based in London. Because of the distance, there was a lack of clear direction and guidance from my Academic Supervisor... However, online platforms, such as email, were useful as a medium to get instant feedback and output from my Supervisor.***" (Expert 9, KTP Associate)**
"The online platform was helpful because it was quite a small company… I looked at how they would go forward in terms of communication. In terms of reaching out to everybody in the company, I think that turned out to be the best option… since everybody had easy access to it. I could just send it out through email." **(Expert 11, KTP Associate)**
"SLACK is an online platform. It is Twitter for the company. People can just contribute to keep everybody in the loop." **(Expert 12, KTP Associate)**
"Faster online platforms will actually help the transfer the knowledge. Skype is quite good for communication and could be a medium to transfer knowledge. Online platforms can support the progress of development, keep people updated on the project." **(Expert 19, Academic Supervisor)**
"It is important to document and share information with each other. The academics shared documents, the lab data, shared it in databases such as Dropbox… the company Dropbox. We share information, presentation files. The Associate put all the data and the progress of the project there. After the meetings the Associate shared that… It was helpful... I can get through to the documents and keep a record." **(Expert 27, Business Advisor)**

Table 5.24 Quotes from the expert interview

- **Small number of team members with informal hierarchical structure**

Several experts have emphasised the significance of working with small companies with an informal hierarchical approach allowing better input on the development of the product. Small teams with more open structures led to closer ties (professional / friendship) and partners that had consistently open and encouraging relationships in fostering innovation. The expert interviews revealed that small firms do not rely on a top-down approach. The hierarchical structure of small firms is more informal in that every employee could give feedback and suggestions without being restricted to any formal procedures. KTP Associates had more flexibility and freedom to express their ideas and opinions.

The KTP Associates could just approach the senior member of staff, even the head of the company, without resistance. For instance, some small companies are family-based and basically have no hierarchy. This has allowed KTP Associates to express suggestions and ideas within the partnership without resistance. This was helpful for knowledge transfer by stimulating new ideas, creativity and innovation.

Quotes from the participants
"It is a small company… and the structure is more open and less formal. I could just go as high as the senior management team to talk and chat about any queries or share any ideas… I was fully involved in the company… It helped to stimulate my thinking throughout the project, and it was quite a good experience, actually. It's kind of brought the best out of me." **(Expert 11, KTP Associate)**
"They are a small company, a family-based company. I was lucky enough to be part of the team; they are completely open with each other. We share ideas with one another. I think they are a small business, so their culture is quite open… which is a good thing… The director of the company was helpful as well, giving me guidance and pushing me in a business direction…" **(Expert 13, KTP Associate)**
"We have an open office plan… I can see different teams and talk to them without any resistance… I think it is a more flexible approach, especially when you are just moving from the university to a company, because otherwise, it is a bit of a silo, I suppose, working alone on my project… However, the open plan office, open communication with everyone in the team, let us share more knowledge, because we have more communication with everyone in the company…" **(Expert 16, KTP Associate)**

Table 5.25 Quotes from the expert interview

- **Prior professional connection that links the partners giving access to more knowledge**

The experts interviewed described how prior connections contributed to better knowledge transfer within the current partnership projects. According to the experts, previous relationships with the university enhanced communication between the partners. Both partners had a better understanding of each other's culture. One of the experts described the KTP as one of the many projects that the company had worked on before, and therefore it was quite easy for the company to adapt to the university culture and vice versa. This has helped to develop a shared understanding and allowed the university and the company to share more information and develop their personal interactions. Prior connections were basically developed from meeting in social events, having PhD students within companies and other consultancy projects.

Quotes from the participants
"Before the project, we did have an element of informal contact… Some sort of connection before the project made you feel comfortable when you were working in the project…" **(Expert 18, Academic Supervisor)**
"On many occasions, the university has become a partner before the KTP, for example, a firm taking a student for an internship. They have done lots of work before the KTP and many other informal relationships… It helps to develop a common understanding between partners, and it was good. That helps to develop, to solve the problem in the project." **(Expert 19, Academic Supervisor)**
"We are quite close; we do have a previous connection with the university. We had one PhD student in the company before… This is how we knew about the project; it was a good opportunity for us.

We've got somebody in the project, access to the university lab, and it was beneficial for us." **(Expert 22, Academic Supervisor)** *"Prior to the project, I have met the Academic Supervisor at several conferences and innovation fairs. We had also worked together on several projects. I guess I have understood how academia works and it helps us to adapt to their needs as well..."* **(Expert 25, Business Advisor)**

Table 5.26 Quotes from the expert interview

- **Diversity of skills driving creative input and solutions for the transfer of knowledge**

The expert interviews also emphasised that the elements that influence knowledge transfer in achieving innovation within the firm also depended on the diversity of knowledge and skills that the project teams had. According to one of the experts with experience as a software developer, diversity of skills enhanced the learning curve enabling her to apply her research in the business context. The development of the prototype was successful and she was ahead of her project's timescale because of access to a diverse range of knowledge within the team. Both partners seemed to be interested in the different knowledge that each of them brought to the project. Furthermore, a diversity of skills gives opportunities and experience to employees in the firm to learn and adapt to new ways of learning, such as by doing research.

Quotes from the participants
"We have come from different environments and backgrounds… with different skills and experience… But having differences was good in some respects… There has been a learning curve… I could understand better how to apply my research to business…" **(Expert 9, KTP Associate)** *"The Associate has brought different skills to the company. Our company has learned new ways of working… We have somebody with knowledge outside of the work and it has helped. We have got different views and opinions to help us to develop the new technology within the company…"* **(Expert 24, Business Advisor)**

Table 5.27 Quotes from the expert interview

5.2.6 Role of relational capital

The expert interviews revealed several elements of relational capital that influence the transfer of knowledge in fostering the innovation outcomes. Some of the findings from the expert interviews confirm most of the findings in the cross-case analysis. In addition, there are also some new findings that emerged from the analysis of the expert interviews. Table 5.7 provides a summary of the types of relational capital that have influenced knowledge transfer throughout these projects.

Role of relational capital
Trust based on capability enhances efficiency of knowledge transfer
Trust based on proven performance sustains relationship between partners
Professionally-based relationship enhances proactive engagement
Friendship-based relationship leads to supportive environment and feeling of belonging
Committed relationship drives additional resource generation
Compromise balances institutional differences
Reciprocal relationship encourages willingness to engage
Respectful relationship encourages supportive environment and generates more resources

Table 5.28 Summary of relational capital found from the expert interviews

- **Trust based on capability enhances efficiency of knowledge transfer**

Experts described the presence of trust as enhancing the efficiency of knowledge transfer in fostering innovation within projects. Similar to the cross-case analysis, the expert interviews uncovered that trust was mainly established on two grounds: firstly, based on capability / competence; secondly, based on proven performance / credibility. Trust based on academic capability appeared to enhance the efficiency of the knowledge transfer process. When trust was present, the academics, particularly the KTP Associate, felt safer and more comfortable with sharing ideas and information in regards to the project. This was particularly important for generating ideas and implementing activities. Apparently, these activities required project management behaviour to be demonstrated by the KTP Associate and when the KTP Associate felt safe and comfortable, they could manage the project better and be more active in the project.

Furthermore, the analysis of the expert interviews also discovered that trust drives open communication between partners, which allows both partners to share more input, such as offering ideas and suggestions on how to implement the knowledge transfer. The experts also highlighted how, when trust was present, the knowledge that they shared was not limited only to technical information but also included implicit knowledge.

Quotes from the participants
"They have a lot of trust in this knowledge transfer. They've got trust in the knowledge that I'm giving them. They trust me to sit down and get the work done. And it was really a relaxed and safe environment. I was more confident to manage and lead the project; I was able to get most of the things done… At that time, there was lots of testing and research that needed to be done in order to optimise the outcome / result... but the trust that they had in me has helped a lot and I have got all the tasks done successfully…" **(Expert 1, KTP Associate)**
"The team knows that I am an expert in data. I think that was very helpful for my project… They were very open to my ideas… They have always asked me to offer suggestions on better ideas or better ways in presenting data…" **(Expert 4, KTP Associate)**
"The industry understands very well that we know the best in the field that we are working in. What we are doing is one of the best solutions and the industry understands very well. We are to provide the solution which benefit the industry. So, I think that is the key element that builds trust…" **(Expert 8, KTP Associate)**
"They see me as a knowledgeable person… and they take my advice. And it is more than information transfer; it includes some implicit transfer…" **(Expert 15, KTP Associate)**

Table 5.29 Quotes from the expert interview

- **Trust based on proven performance sustains relationships between partners**

Although some experts described how trust emerged from the capability of the academic partner, others emphasised that trust could also be developed from proven performance. Proven performance was either based upon prior connection or progression shown in the current knowledge transfer project. According to the experts, the KTP Associate needs to regularly build trustworthy impressions towards the company by showing their progression during the partnership, such as by documenting weekly progression, and delivering promised tasks on time and with reasonable sources. Being able to prove performance within the project would enhance the willingness of partners to engage together, leading to greater knowledge transfer. Another expert described how trust leads to a comfortable environment which, in turn, leads to fast or instant decision making and fast development of the project. This can be achieved as trust helps to balance the organisational differences between the partners by reducing vagueness of the project. Being able to prove progression over time helps to reduce the organisational distance between partners.

Interestingly, the findings also uncovered that trust developed due to the performance or progression of the project could sustain the relationship between the partners. One of the experts mentioned that, while trust may have been present at the start of a project, it can lessen

or change when there is no proof of progression having been made. When the trust lessens, there will be some difficulties in achieving a harmonious relationship between the partners, as the business partners become tense about the project. This could hinder the knowledge transfer process. However, by sustaining the level of trust within the partnership, through regularly updating on the progression, this problem can be managed.

Quotes from the participants
"Both supervisors, they believe in me. They basically trust me to work on the project. But of course, I have to prove to them my work… The company would like to know your progression and weekly progress." **(Expert 5, KTP Associate)**
"Be able to deliver the work on time, able to prove the work you promised, and as they expected. It builds an impression that you are capable to manage yourself and the project. Deliver the items; deliver the items in time and with reasonable resources, time and effort. People will have faith in you. This is important; it reduces the distance and maintains good interaction between the partners." **(Expert 6, KTP Associate)**
"Trust is very important. For example, if you're providing and implementing a new solution for the company… they do not come from academia; they don't understand the academics very well… They need to see some action, to extend their trust in you with your credibility… Record the performance achieved or any progression made, and show it to them. This enhances their belief in you. They will become more interested in the project and willing to contribute more when this is happening…" **(Expert 11, KTP Associate)**
"Companies need some assurance from the academics that the KTP is not just a waste of time. Work progress and performance is one way to ensure that the project is achieving something, and something realistic, and it is how we build trust… and it helps…" **(Expert 18, Academic Supervisor)**
"In some projects, the level of trust is high because they already know the person, and sometimes the level of trust is low at the beginning because they have never worked with the person before, or they haven't any previous experience working with the university… However, I think that there is a connection between trust and financial outcome… I absolutely see that through the meetings… The company partner feels happier when it is obviously working… He is not going to be stressed and show anger towards the academic… Everybody is smiling and they make money. The social capital has been repaired. Trust is built. This helps everyone to work in a good working environment… Knowledge transfer becomes easier. They are more tolerant with the academic point of view, fast decision making... a fast project..." **(Expert 19, Academic Supervisor)**
"Even though some of the things you tend to do are intangible, such as software; this is, itself, intangible. You have to make it look tangible and show the progression of your work... People will be confident in you..." **(Expert 22, Academic Supervisor)**
"Initially, we had some problem with the academics. The Associate produced a structure for the work, a 36-month project. He got Gantt chart; he knew what he was doing… But in terms of business output, it was quite frustrating. However, this change when he had gradually showed us something. He had produced something promising. We could see some significant changes, and we became more confident to move forward with them…" **(Expert 23, Business Advisor)**

"We certainly like to see the university produce some output occasionally, get some stuff done... rather than just reporting… The actions that you do and the results that you get… help to build trust and people are happy…" **(Expert 24, Business Advisor)**

Table 5.30 Quotes from the expert interview

- **Professional relationship enhances proactive engagement**

The expert interviews supported the findings in the cross-case analysis on the importance of a professionally-based relationship to support the knowledge transfer within the partnership. According to some experts, the relationship between both partners was described as good, close and supportive. However, these relationships were based on professional activities, in which the interactions between the partners were limited to delivering the work. A professional relationship supports proactive engagement between the partners, with both partners engaged, sharing information, supporting each other and working together to deliver innovative solutions to the company. The partners were described as being actively involved and giving more feedback to support development activities.

Interestingly, some experts revealed that a professionally-based relationship was usually present at the introduction / beginning phase of projects. However, over time these relationships grew and would eventually lead to friendship-based relationships. At the start of projects, interactions are mainly about the project, with occasional talk of things outside the project. However, relationships grow as there are more interactions while working together. Partners start to build more rapport and trust in each other. The experts further described how this could make the knowledge transfer easier as it involves more communication in a more comfortable environment, in which they can generate more input and ideas for fostering innovation within the company. Table 4.30 presents some of the quotations from the expert interviews.

Quotes from the participants
"They all might have many other commitments, but you need to build a good relationship with them. Start talking about the project, make chat with them, ask for their opinions and feedback, make notes. It is always good to have a relationship with them… We work collaboratively and share information to support the knowledge transfer. It makes the knowledge transfer smoother…" **(Expert 4, KTP Associate)**
"We get along very well. They are always happy to help and teach me... very professional. They have shared information on the project, and are very helpful…" **(Expert 8, KTP Associate)**

"Our relationship… mostly professional with everyone in the company. You occasionally text and have a little chat or catch up about things not related with the project. It is good to build a bit of rapport. There was a time when they organised to go out for a meal... They do like to have a big meal and I sit with everybody and have some food and a drink with them… and catch up with people, and again, build some of that sort of rapport and talk about things to do with me and that sort of situation is good to talk about my role and knowledge transfer…" **(Expert 14, KTP Associate)**
"We have a good working relationship with the company. The relationship kind of grows… after you are working together. You develop a relationship with the company. You become closer and more friendly… and that helps to support knowledge transfer, to be able to work with other people comfortably…" **(Expert 21,** Academic **Supervisor)**
"The relationship starts on a professional level… but then you start getting comfortable after some time, after working with each other, with colleagues, and see them frequently. It makes some sort of connection, makes you feel comfortable." **(Expert 22,** Academic **Supervisor)**
"I would say our relationship was a bit like a business relationship… We had lunch, we kind of socialised… but we mostly talked and discussed queries and we shared knowledge transfer… We engaged with the project very well…" **(Expert 27, Business Supervisor)**

Table 5.31 Quotes from the expert interview

- **Friendship-based relationship drives a supportive environment and a sense of belonging**

A friendship-based relationship was described by most of the experts as having some social activities beyond the professional work. Some of the activities that the partners do together as friends were going out for drinks after work and going out for informal celebrations. The interactions between academics and the staff in the company are more frequent, more open, and not only aimed at resolving problems and issues with knowledge transfer. But the interactions also involved discussing personal problems and casual talk about people's interests such as sport. The experts described that the friendship between members of staff established a supportive environment for knowledge transfer. The KTP associate obtained more help when needed, and extra support and resources to implement the knowledge transfer. The staff were not reluctant to share any new information that could benefit the transfer. Furthermore, friendship drives a sense of belonging to the company and builds a shared understanding of the project.

Quotes from the participants
"We get on very well. And I think that the fact that we get on well, if they got a problem, they are more open to talking about their problem… They do not feel reluctant to express their feelings and their problems… It is helpful for knowledge transfer. We are happy to move forward. Everyone is

happy to learn new methods... If any of us learn something new, we talk to the other people and share it..." **(Expert 1, KTP Associate)**
"We had a good relationship. It was one of my best working experiences. I have a good relationship and still keep in touch with them. We didn't really have much political conflict within the members of the staff. Everyone was very good, helpful, handy and friendly, and this was helpful for the knowledge transfer. A good relationship allowed me to freely express my opinion and ideas in a more natural way" **(Expert 9, KTP Associate)**
"The relation that we built, it was sort of a friendly basis. We learned their work style and understood each other." **(Expert 10, KTP Associate)**
"I'm very friendly with everyone in the company... That makes me very comfortable and convenient… We told joke; we talked about football. Sometimes we went out together for a drink… It was good; we worked together easy..." **(Expert 12, KTP Associate)**
"I kind of was friendly with one of the girls in the tech team... We went out for dinner; we socialised outside of work… It was useful; she was a bit quiet and shy to ask questions at work… So, we chatted over dinner; she asked questions. And I would say it is beneficial to transfer and share knowledge with someone who is an introvert…" **(Expert 14, KTP Associate)**
"I think it is about knowing the people; having that sort of friendly relationship is good. I got to understand about the company more, understand everything that's going on, and I got more input for the KPT, more involvement in the activities. In fact, we still meet occasionally. There was a guy who was my boss there; we still meet up. There is still an on-going relationship." **(Expert 16, KTP Associate)**
"The members of the staff were close to the Associate… I would say that they were friends with each other. Everyone saw the Associate as a full-time employee within the organisation... Building a sort of friendly relationship with the Associate, I suppose, changed some attitudes towards the project… It was helpful in building more understanding towards the project…" **(Expert 25, Business Advisor)**

Table 5.32 Quotes from the expert interview

- **Commitment to / prioritising the partnership encourages the innovation effort**

A committed relationship has been described as one of the elements that facilitates knowledge transfer in supporting innovation within partnerships. Similar to the finding highlighted in the case studies, some of the experts described a feeling of responsibility to prioritise the project and devote themselves to performing within the team, which was found to have a favourable influence on knowledge transfer, particularly in generating additional resources for the project in terms of time and effort. Being committed to the project was found to retain an individual's engagement within the project.

Quotes from the participants
"The project was complicated, and the tasks were complicated. I did a lot of different tasks. I had to do research, analyse the results, communicate the results, learn about new stuff. But I worked hard, and I was very committed to the project. I spent a lot of time and energy on the project. I thought it's best to use this opportunity as much as I could to develop myself…" **(Expert 3, KTP Associate)**
"I always prioritised the project. I did additional research myself. I did some courses that were related with project… which I enjoyed at the time. I helped the company to answer some of the technical challenges. I put a lot of my capacity into the project, to make the transfer smooth between the two partners, and that certainly helped…" **(Expert 17, KTP Associate)**
"The most important thing is the Associate. While everyone should play their part and role, the Associate needs to be willing to learn, making progress and prioritising the project… It is important to the transfer of knowledge. They are a small company, and by showing some appreciation and dedication, they will be happier. And it would be easy to work together..." **(Expert 21, Academic Supervisor)**

Table 5.33 Quotes from the expert interview

- **Compromise balances the institutional differences**

Compromise in partnerships appeared to be described by experts to balance the institutional differences between partners. Knowledge transfer between the university and the firms is basically a two-way interaction and both partners have different views and expectations regarding the project, whereby the company has a commercial view and the university has an academic view. While managing the differences is not easy, by compromising both partners are willing to reduce and balance their demands with each other in ensuring the project's objectives can be met. The analysis shows that the university could compromise with the company, by doing the research in parallel with the development work. This has been identified to balance the expectations form the company side but, at the same time, benefits the academics as well. Compromise through this parallel approach was found to speed up the development work.

Quotes from the participants
"I have targets to meet but at the same time not upsetting the others… to make sure that everyone happy. What I did was… I spent more effort benefiting the company and minimised my effort on producing KTP materials and research materials…" **(Expert 3, KTP Associate)**
"The relationship is like a marriage; some compromises are needed to make sure the transfer could run smoothly. For example, in my case, the company that I worked for was willing to let me take one day off to do some courses, part of my professional development, to grow and develop…" **(Expert 7, KTP Associate)**

"We agreed to conduct the research in parallel with the development activities. I think this is one of the reasons why our project moved faster than we thought it would. Instead of spending too much time on research, we started doing some development jobs and research at the same time... I think this is how it should be because along the way in the development work, there is a need to do research, a need to reduce defects in the software and speed up the development process..." (**Expert 10, KTP Associate)**
"It is very difficult to make all the parties satisfied, even though the KTP itself, it clearly describes each benefit for each entity… However, the majority of the problems were solved; we compromised… You know, sometimes you may win, sometimes you may lose…" **(Expert 19, Academic Supervisor)**
"So, the company sometimes liked to change the direction of the project slightly… Sometimes it was hard to adjust to their requests… The company usually wanted to see some development work rather than reports. Hence, we usually needed to do the development work and do research at the same time..." **(Expert 18, Academic Supervisor)**
"In the first phase of the project, we felt like too much time was spent on research and development. It was progressing slower than hoped. However, the university agreed to narrow the focus of research, and start with the development, and extend the model's capacity… and we were happy with this decision… and agreed to move forward with that…" **(Expert 24, Business Advisor)**

Table 5.34 Quotes from the expert interview

- **Reciprocal relationship encourages willingness to engage**

The experts recognised that a reciprocal relationship is important to facilitate the transfer of knowledge. Reciprocal relationships are viewed as giving both partners strategic needs and interests within the partnership, but both are willing to collaborate only if they were gaining value from the partnership. Partners perceive reciprocal relationships to be based on a fair environment, constructed on the recognition of the benefits and rewards that each partner would receive at the end of the project when they give input / invest resources in the project. A reciprocal relationship was identified to facilitate learning between the partners by increasing the willingness to engage in the partnership.

Quotes from the participants
"The programme has some research in it… and the firm needs to understand this. It is like give and take. We help to support them; they need to support us as well. Some businesses get sensitive when we explain that we want to get some papers out of it. They don't want the Associate to do the research; they only want them to do the development work… and that is not how it is supposed to work. And it is important to emphasise this to avoid conflict in the future. And again, it is about give and take..." **(Expert 17, Academic Supervisor)**
"It has to be reciprocal to make the company and the university get along well. We have something a bit less reciprocal, which is consultancy, where there is no academic value at the end of it. But for

a partnership, it is reciprocal and both sides are getting value from the relationship…" **(Expert 20, Academic Supervisor)**
"The company need to know what the academics will get from the project. I would explain to them what our strategic objectives are, so they can help me deliver on our objectives and, at the same time, we are delivering on theirs… And that's important to avoid any difficult communication, such as the company not being very happy when we try to get the academic value out of the project…" **(Expert 21, Academic Supervisor)**
"We want to double our turnover in the next three-year period, and we believe the academics have the expertise to help us with that, by advancing our products, by adding relevant features… So, we have a need from the academics, yet we were also willing to give some opportunities to the academics. They can gain academic experience and do research…" **(Expert 27, Business Advisor)**

Table 5.35 Quotes from the expert interview

- **Respect encourages a supportive environment and generates more resources**

A respectful relationship between the partners was found to be significant in enhancing the transfer of knowledge within the partnership. Some of the experts emphasised that being respectful towards the academic team and towards the business team sustained the engagement of both partners, and therefore, more knowledge could be transferred. Respect was found in the way the partners were treated with courtesy and kindness. This was found to be helpful to encourage the KTP Associate to share and generate more ideas throughout the process.

In addition, respect is found when the partners, particularly the KTP Associate, are valued and recognised. This is shown when the KTP Associate is introduced into the company with a respectful title and role, such as Software Developer, or other title related to research development. This recognition allows the KTP Associate to feel part of the team and feel valued and recognised during the knowledge transfer. This has been found to stimulate the engagement of the KTP Associate with the other members of staff, as they are more open and willing to collaborate. In addition, respecting the differences between academia and business also helps in reducing culture clashes between partners.

Quotes from the participants
"There was a lot of mutual respect during the project. Everyone in the business knew why I was there. I was given a specific title and role; I was known as the Software Developer within the company, and was not referred as the student… So, it was really great. And yeah, there was a lot of mutual respect…" **(Expert 2, KTP Associate)**
"The company has a sensible director; he is very relaxed and laid back and knows how to manage staff diplomatically. He is open to other people's opinions and respects academia… He knows how

to value the staff... and it encourages me to share my ideas and opinions with him." **(Expert 14, KTP Associate)**
"They are very nice. We feel like a big family… nice behaviour. There is a lot of respect. They are so kind and nice, a very good working environment..." **(Expert 5, KTP Associate)**
"Academia and industry are very different, and you have to respect the strengths and weaknesses of both... There would be a culture clash if you don't respect the differences." **(Expert 23, Business Supervisor)**

Table 5.36 Quotes from the expert interview

5.2.7 Role of cognitive capital

There were several cognitive elements that were identified as influencing knowledge transfer in fostering innovation throughout these projects. Most of these elements found were quite similar to findings of the cross-case analysis, and thus confirm the earlier findings. Table 5.8 provides a summary of the cognitive elements that were found from the expert interviews.

Cognitive Capital
Shared understanding through clarity of the project balancing the institutional differences
Shared innovation mind set encouraging willingness to cooperate
Shared interests outside the project encouraging personal relationship
Shared set of performance goals leading to a more focused project
Being business-driven encourages passion toward knowledge transfer

Table 5.37 Summary of the cognitive elements in the expert interviews.

- **Shared understanding through clarity of the project**

A shared understanding through clarity / transparency of the process was a common element of cognitive capital emphasised by the experts. Most of the experts agreed that it is important to develop a shared understanding between the partners to ensure that their expectations would be managed throughout the process. According to the experts, a shared understanding needs to be present in the early phase of the project to reduce the risk in knowledge transfer. In the early phase of projects, many experts agree that it is important to communicate with and induct the business partners regarding the knowledge transfer details. The business client needs to have clear information on the project, the activities involved, the stakeholders' roles and the outcomes of the project. In addition, some of the experts stressed that it is important to identify some of the risks that could occur during the project. This will help to create awareness amongst the partners of these risks. This was highlighted by the experts, suggesting that the partners should give some scenarios, risk assessments and some predictions for how the project will

progress and what the final outcomes of the project will be. Furthermore, the experts stressed that it is important to write the case for the project in business language to meet a business level understanding.

Although it is important to have a shared understanding amongst the partners at the very beginning of a project, it is also important to develop a shared understanding during the other stages of the knowledge transfer process. For instance, it is important to provide updates on the progress of the work on the project and the achievements made throughout the process. This provides the partners with a better understanding of the process and enhances the willingness of the partners to engage in the project.

In addition to that, in fostering innovation it is important for the business partners to have a clear understanding of what the problem is that they would like to address within the company, and of what they want to get from the partnership. This stresses the importance of having a proper assessment of the project, so that the innovation can be delivered to meet their expectations. A proper risk assessment is also helpful in determining what is realistic for the project. This is to ensure that there are the right resources, capabilities and expertise for the project.

Quotes from the participants
"My project had a clear focused objective; it was helpful. This helped us to plan our work accordingly, we are clearer on what need to be done for knowledge transfer to meeting the objectives. We have clear direction on what to achieve" **(Expert 13, KTP Associate)**
"We provided a risk assessment for them. They had some predictions, the statistics. We warned them of the consequences for the project and how the project was going to benefit them. We provided a clear understanding of the project and we talked in their language, talked about profit. They needed profit. And things were working well at that time." **(Expert 14, KTP Associate)**
"Understand and appreciate the risk from the start. When you put the business case and start the initial discussion with the director of the company, you have to make sure that, obviously, you talk in the same language, and you have to agree a rapport, that you understand each other. That's very important. This type of dynamic is to minimise the risk. But also, throughout the project, it is important to have regular assessments. You got a target, KPIs; you got milestones. You must be able to meet them. Provide the business client with formal documentation that records the progress and project plan." **(Expert 19, Academic Supervisor)**
"They need to be clear about the whole process. At the first meeting we tried to be clear… what it is and what it is not... and we also highlighted that the KTP shouldn't be run like a consultancy. During

the project, we updated them with the progress of the project, so they could see where we were going..." **(Expert 20, Academic Supervisor)**
"As long as there is common understanding, common endeavour to everybody's benefit, it will go well." **(Expert 24, Business Supervisor)**
"A clear plan from the start. We did have some issues at the beginning. Luckily, in my case, we knew where we were going. We did have a clear whole plan or the project plan for the 18 months… That was helpful in making sure you knew where you were going and knew whether you had met the target and everything… Have that arranged at the beginning of the project. That was really helpful for our knowledge transfer..." **(Expert 26, Business Supervisor)**
"It was important to have a good and clear understanding of the project... and certainly they needed to check with us to make sure that the plan was achievable and realistic. The plan was accepted but it didn't make a lot of sense at first. For example, the output was, like, the KTP will provide ten jobs for our centre; it didn't say what the jobs were, what the jobs would be doing. It was, like, ten new desks, if it was really to happen. This would have been unrealistic for the business. Therefore, it was important to check it with the business..." **(Expert 27, Business Supervisor)**

Table 5.38 Quotes from the expert interview

- **Shared innovation mind set encourages willingness to cooperate**

Similar to the cross-case analysis, a shared innovation mind set amongst company staff appears to facilitate the fostering of innovation within partnerships. Some of the business partners were found to have changed their directions or policies to focus on innovation through doing more research and development activities. Companies have to slightly change focus more towards research. Some of the companies have an 'Innovation Space' and have a research team in-house to promote innovation value. This was found to enhance the openness of the staff to collaboration for knowledge transfer. They were more open and appreciative of the value of research. This was identified as supporting research and development activities. The company partners were more involved in giving feedback and the team were more motivated for the implementation of innovation.

Quotes from the participants
"The company was very accepting to change and innovate. They understood and valued the importance of research. They started to focus more on R&D activities. They were looking forward to transforming their business from being a follower to more like an influencer..." **(Expert 12, KTP Associate)**
"I feel like I was on board. Every member was open minded about the project. The company was very keen on innovation. They had an Innovation Space in-house. They were very interested in research and some academic work... They were very helpful in giving their feedback and opinions, on what could work and what could not work... It was good; we worked together in a unit." **(Expert 15, KTP Associate)**

"We looked for growth and innovation. What helped was to have somebody outside the business to give us new research and recent technology available to help with our productivity." **(Expert 25, Business Supervisor)**

Table 5.39 Quotes from the expert interview

- **Shared interests outside the project encourage personal relationship**

In developing and sustaining the relationship between partners, it is significant to have shared common interests outside the project. These common interests help to develop a good relationship with other individuals within the project. This helps to gain more contributions to the project in terms of ideas, input and immediate feedback from the partners.

Quotes from the participants
"It is good to have some conversations outside the project, have the same topic of conversation, which is not about the project. Chat with them... it is good. It helps to develop human relations. It makes things easier, easier to discuss problems, easier to get feedback and opinions from people." **(Expert 7, KTP Associate)**

Table 5.40 Quotes from the expert interview

- **Shared set of performance goals lead to a more focused project**

In fostering innovation, a shared set of performance goals and a common purpose for the project were found to lead to engagement between partners and help to define the purpose of the knowledge transfer. In a KTP, the main project goal is different from individual objectives and benefits that will be gained at the end of the project. A shared common goal ensures both partners are responsible for making sure that the project will achieve the main target and will not be diverted outside its main scope and the activities conducted will be aligned with the project scope. This was also found to avoid misunderstandings about the project and to provide more opportunities to exchange resources and input for the project.

Quotes from the participants
"The academics must adapt to the environment. Putting the company's interests first usually will help me to cope with the problem. Because if the company's interests in the main are obtained, through that process it would benefit. So, you try to understand the company culture and have a shared goal with the company..." **(Expert 8, KTP Associate)**
"The Associate sometimes is trying to do many things at the same time and gets diverted from the project. It is important for the Associate to focus on the main purpose of the project and it is important to ensure that the main objective is relevant and measurable..." **(Expert 19, Academic Supervisor)**

"We have a very clear requirement and a very clear goal of what we wanted out from the project... Sometimes they might have different objectives. It depends on what they want… Some like the academic or academic data scientist, they might just want to publish papers for conferences… but the key goal is to develop and implement a product with value... The academics need to prioritise the project based on the main goal set." **(Expert 23, Business Supervisor)**

Table 5.41 Quotes from the expert interview

- **Cultural fit / being business-driven**

The expert interviews highlighted that the cultural fit of the academics / extent to the academics are business-driven were found to facilitate the fostering of innovation within the company. Most of the experts emphasised it was important to hire an Associate that has a passion for business, whereby they not only focus on research but always expect to develop that research and implement it for practical use. According to the experts, this is one of the important criteria that needs to be considered in hiring the right Associate for the project. Being business-driven has a favourable influence on knowledge transfer, particularly in implementation activities. This is because a passion for business leads the Associate to be more productive, demonstrating project management and risk-taking behaviour. Furthermore, if the Associate is business-driven, this could also balance the institutional differences between the partners, as the researcher is interested in moving in the business' direction and making the company their priority.

Quotes from the participants
"I quite like their (business) ways. Back then, I felt it was only one way, where we (academics) only did research, but within the project, it was more than research, something that I never done before. We investigated different ways to do it, and we were expected to produce results at the end of the week, which was more productive, and I was really enjoying it..." **(Expert 2, KTP Associate)**
"I had good enthusiasm to drive the project... It is also important to think of yourself as a project manager. This made me feel more of a part of the team. I was churning out product every month, which the business really wanted to see... It was challenging, but it was really a good experience. I learned to understand their working style..." **(Expert 7, KTP Associate)**
"I really wanted to stay in this (business)... It was something that I really wanted to do... to use the knowledge that I studied and again to utilise those skills, and make an impact within the company..." **(Expert 11, KTP Associate)**
"It is important to select the right associate for the project that is interested in applying research that could make an impact. Hiring the wrong Associate who is not open, not willing to learn and not making progress, the Associate may have skill but is not willing to adapt, be open and understand the knowledge in the business, would be difficult..." **(Expert 18, Academic Supervisor)**

Table 5.42 Quotes from the expert interview

5.3 Conclusion

This chapter has discussed findings from the expert interviews. The expert interview strategy was chosen to maximise data triangulation so that the data could be investigated from different perspectives. This is regarded as a useful technique in exploratory studies (Glaser & Strauss, Eisenhardt, and Sole & Edmondson (as cited in Swan et al. 2010). In addition, the expert interviews were employed to focus on informing recommendations regarding the influence of social capital in terms of knowledge transfer in fostering innovation to benefit the partnership between the universities and TBSFs. A total of 27 expert interviews were analysed. The thematic data analysis process introduced by Braun and Clarke (2006) was applied to analyse and report patterns and themes within the qualitative data [see section 3.6.1 for analysis of the interview data].

Chapter 6. Discussion and Conclusion

6.0 Introduction

This chapter discusses the findings and contributions that have emerged from this study and concludes the study. The outline of the chapter is presented as follows: first, the overall aim of the research is revisited and the research questions are outlined; second, summarised the findings from both the case studies and the expert interviews are summarised; third, a theoretical model outlining the role of social capital in facilitating knowledge transfer to achieve innovation is presented, identifying academic and practice implications as well as future research opportunities.

6.1 Summary of the aim and research questions of the study

The overall aim of this research was to investigate the implications of social capital for knowledge transfer in achieving innovation within the context of the partnership between universities and TBSFs in the UK. The aim of this research was mainly, upon consideration, to fill in for the limitations of previous studies that have integrated knowledge transfer, innovation and social capital. As Filieri and Alguezaui (2014) suggested, future study should consider the three bodies of literature together as they have been found to be complementary, while Alexander et al. (2016), pointed out that "transferring knowledge for innovation was recognised as being of growing importance, but the field is under-researched, particularly in terms of developing practical insights into stimulating, managing and delivering success to the organisations who participate in these types of knowledge transfer projects; where success is realised in terms of innovation". As a result of the limitation of the existing studies, three questions were identified. The research questions that guide this study are:

Main research question:

I. How does social capital influence knowledge transfer in fostering innovation in partnerships between universities and TBSFs?

The following sub-questions provide additional scope to this study:

II. How does knowledge transfer foster innovation in partnerships between universities and TBFSs?

III. What are the challenges for knowledge transfer in fostering innovation within partnerships between universities and TBSFs?

These questions were addressed in the case studies and the expert interviews (as described below).

6.2 Responding to research questions of the study

6.2.1 The implication of knowledge transfer on innovation

In line with the interpretive perspective, this study has identified knowledge as not absolute, as a form of understanding, and links to the capability of action. This described the subjective views of knowledge and emphasised knowledge as an ongoing accomplishment, continually emerging rather than as an object (Tsoukas, 1996). Therefore, this finding emphasised on the importance of social process to gain knowledge continuously and leading to capability for action (Garavelli et al., 2002; Hunt, 2003; Jasimuddin, 2012; Wasko and Faraj, 2000; Schultze, 1999). As such the study also has identified that knowledge transfer as an interactive process and results in bi-directional interaction between the knowledge sender and the recipients, in which knowledge is actively constructed rather than simply transmitted as highlighted by Rosli and Rossi, (2015). The perspective meeting the definition of knowledge transfer is the process through which one unit is affected by the experience of the another (Argote and Ingram, 2000).

Typically, two main classifications of knowledge that have been discussed within the literature, namely, tacit and explicit knowledge (Jasimuddin et al., 2005; Nonaka and Takeuchi, 1995; Polanyi, 1966). Consistent with this, the finding of this research identified two groups of knowledge, explicit and tacit knowledge. Explicit knowledge mostly has been described as up-to-date facts, information, theory or facts on the textbook or recent research. On the other hand, tacit knowledge has been referred to as experience, skill, and technical knowledge capability. This research also identified that both categories are not stand-alone and stressed the importance of added skills and experience to allow knowledge to be valuable, which lead to performing a certain action. Consequently, this highlighted the importance of tacit knowledge to support the understanding and interpretation of explicit knowledge, which has been emphasised by Polanyi, (1962). Furthermore, it also has supported the ‘knowledge-as-continuum’ perspective, which has to be emerged from the interpretive perspective, that tacit

knowledge and explicit knowledge should not be perceived as two independent types of knowledge (Jasimuddin et al., 2005).

Whereas some scholars (e.g. Santoro et al., 2018; Grillitsch et al., 2019; Kogut and Zander, 1992; Grant, 1996), has perceived knowledge as significant to support innovation and leading to competitive advantages within the firm This research acknowledged that knowledge is significant as a basis for innovation within the company and also recognised knowledge enables a business to make better decisions and to perform better action. On the other hand, this study also has recognised that knowledge is significant for personal and professional development of employees within the partnership.

Meanwhile, with reference to research question two, namely, to explore how does knowledge transfer foster innovation in partnership between universities and TBSF. The findings from the case studies and the expert interviews have shown that knowledge transfer through partnerships between universities and TBSFs has significant implications for innovation outcomes within firms. In the previous studies, knowledge transfer has been underlined as significant in fostering innovation outcome (Zubielqui et al., 2019, Schweisfurth and Herstatt, 2016; Perkmann et al., 2011). However, in the literature the concept on innovation outcome was mainly focused on the objective view of innovation; mainly emphasised on new products introduced, increased in financial performance, new patent, and innovation capabilities (e.g.Van Wijk et al., 2008; Santoro et al., 2018; Grillitsch et al., 2019). This research has identified that knowledge transfer through partnerships between universities and TBSFs has contributed to several types of innovation outcome from subjective perspective.

Consistent with the Schumpeter's (1934) definition of innovation, the study identified four forms of innovation: i) product innovation, such as the introduction of a new product, technology development, new software application or introduction of new prototypes with new improved features; ii) process innovation (new ways of delivering products or services); iii) market innovation (new ways of marketing products or services); and iv) organisation innovation (new R&D unit). Whilst, Schumpeter (1934) considers only four forms of innovation outcomes, the findings underline that the combination of product innovation and process innovation could be achieved at the same time. This study also underlines that the introduction of new products has result in changes into the production process, which was identified to be more efficient, and cost efficient. In addition, the findings also highlighted that

new reputation within the company has also been perceived as innovation outcome within the partner. The study identified that the transfer of knowledge has significantly enhanced the status of their company, which potentially expand their market. This means that innovation outcome has been perceived beyond than the common objective view of innovation within the literatures. This study highlighted that there are several types of innovations to have been perceived as an outcome through the knowledge transfer between university and TBSFs partnership.

Table 6.1 presents a summary of the knowledge and innovation outcome from the case studies and the expert interview.

Unit analysis	Experts	Cross-case
Knowledge		
Leading to action	√	√
Two main types of knowledge: Explicit and tacit (textbook, technical knowledge, experience)	√	√
Value information		√
Basis for business growth and innovation	√	√
Basis for personal and professional development		√
Form of understanding	√	√
Can be source externally	√	√
Knowledge is not absolute	√	
Knowledge transfer		
Two-way process, combining and sharing knowledge, continuous interaction	√	√
Initiated with a specific objective; to foster innovation; solve company problem	√	√
Embedding specific knowledge that relates to company problem	√	√
Collectively benefits all partners	√	√
Flexible to modification upon agreement	√	√
Formal knowledge transfer process with structured work plan	√	√

Innovation outcome		
New knowledge, new ideas leading to new product development; prototypes, new software application with new features (product innovation)	√	√
New solutions introducing new ways of working (process innovation)	√	√
Development of new technological solution to improve existing product as well as improving internal processes (product innovation & process innovation)	√	√
Advance technological knowledge leading to new ways to market the company's products (market innovation)	√	√
New understanding leading to the development of new R&D unit (Organisation innovation)	√	
New knowledge and changes to technology leading to new reputation / new status within the company	√	

Table 6.1 Summary of the knowledge and innovation outcome from the case studies and the expert interview

6.2.2 The Challenges for Knowledge Transfer in Fostering Innovation

With reference to research question three, namely, to explore the challenges for knowledge transfer in fostering innovation within partnerships between universities and TBSFs. The findings show that there are several challenges for knowledge transfer to realise innovation outcomes during these partnerships. Most of the challenges in achieving innovation outcomes were found to be quite similar to those in the existing literature that has emphasised the main barriers for knowledge transfer in academic partnerships. In the literatures, it was identified that most of the challenges concern the differences in organisational expectations, objectives, purposes, and norms (Bruneel et al., 2010; de Wit-de Vries et al., 2018; Plewa, 2013). Interestingly, this study extends new several challenges that have not been highlighted in the previous studies. These includes; diversion from the project focus, lack of proactive engagement (lack of openness) between partners, difficulties in recruiting a suitable KTP Associate, fear in adopting new solutions and geographical issues.

Furthermore, in the literature, it could also be noted that previous studies have mostly put significant effort into solving the problems at an early phase of the knowledge transfer (Thomas and Paul, 2019; de Wit-de Vries, 2018; Bruneel et al., 2010). It was found that there is lack of studies that focus on the actual initiation and collaboration phase. This study analysed the challenges throughout the partnership and found that the challenges should not only be

addressed in the early phase of the project, but that it is also important to put effort into managing the overall challenges throughout the whole process of partnership. This study also highlighted that it is significant to mitigate the knowledge transfer challenges in fostering innovation in the partnership over time.

6.2.3 The Implication of Social Capital on Innovation

With the reference to the main research question, namely, to understand how social capital influence knowledge transfer does in fostering innovation in partnership between universities and TBSFs. The study identifies that social capital is helpful to manage challenges encounter in the knowledge of transfer in fostering innovation. In the literature, social capital has been highlighted to enhance knowledge transfer to achieve innovation outcome (Steinmo, 2015; Plewa et al., 2013; Filieri and Alguezaui, 2014). However, there are limitation on comprehensive understanding of the three dimensions of social capital in facilitating knowledge transfer to foster innovation. This study provide in-depth understanding of the implication of social capital in facilitating knowledge transfer for fostering innovation.

The findings show that social capital established is beneficial in facilitating knowledge transfer to foster innovation outcomes. The study identifies the significant influence that each dimension of social capital has in facilitating knowledge transfer. The study also recognises that three dimensions of social capital are interrelated with one another. This confirming the acknowledgement in the social capital framework of Nahapiet and Ghoshal (1998), who emphasised that each dimension may posits an indirect relation to facilitate knowledge transfer (or described as intellectual capital). While the findings has identified that there are interactions between the three dimensions, it is confirmed that there is also a direct implication of each dimensions to facilitates knowledge transfer in fostering innovation. This provides a new understanding on social capital, which shows that the three dimension is not only interrelated with one another but there is also a direct implication of each dimensions to facilitate knowledge transfer (as shown in Figure 6.1).

Whereas, previous study has suggested the importance to develop social capital to promote knowledge transfer, however, they have not acknowledged the importance to sustain the capital overtime (Steinmo, 2015; Plewa et al., 2013; Filieri and Alguezaui, 2014). The study also acknowledges the importance of developing and sustaining social capital among the partners

through the whole process of partnership. This is because it was identified that social capital between partners can become lower and hinder knowledge transfer is it is not sustained over time.

- **Role of Structural Capital**

In the literature, structural capital has received many attentions compare to the other two dimensions of social capital. Most studies commonly viewed the structural dimension of social capital through focusing on network analysis such as based on the number of ties, or network size (Filieri et al., 2014; Bartkus and Davis, 2009; Burt 2000; Yli-Renko et al., 2001). Therefore, the nature and the structure of relationship of structural capital among stakeholders within the project has not been explored in-depth, particularly in the context of partnership.

Although, prior research has suggested regular face-to-face communication and workshops facilitate knowledge transfer by improving the partners' goals and developing share understanding (de Wit-de Vries, 2018; Plewa et al., 2013). However in establishing the structural connection between partners within the partnerships, this study has found that partners use different activities and different platform to promote regular communications among themselves. The findings have found that regular communication through formal meetings and daily face-to-face communication allows partners to be proactive in the support of knowledge transfer. Regular communication enhances knowledge transfer by encouraging shared understanding, leading to compromising, reduce stress, enhances clarity of the project and also developed closed relationship between partners. This study has also noted that regular communication is also needed through all phases of the partnership to support the sharing of knowledge, and to develop a shared understanding between the partners. This validates Bourdieu's (1986) argument that interactions are a precondition for development and sustain a dense social capital.

To encourage bi-directional interactions and to support the development of a strong relationship between the partners, it is beneficial for the partners to be located physically close to each other. Consistent with Inkpen and Tsang's (2005) argument, proximity helps the formation of network ties and facilitates interpersonal interactions through which knowledge is transferred while online platforms have been found to reduce the distance between partners and enhance communication. This study extends the literature on the influence of interactions via online platforms. There was evidence that partners rely on more recent technology

applications, such as Slack and Google Docs, to interactively communicate with their each other. These technologies enable a continuous and instant transfer of knowledge and information throughout the process. Furthermore, online platforms and project management tools are fruitful in enhancing the transparency of projects.

The study also contributes to the existing literature by highlighting that on-going interaction through informal activities has a favourable influence on generating innovation outcomes. Informal communication facilitates instant feedback and supports decision making. Consistent with Nahapiet and Ghoshal's (1998) arguments, informal or casual communication provides unplanned and unstructured opportunities for coming together that may lead to the development of new knowledge and maintains the relationship between the partners.

Whereas in previous studies commonly discussed structural capital in term of frequency of communication, this study explore structural capital more in-depth by looking into the nature of structural capital. The study has found that when firms are small and have a less formal hierarchical structure, this enhances open communication between the partners, which encourages proactive engagement in knowledge transfer. This has also assisted the direct involvement of TBSFs' senior teams and of other members of staff in supporting the transfer of knowledge. This validates Grant's (1996) argument that centralised decision making by members of the network will reduce the sharing of knowledge. Furthermore, the study has highlighted that team size plays a significant role in facilitating knowledge transfer in achieving innovation. When the team / firm are small in size, this enables personal ties, encourages an open relationship, and facilitates the transfer of knowledge in achieving innovation.

The results have highlighted the position of prior ties in enhancing communication and helping to develop a collective understanding between the partners. The findings, however, differ from the existing literature which has highlighted that prior ties between universities and firms have a significant influence on the value of innovation (Tsai et al., 2014; Petruzzelli, 2011). While previous studies have indicated that prior ties contribute to a rise in trust between teams (Zucker, 1987, cited in Petruzzelli, 2011), this research has shown that prior ties contribute to a shared understanding and improved communication between partners.

Network structure with a diversity of skills and knowledge is noted to be important to enhance diversity of information and fruitfulness of innovation outcomes. Diversity of skills and

knowledge provides valuable resources that are fundamental to innovation outcomes. This corresponds with Maurer and Ebers' (2006) arguments that stress the configuration of firms' social capital across different peoples create a more differentiated and complementary composition of social capital.

- **Role of Relational Capital**

Correspondence with previous studies, (Easterby-Smith et al., 2008; Steinmo, 2015; Battistella et al., 2016) that emphasised the importance of relationship between actors in facilitating knowledge transfer, the study has highlighted the importance of relational capital for facilitating knowledge transfer in achieving innovation. In the literature, trust have been perceived as one of the important constructs for relational capital. For example, Van Wijk et al., (2008) found that trust to be the most important dimension of social capital that drives the university-firms collaboration. It is common that previous studies emphasised trust through regular communication and through prior connections (Steinmo and Rasmussen, 2018; Steinmo 2015; de Wit-de Vries, 2018).

However, this research have highlighted different types of trust established between partners in supporting the transfer of knowledge to foster innovation. Trust is largely based on the capabilities and proven performance of the university partners. These types of trust relate in form to beliefs about competence / capability and reliability, as identified by Nahapiet and Ghoshal (1998). Interestingly, this study has additionally indicated that trust is based on proven performance sustaining the relationship between the partners and strengthening the trust that is present at the beginning of a project. Proven performance over time plays a significant role in partnerships. This study has highlighted that trust can be lowered if not supported by proven performance during the project which reduces interest in the knowledge transfer. This study has also indicated that trust could lead to project management behaviour on the part of KTP Associates, but the Associate must feel comfortable within the project. Also, the study has highlighted that trust could reduce organisational distance between the partners by reducing vagueness in the project.

The construct of relational capital is also identified through professional and friendship-based relationships between partners. Although previous research has highlighted the significance of friendship-based relationship in fostering innovation outcomes (e.g. Perez Luno et al., 2011; Capaldo et al., 2007; Tsai and Ghosal, 1998), however their research focus on the network

analysis rather than nature of the network. As such previous studies indicated that getting knowledge from friends in other organisation increase innovation outcomes. For example Tsai and Ghosal (1998) highlighted that informal social relations and social arrangements encourage productive exchange and combination of resources and thereby promotes product innovation. Meanwhile, this research highlight the nature of the relationship between partners that facilitate knowledge transfer within the project to foster innovation. This study has indicated that friendship-based relationships and professional relationships are important to determine knowledge transfer in achieving innovation within partnerships. Through friendship-based relationships, the challenges for knowledge transfer can be reduced as it provided a more supportive environments and sense of belonging to the company. The research has identified that a professional relationship could develop into a friendship-based relationship over time as a result of on-going regular communication. Both types of relationship are regarded as important in supporting the transfer of knowledge to achieve innovation outcomes.

On the hand, the significance of commitment, of feeling the responsibility to prioritise a project and being devoted to performing within the team has been found to have a favourable influence on knowledge transfer. This study does not agree with commitment as suggested by Nahapiet and Ghoshal (1998), who suggest it to be direct expectations developed within certain expectations. This study also does not favour the commitment suggested by Coleman (1990), who argues that commitment represents a duty or obligation to engage in future action and arises from frequent interaction. However, commitment in this study, agrees with Fairclough's (1994) definition that commitment conveys a sense of responsibility and given priorities to others, as suggested by Fairclough (1994). This is in line with Drucker (1985) that innovation requires diligence, persistence and commitment.

This study has also highlighted the role of reciprocity in ensuring ongoing supportive knowledge transfer in fostering innovation. Both partners need to have understood the value and the collective benefits that they will receive from engaging in the project's activities. This is consistent with prior research indicating that knowledge transfer is facilitated by a sense of reciprocity, in which individuals believe that their efforts will be reciprocated (Putnam, 2005; Wasko and Faraj, 2000). Where, when there is a reciprocity, individual believes on a fair environment, constructed on the view that that their effort will be reciprocated.

Furthermore, the study has distinguished other variables in the relational dimension that are relevant in promoting knowledge transfer for innovation. These elements are compromise and respect. While compromise cultured between members has been highlighted by Inkpen and Tsang (2005), however, their study concerned on strategic alliance and encourage to partners to adopt similar policies to reduce the cultural conflict. Whereas, this study highlighted, compromise balances institutional differences and encourages cooperative relationships. The findings have shown that compromise could help to reduce institutional conflict between the partners. The study has highlighted that doing research parallel with development work is one of the best approaches to compromising with the TBSFs. The TBSFs are more willing to move forward on the project in a parallel approach that speeds up the process.

Another essential element of relational capital this research has identified is respect. In contrast, the literature on social capital has highlighted respect as one of the aspects of the relational dimension that influence someone behaviours (Granovetter, 1992; Bourdieu, 1986). However, respect has not been highlighted as of the important elements for facilitating knowledge transfer in fostering innovation literature. This study has identified as encouraging a helpful environment and generating more resources, as well as a sense of belonging. Even though KTP Associates are employed by universities, they need to have a respectful title and role within the TBSFs. This recognition allows the Associates to be respected and increases the willingness TBSF staff to engage in knowledge transfer. Furthermore, the present of respect increases openness and promotes a good working environment. Both partners are more willing to cooperate and transfer more knowledge.

- **Role of Cognitive Capital**

In the literature, cognitive capital is highlighted as the shared vision and common understanding among actors in the network which facilitates the common understanding in achieving collective goals and outcomes (Steinmo and Rasmussen, 2018, Steinmo, 2015; Nahapiet and Ghosal, 1998). Consistence with the previous studies, this research highlight the significance of cognitive in terms of several elements. The most crucial element of cognitive capital in fostering innovation is a shared understanding of the project. This is achieved through communicating the project using language understood by the business. It is important to promote a shared understanding through language that is understood in the business context. This is in line with Nahapiet and Ghoshal's (1998) view that it is important to gain access to information and that, to the extent that their language and codes are different, this keeps people

apart and restricts their access. This study has also highlighted the importance of transparency in developing a shared understanding among the partners. Transparency of a project helps to manage different expectations between the partners. This research has highlighted the importance of scenario understanding, risk assessment and prediction in order to develop a shared understanding. This is consistent with Wack (1985), who noted that presenting other ways of seeing the world and decision making scenarios allow the breaking down of one-way views, providing people with the ability to re-perceive reality. Several interactive tools, such as project management tools, online blogs and interactive presentations were found to be useful in these projects.

While existing literature has stressed on the importance of shared language and codes to develop shared understanding (Nahapiet and Ghosal, 1998), this research has highlighted the importance of developing a shared innovation mind set between the partners. A shared innovation mind set encourages openness in engaging with and transferring more knowledge. An innovation mind set helps the members of the firm to recognise the value of knowledge and promotes the capability for openness in cooperating for innovation (Chesbrough, 2017). TBSFs have been found to have developed an innovation mind set by introducing innovation policies and encouraging innovation, such as by having innovation spaces to create awareness.

Furthermore, the study has also identified the importance of shared interests outside the project. This highlighted the importance of to have common interests outside the project help to develop good relationships with other individuals within the project. The shared outside interests promote interpersonal relationships that promote an interest in the project, which is conclusive for innovation outcomes. This finding is contrast with existing research that only focus shared interest in term of goals similarity (de wit Vries et al., 2018). The research has also found that a shared or common institutional background and technical knowledge encourages a shared understanding between partners. This supports Nahapiet and Ghoshal's (1998) cognitive view that it is important to have some overlap in knowledge to be able to combine information. This study has highlighted the significance of a shared set of performance goals. This has been found to lead to a more focused project and helps both partners to stay on track without being diverted from the original goal, such as by focusing too much on research and publishing papers instead of development work. Consistent with Inkpen and Tsang (2005), shared goals promote mutual understanding and the transfer of knowledge.

In the literature, studies has highlighted the importance academic expertise and educational background to develop common understanding (de Wit-de Vries et al., 2018; Steinmo and Rasmussen, 2018). Whilst this study agrees with this finding, this research also has highlighted the significance of the academic partners being 'business-driven' to facilitate knowledge transfer in fostering innovation. This is one of the important criteria that needs to be considered in hiring the right Associate for the project. Being business-driven and having a 'cultural fit' have a favourable influence on knowledge transfer, particularly in the implementation of activities which encourage the Associate to be more productive, and to demonstrate project leadership and risk-taking behaviour. These qualities could be related to innovation champions to support the project. The term 'cultural fit' explains how actors forge an identity based on the sharing of empathy, effectuation and honesty (Starkey and Tempest, 2004). This quality on the part of the Associate is therefore relevant to achieving innovation within projects. An ability to adopt business perspectives appears vital.

Finally, the research acknowledges the importance of an open communication policy to encourage participation among the partners. Open communication policy is one of the new themes emerge within the existing literature. The open communication encourages engagement and communication between partners and enhances the transfer of knowledge. This has been found to increase awareness and alertness among members of the firm to sharing and implementing information for potential future business innovation (Gangi et al., 2012). Table 6.2 presents a summary of the findings on the influence of social capital in facilitating knowledge transfer in achieving innovation.

Unit analysis	Experts	Cross-case
Challenges		
Managing expectations – time and outcome	√	√
Limited resources and capacity		√
Lack of understanding / communication difficulties	√	√
Lack of proactive engagement (lack of openness)		√
Different institutional objectives / lack of predefined objectives	√	√
Fear of risk in adopting new solution	√	

Difficulties in recognising the outcome	√	
Recruiting suitable KTP Associate	√	
Diverting from original project focus	√	
Geographical issues leading to difficult communication	√	
Structural capital		
Regular communication through meetings and daily face-to-face interaction encouraging shared understanding, compromising and enhancing the sharing of knowledge Structural → Cognitive → Relational	√	√
Proximity between partners drives consistency and shared understanding, supports bi-directional information flow, creates familiarity that helps to contribute to better communication and rapport relationship Structural → Cognitive Structural → Relational	√	√
Online platform providing close network configuration and fast access to information, enhancing clarity; SLACK, email, Google drive Structural → Cognitive Structural	√	√
Informal communication leading to instant feedback and decision making- reduce stress lead to clarity and also develop relationship Structural→ Cognitive Structural → Relational	√	
Prior professional connection enhancing trust and shared understanding, encouraging personal interaction Structural → Cognitive → Relational	√	√
Diversity of skills forming creative input and solutions for the transfer of knowledge Structural	√	√
Small number of team members with less formal hierarchy enhancing input and feedback for development of innovation- create close network Structural → Relational	√	
Relational capital		
Trust based on capability enhancing efficiency of knowledge transfer; effective feedback for generations of ideas and implementation of activities; encouraging of project management behaviour; sustain ties Relational → Structural Relational	√	√
Trust based on proven performance sustaining relationships and access to additional input Relational→ Structural	√	√
Professional relationship supporting proactive engagement between partners; can be developed to friendship relationship	√	√

Relational		
Friendship-based relationship driving a supportive environment Relational → Cognitive Relational → Structural	√	√
Commitment leading to prioritising the partnership and encouraging innovation effort Relational	√	√
Compromise balancing the institutional differences Relational → Cognitive	√	√
Reciprocal relationship encouraging willingness to engage and sustaining cooperation between partners Relational → Structural	√	√
Respect encouraging a helpful environment and generating more resources; sense of belonging Relational	√	
Cognitive capital		
Shared understanding through clarity of the project balancing the institutional differences Cognitive	√	√
Shared innovation mind set encouraging willingness to cooperate Cognitive → Structural	√	√
Sharing of common institutional background and technical knowledge encouraging shared understanding Cognitive		√
Shared interests outside the project enhancing input for knowledge transfer and encouraging relationship & sustain connection Cognitive →Relational →Structural	√	√
Shared set of performance goals leading to a more focused project, lead to compromise Cognitive → Relational	√	√
Being business-driven encouraging passion toward knowledge transfer Cognitive	√	√
Open communication policy; encouraging an open environment; encouraging input Cognitive →Structural → Relational		√

Table 6.2 Summary from the findings on the influence of social capital in facilitating knowledge transfer in achieving innovation

Based on the finding discussed, this study proposes a conceptual framework that illustrating the nature and implication of social capital for knowledge transfer in fostering innovation within the context of partnerships between universities and technology-based small firms (TBSFs) in the UK. Figure 6.1 presenting the conceptual framework of the role of social capital in fostering innovation through knowledge transfer between universities and TBSFs.

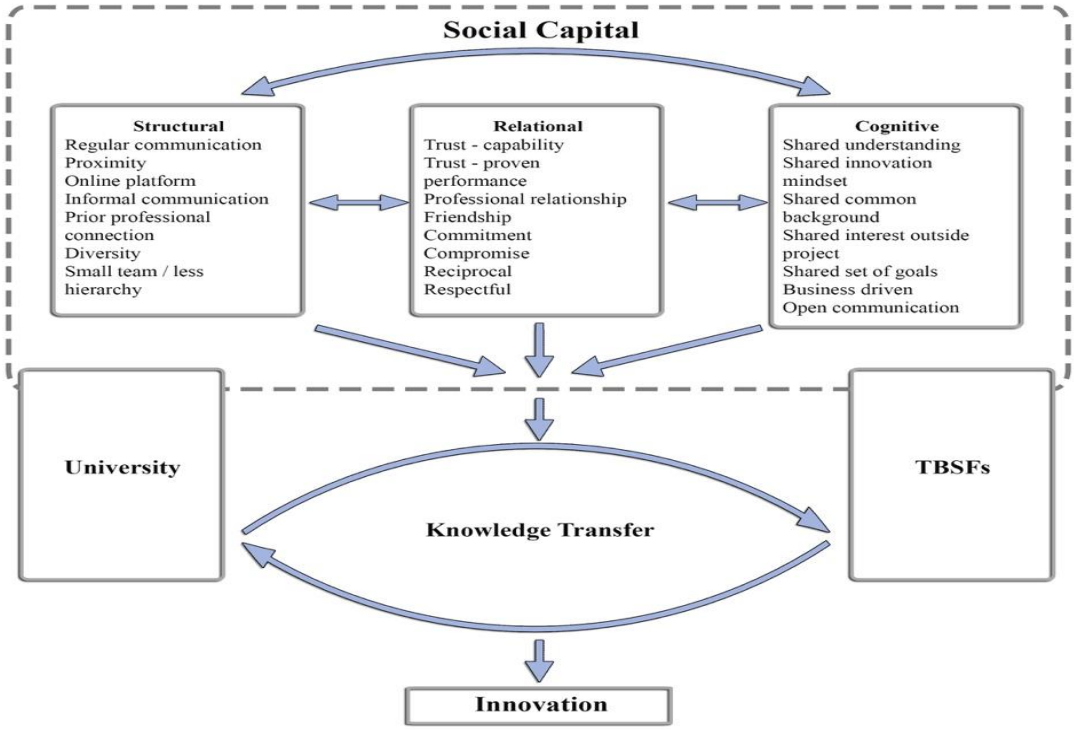

Figure 6.1 The role of social capital in fostering innovation through knowledge transfer between university and TBSFs

6.3 Contributions of the Study

- **Theoretical contribution**

This study provides an empirical understanding of how social capital influences the transfer of knowledge in fostering innovation in the context of partnerships between universities and TBSFs. This study has contributed to past research and help to build new theory within this area. Prior study has stressed the importance to explore knowledge transfer, innovation and social capital together (Filieri and Alguezaui, 2014; Perez-Luno et al., 2011; Steinmo and Rasmussen, 2018), however it is under-researched. There has no empirical study has developed a conceptual framework developed which combines knowledge transfer, innovation and social capital within the partnership between universities and TBSFs.

By conducting a total of forty interviews with stakeholders who were involved in and experienced these activities, the study has developed a conceptual framework for understanding the interrelations between social capital, knowledge transfer and innovation in the context of partnerships between universities and TBSFs. The conceptual framework emphasises the multidimensionality of social capital through its structural, relational and cognitive dimensions to provide more comprehensive details of social capital.

The framework shows that the three dimensions of social capital are important for fostering innovation through knowledge transfer. These social capital dimensions are interrelated, and it is also noted that social capital is stored in each dimension, which facilitates knowledge transfer to foster innovation. The study also acknowledges the importance of developing and sustaining social capital among the partners through the whole process of partnership. Hence, this study contributes to the previous research, which focuses on the three dimensions of social capital in facilitating knowledge transfer to foster innovation in the context of partnership between universities and TBSFs. This is a response to the call from scholars to illustrate social capital as a multidimensional system (Steinmo and Rasmussen, 2018, de Wit-de Vries et al., 2018). Thus, the research has provided a holistic and a more comprehensive picture of the three dimensions of social capital in reinforcing innovation outcomes from knowledge transfer and is a shift away from the structuralist approach to social capital.

Furthermore, the study also makes a contribution by providing a better understanding of the role of social capital in facilitating knowledge transfer throughout the process of partnership. To date previous studies has mainly focus on implementation phase for knowledge transfer (de Wit-de Vries et al., Filieri and Alguezaui, 2014). This is in response to the limitations of studies that mainly focus on the implementation phase. The study also contributes to the narrow view of the range of knowledge transfer from universities in terms of innovation output that generally focuses on patents and IP. This study confirmed that several output of innovation from the transfer of knowledge, such, market innovation, organisation innovation and new enhanced company status.

- **Practical implications**

In terms of practical contributions, this research has provided a list of recommendations to benefit future partnerships between UK universities and TBSFs. The recommendations are based around the challenges that partnerships commonly encounter during the development of innovation outcomes. The recommendations are to guide knowledge transfer partnerships between universities and TBSFs, to create awareness and possible new strategies to enhance the knowledge transfer process in achieving innovation outcomes. The recommendations provide understanding in assisting diverse stakeholders within the partnerships. Business managers can be well-prepared when targeting resources to support these relationships. Knowledge transfer offices, universities and other agencies that are involved in such

partnerships could emphasise the explicit mechanisms and resources for future partnerships, as this will help to facilitate the transfer of knowledge to achieve innovation. The list of these recommendations is presented below.

i. Promote regular communication, formal and informal

The transfer of knowledge within a project should promote more interactive communication between both partners. Both formal and informal mechanisms, such as meetings, social events and daily face-to-face communication are crucial to the transfer of knowledge within projects. Formal mechanisms are important to enforce a formal environment in which all the important stakeholders are required to participate. This will help two-way interactions to discuss and brainstorm the development of innovative solutions within the company.

On the other side, formal communication needs to be supported by some informal communication channels between partners. Informal communication contributes to a calm and relaxed environment and provides opportunities for more openness in expressing ideas and feedback around knowledge transfer. Informal communication can also help to fill the gap in formal communication because it can be done faster than through formal meetings. Furthermore, it will also help participants improve their relationships to reach common decisions on certain matters.

Nevertheless, partnerships need a combination of formal and informal communication between partners. It is also important to communicate the project goals and vision relentlessly. This is to ensure that both partners are explicitly clear on the project's goals and understand the value of the project. These are particularly important to developing a shared understanding and active engagement between both partners, and lead to the generation of more knowledge input for the development of innovative solutions within the company.

ii. Consider the proximity and location of the business partners

As knowledge transfer is identified as a two-way interaction between partners, it is therefore important to reduce the distance between the partners. It is recommended that the university Associate be placed in the company partner. In addition, it is also essential to make sure that the university and the firm are geographically close. This is particularly important to allow more direct communication between all stakeholders and to allow more access to knowledge. Furthermore, technical information and skills can be transmitted faster between partners when

their location is closer. It is also helpful to develop a close relationship and promote regular communication between the partners. Furthermore, it can help to reduce cultural differences between universities and businesses, as both partners can adapt and learn about their differences faster. It is important for the company partner to monitor the KTP Associate's progression and to facilitate coordination.

iii. Promote the application of an online platform and project management tools

To support the transfer of knowledge, it is important to use online communication such as email, Slack, shared drives and other project management tools. Online platforms and project management tools can help to reinforce information about the project. Electronic networks such as Slack can help partners to communicate and access knowledge about the project. They help to facilitate mutual understanding of the project and to reduce the cognitive distance between partners. Furthermore, an online platform and project management tools, such as Milestones Achievement, can relentlessly reinforce the clarity of the project.

These platforms are also useful for developing social ties between partners, as they allow the distance between partners to be reduced, and improve the network between the partners. These platforms contribute towards reliable and fast access to knowledge. The transfer of knowledge requires access and interaction between partners. Thus, online platforms are particularly useful when there is distance between the partners.

iv. Value the diversity of skills brought by both partners

It is important to inform and promote to both partners the value of the diverse skills and attributes that are brought into the partnership. Both partners need to be aware that innovation in the partnership is the result of combining each other's knowledge and that they both depend on each other to achieve innovation outcomes. Both partners need to understand that both the universities and the business firms are required to contribute their skills and experience, and to interdependently complement each other's differences to successfully embed and implement knowledge that has an impact on innovation in the company.

v. Company partners to have an open working environment and informal hierarchy approach

It is recommended that the company partner introduces some type of informal hierarchy approach to the KTP Associate. It is important for the KTP Associate to have open and direct

communication with members of the company. This can be achieved by letting the KTP Associate work alongside other members of staff in the company or in the company's R&D team. This is important to reduce the institutional gap between partners and to enhance communication. An informal hierarchy and open working environment can facilitate smooth within-team interactions, and thus enhance the transfer of knowledge.

vi. Recognise the value of professional and friendship-based relationships between partners

A sixth recommendation is that both partners should value the importance of having professional and friendship-based relationships between themselves. While most projects start off with a professional relationship, it is important for both partners to take advantage of this relationship as it is fruitful for professionally supporting interaction between partners in achieving innovation outcomes.

With strong efforts to establish bonds between partners, a professional relationship could grow and eventually lead to a friendship-based relationship. This research encourages both partners to be more proactive in socialising with other members in the firm by casually meeting for drinks or eating together. This is useful to create a more supportive environment and facilitates the transfer of knowledge to achieve innovation outcomes.

vii. Recognise both tangible and intangible outcomes during the project

It is recommended that both university partners identify the outcome of the project occasionally during the project and occasionally produce significant outcomes that sustain the relationship and increase the partner's confidence. Even though the main output of the project emerges at the end, it is important to have work in progress output in the short run. The partnership needs to identify some of the best metrics for measuring productivity within the partnership while considering both tangible and intangible features. Milestone achievements need to consider both types of outcome. It is important to choose the appropriate metrics for performance measurement as this plays a role in developing trust between partners. The business partner needs some assurance that the academic team will, in the end, demonstrate new innovative technology within the company.

viii. Hire experienced academics with complementary skills, who are committed and business-driven

The study recommends that it is essential to hire a KTP Associate with complementary skills, who is committed and willing to adapt to the business environment. The KTP Associate is viewed as the champion for the project, the spotlight of the project, and it is important to have an Associate with a dual identity, with a set of academic skills and an interest in developing commercial / innovative outcomes. Passion for business and a 'cultural fit' will lead the Associate to be more productive and to demonstrate project management, potentially balancing the institutional differences between partners.

ix. Establish clear project details and clear goals

The project details need to have clear and precise information that is understood by both partners. It is important to establish clarity of the project and identify clear objectives for the project from the very beginning, which is known as the 'bidding' stage. In developing the project details / proposal it is important to have both partners involved, and to brainstorm in the writing process. This will help the project details to be understood by both partners and will help the project to be written in language that is understood by the business partners. The process also needs to involve risk assessment to evaluate if the overall project is not too ambitious and if it has the appropriate resources. Market analysis is also required to ensure that the product developed could be adapted to market needs.

x. Recognise the significant role of the KTP Associate – job title

The project is recommended to recognise the significant role of the KTP Associate by giving a specific job title within the company. A respectful title allows a similar level of reputation and status that promotes openness and enhances willingness of the business partner to engage in the transfer of knowledge.

xi. Compromise by adopting a more flexible and parallel approach

Compromising with partners is identified as balancing institutional differences and managing expectations between partners. Approaches that can be adopted by the project include flexibility and parallel working. Flexibility refers to the ability of the project to be modified slightly to adapt to the market and respond to feedback and changes. Meanwhile, a parallel working approach is the capability of the project to conduct research alongside the development of innovative solutions. The parallel approach is suggested mainly for software development in order to speed up the process and increase competitive advantages.

xii. Be proactive in the effort to create an innovation mind set

Both partners need to be proactive in encouraging an innovation mind set. This is particularly the case for the TBSFs. The company needs to articulate the innovation mind set within the organisation, and to promote an environment that can be open to change and embrace the value of research and knowledge. The company partners could develop innovation activities within the company such as having innovation spaces and innovation teams to embrace the transformation.

6.3 Limitation of the research and future study

The study sought to qualitatively investigate the implication of knowledge transfer and social capital in fostering innovation within the partnership between the universities and TBSFs partnership. This aim was based on the overall philosophical stance of the researcher, which subjectively addressed the research question subjectively. Although qualitative studies are often challenged regarding their generalisability (Gerring, 2007), which means that the replication of the results to a wider population is difficult. However, study has provided a detailed account of the research settings which should allow adequate comparison with other settings to judge the generalisability of the study (Barratt et al., 2011). Hence, the extent to which these findings and conclusions can apply to other contexts would depend on the degree to which such settings match the situations and conditions presented in this study (Tsang, 2014). It is suggested that future research should develop the proposed framework into testable propositions to be used in other contexts, thus facilitating empirical generalisation regarding knowledge transfer in fostering innovation. For instance, a quantitative approach could be adopted to investigate the findings across broader range of partnership between the universities and other industries.

This cross-sectional qualitative research conducted an in-depth exploration of fostering innovation, as well as social, knowledge and structural capital and their implications. The study aware with the potential bias of the participants at a particular time. While, the study has taken several approaches to reduce this limitation with the use of multiple cases and conducting multiple interviews with diverse stakeholders in the project. The interview comprised with participant from both business and academic, to obtain in-depth, to avoid findings that solely preserved to one group and reduce bias (Mason, 2002). However, the techniques did not allow for exploration of the development of social capital over time in more details and enhanced the

explanation for its implication on innovation. Damanpour et al., (2009) stressed the value of a longitudinal approach in the investigation of innovation in providing an enhanced explanation for its influence on organisations. Therefore, this provide an opportunity for future study to undertake a longitudinal approach to investigate the implication of knowledge transfer, social capital on fostering innovation over a longer period.

6.4 Conclusion

This study aims is to understand the implications of social capital for knowledge transfer in fostering innovation within the context of partnerships between universities and technology-based small firms (TBSFs) in the UK. Overall, the aim of the thesis was met by completing all the objectives of the research. The study integrates literatures primarily on knowledge transfer, social capital and innovation to inform the theoretical direction of the study. This research is designed within the interpretative stance and adopts a multi-method qualitative approach. The two research strategies undertaken in this study are 1) multiple case studies; 2) expert interviews. A total of four case studies have been conducted to provide an in-depth insight into the implications of knowledge transfer and social capital for innovation within its real-life context. The data from these two research strategies, presented in Chapter 4 and Chapter 5, were analysed and discussed resulting in the conceptual framework and has provided a list of recommendation to benefit future partnerships between UK universities and TBSFs, have clearly shown that the research has achieved its objectives. It is hoped that this research will stimulate future discussion for knowledge transfer, innovation and social capital within the context of the partnership between universities and small firms.

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Appendix

1. Approval Letter

Research, Innovation and Academic Engagement Ethical Approval Panel

Research Centres Support Team
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23 March 2018

Hafizah Yusup

Dear Hafizah,

RE: ETHICS APPLICATION SBSR1718-15: Fostering Innovation through University and Technology-based Small Firm Partnership in the UK: A Study of Knowledge Transfer Implications on Innovation through Social Capital Perspectives.

Based on the information that you provided, I am pleased to inform you that your application SBSR1718-15 has been approved.

If there are any changes to the project or its methodology, please inform the Panel as soon as possible by contacting SBS-ResearchEthics@salford.ac.uk.

Yours sincerely,

Professor David F. Percy
Chair of the Staff and Postgraduate Research Ethics Panel
Salford Business School

2. Interview questions

FOR TECHNOLOGY-BASED SMALL FIRM

I. DEMOGRAPHIC INFORMATION

1. Name: ……...
2. Role in the partnership project:…….
3. Number of employees in your company:…….
4. Business type:……
5. Main service/product offered by your company:……..
6. Name of university partner:……
7. Partnership objective:……..
8. Stage of the partnership:…….....

II. INTERVIEW QUESTIONS

No.	Questions	Literature Theme & Objective Tackle
1.	What do you understand by "knowledge"?	General understanding of individual view of knowledge.
2.	How do you define knowledge transfer?	Understanding of knowledge transfer within the partnership setting.
3.	What types of knowledge have been transferred within the partnership?	Understanding types of knowledge transfer within the partnership.

4.	How do you define innovation?	Understanding of innovation within the partnership.
5.	How has knowledge transfer through partnership contributed (if at all) to firm innovation?	Tackling the research objective 2. Accessing the firms' innovation that is fostered through knowledge transfer.
6.	What is the effect (if at all) of the knowledge transfer on your firm?	Tackling Objective 2. Assessing the firms' innovation that is fostered through knowledge transfer
7.	What challenges, if any, did you face with the transfer of knowledge from the university associates/ team members?	Tackling the research objective 3. Identify the challenges of knowledge transfer.
8.	How were these challenges dealt with?	Tackling objective 4. Examine the influence of social capital towards the transfer of knowledge.
9.	Have you ever been in a situation that you did not understand the information from the university associates/ team members?	Tackling the research objective 3. Identify the challenges of knowledge transfer
10	What did you do?	Tackling objective 4. Examine the influence of social capital towards the transfer of knowledge
11	What kind of medium did you usually use for interaction with your university partner?	Tackling objective 4. Examine the structural dimension of social capital upon knowledge transfer.

12	How did these mediums affect the transfer of knowledge?	Tackling objective 4. Examine the structural dimension of social capital upon knowledge transfer.
13	How often did you communicate with your university partner outside the contracted time?	Tackling objective 4. Examine the structural dimension of social capital upon knowledge transfer.
14	How did the frequency of communication with university partners affect the transfer of knowledge?	Tackling objective 4. Examine the structural dimension of social capital upon knowledge transfer.
15	How would you describe your relationship with the university associate/academic team?	Tackling objective 4. Examine the relational dimension of social capital upon knowledge transfer.
16	How was your relationship with the university associate/academic team affected the transfer of the knowledge?	Tackling objective 4. Examine the relational dimension of social capital upon knowledge transfer.
17	Think of the time when you needed to seek help and further guidance from someone in the partnership. What was this in relation to?	Tackling objective 4. Examine the cognitive dimension of social capital upon knowledge transfer.
18	Who did you approach?	Tackling objective 4. Examine the relational dimension of social capital upon knowledge transfer.

19	Why did you approach him/her?	Tackling objective 4. Examine the relational dimension of social capital upon knowledge transfer.
20	How useful was the advice received?	Tackling objective 4. Examine the relational dimension of social capital upon knowledge transfer.
21	Could you describe the motivation for the partnership?	Tackling objective 4. Examine the cognitive dimension of social capital upon knowledge transfer.
22	If there was a clash of culture, how has this been mitigated?	Tackling objective 4. Examine the influence of social capital upon knowledge transfer.
23	What recommendations would you make towards easing the transfer of knowledge and achieving innovation within the partnership?	Tackling objective 4. Examine the influence of social capital upon knowledge transfer.
24	What advices would you give to future business who embarking KTP?	Tackling objective 4. Examine the influence of social capital upon knowledge transfer.
25	Do you consider this relationship with university beneficial?	Tackling objective 4. Examine the influence of social capital upon knowledge transfer.

FOR UNIVERSITY

I. DEMOGRAPHIC INFORMATION

1. Name: …….
2. Role in the partnership project:……
3. Educational background:…….
4. Number of years of experience working in knowledge transfer partnership project:…….
5. Name of University:……
6. Name of School/Department…….
7. Company Partner:…….....
8. Partnership objective:……..
9. Stage of Partnership:……

II. INTERVIEW QUESTIONS

No.	Questions	Literature Theme
1.	What do you understand of "knowledge"?	General understanding of individual view of knowledge.
2.	How do you define knowledge transfer?	Understanding of knowledge transfer within the partnership setting.
3.	What types of knowledge have been transferred within the partnership?	Understanding types of knowledge transfer within the partnership.

4.	How do you define innovation?	Understanding of innovation within the partnership.
5.	How has knowledge transfer through partnership contributed (if at all) to firm innovation?	Tackling the research objective 2. Accessing the firms' innovation that is fostered through knowledge transfer.
6.	What is the effect of the knowledge transfer on the firm?	Tackling Objective 2. Assessing the firms' innovation that is fostered through knowledge transfer.
7.	What challenges, if any, did you face with the transfer of knowledge from the members of the firm?	Tackling the research objective 3. Identify the challenges of knowledge transfer.
8.	How were these challenges dealt with?	Tackling objective 4. Examine the influence of social capital towards the transfer of knowledge.
9.	What kind of medium did you use for interaction with the members of the firm?	Tackling objective 4. Examine the structural dimension of social capital upon knowledge transfer.
10	How did these mediums affect the transfer of knowledge?	Tackling objective 4. Examine the structural dimension of social capital upon knowledge transfer.
11	How often did you communicate with the members of the partner?	Tackling objective 4. Examine the structural dimension of social capital

		upon knowledge transfer.
12	How did the frequency of communication with members of the firm affect the transfer of knowledge?	Tackling objective 4. Examine the structural dimension of social capital upon knowledge transfer.
13	How would you describe your relationship with the members of the firm?	Tackling objective 4. Examine the relational dimension of social capital upon knowledge transfer.
14	How was your relationship with the members of the firm affected the transfer of the knowledge?	Tackling objective 4. Examine the relational dimension of social capital upon knowledge transfer.
15	Think of the time when the company partners has difficulty in relation to knowledge transfer. Who did they approach for help?	Tackling objective 4. Examine the cognitive dimension of social capital upon knowledge transfer.
16	How has the different cultures/background between you and the members of the firm has affected the transfer of knowledge?	Tackling objective 4. Examine the cognitive dimension of social capital upon knowledge transfer.
17	How were these differences were dealt with?	Tackling objective 4. Examine the cognitive dimension of social capital upon knowledge transfer.
18	What recommendations would you make towards easing the transfer of knowledge and achieving innovation within the partnership?	Tackling objective 4. Examine the influence of social capital upon knowledge transfer.

19	What advices would you give to future academic team who embarking KTP?	Tackling objective 4. Examine the influence of social capital upon knowledge transfer.
20	Do you consider this relationship with firm beneficial?	Tackling objective 4. Examine the influence of social capital upon knowledge transfer.