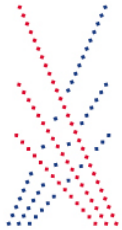

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Transferring Knowledge for Innovation Through Partnership Between University & Technology-Based Small Firms (TBSFs): A Social Capital Perspective

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Abstract

Building upon forty-three semi-structured interviews with universities partnership with technology-based small firms (TBSFs) for knowledge transfer in the United Kingdom, this study explores how social capital influences knowledge transfer in fostering innovation in TBSFs. Accordingly, the study advances the knowledge-based view of innovation by using the social capital theory to explore the implications and complexities associated with knowledge transfer within the context of university-TBSFs partnerships. Our findings indicate that structural, relational and cognitive elements of social capital significantly influence the knowledge transfer between university and TBSFs and set up the platform for innovation. We found that strong ties, friendship-based relationship, reciprocal, norms and trusted relationship are crucial in facilitating knowledge transfer to achieve innovation outcome. Result also indicates that the cognitive aspects create meaningful communication and support knowledge transfer within the partnership.

Keywords: University-industry collaboration; university-industry partnership; knowledge transfer; social capital; innovation; technology-based small firm

Word count: 6940 words

Introduction

How does social capital influence knowledge transfer to foster innovation in the context of partnerships between universities and technology-based small firms? Answering this question is important as knowledge has been widely recognised as a source of firm's innovation (Nonaka and Takeuchi, 1995; Grant, 1996; Alexander et al., 2016) and there is lacks understanding and conceptualisation of how social capital influence knowledge transfer to foster innovation outcome (Filieri et al., 2014; Alexander et al., 2016). While few studies have discussed these concepts together, however, studies traditionally focused the relational and structural dimensions of social capital (e.g. Filieri et al., 2014; Hemmert et al., 2014; Santoro and Bierly, 2006). As such, the cognitive dimensions of social capital have remained neglected (Lee, 2009).

Knowledge-based view (KBV) of the firm theorise that the ability to create and transfer knowledge would lead to the capability to innovate and enable competitive advantages (Nonaka and Takeuchi, 1995). Therefore, in this sense, knowledge transfer is closely associated with innovation (Argote and Ingram, 2000; Kogut and Zander, 1992; Lane et al., 2001; Powell et al., 1996; Tsai, 2001; van Wijk et al., 2008). Knowledge transfer refers to the process through which one unit is affected by the experience of the another, it is attribute to bidirectional approach, purposeful communication, and involves learning which lead in improving action (Polanyi 1962; Albino et al., 1999; Argote and Ingram, 2000; Rosli and Rossi, 2015). Prevailing the concept of that knowledge transfer contributes to innovation, prior research has found that collaborating with external parties such as university could support the transfer of knowledge and subsequent foster innovation (Perkmann et al., 2011).

Nevertheless, the university-industry collaborations for knowledge transfer is often regarded as an intricate process and face many challenges, commonly attributed to differing institutional backgrounds, expectations, cultures and norms (Lopez- Martinez et al., 1994; Plewa, 2009; Bruneel et al., 2010; Santoro and Bierly, 2006). With the need to make collaboration achieve its desire output, research has emphasised on the important of social capital in explaining how individual's stakeholder manage their relationships and influence the transfer of the knowledge (de Wit de Vries et al., 2018; Easterby-Smith et al., 2008; van Wijk et al., 2008).

Likewise, research also provides limited insight on the context of academic partnership between university and industry. Studies in university-industry collaborations has been strongly emphasised on the commercialisation channel such as a spin-off, licensing and patenting (Perkmann et al., 2013). According to Perkmann et al., (2013) it is essential to recognise the differences of collaboration platforms in the university-industry collaboration: as difference platforms may require different support structures and incentive mechanisms. Nonetheless, the literature also has a limited level of analysis, and there is a paucity of understanding the complexities associated with knowledge transfer at the micro level (Padilla-Meléndez et al., 2012; Perkmann and Walsh, 2007; Rajalo and Vadi, 2017). Thus, studies have not been able to provide insightful recommendations to improve the knowledge transfer in university-industry partnership in fostering innovation outcome.

These limitations have reinforced the motivations for this paper and makes the following contributions. First, we provide an in-depth understanding of how social capital may influence the transfer of knowledge in fostering firms' innovation in the context of partnerships between the university-TBSF partnership. Specifically, we access all three dimensions of social capital and understand how each dimension influence the transfer of knowledge in fostering innovation. Second, we develop a conceptual model concerning on the influence of social capital on knowledge transfer and innovation. In doing so, we collect an empirical qualitative data based on in-depth semi-structured interviews with a range of stakeholders in the knowledge transfer partnership (KTP) project in the United Kingdom. A range of stakeholders is likely to benefit from a greater understanding of the influence of social capital upon the transfer of knowledge in fostering firms' innovation within the partnership between university and TBSFs. While university supervisors, associates and their knowledge transfer offices will be able to facilitate the knowledge transfer partnership project with TBSFs more effectively. On the other side, TBSFs will gain insight into how to build lasting relationships with universities to optimise their innovation strategy.

Knowledge transfer in fostering innovation

In this paper, we define innovation as new or significantly changed product or process and added value to the firm. In which, product refers to good or a service and process include production or delivery, organisation and marketing processes (Schumpeter, 1934; Damanpour, 1991). Knowledge is defined as justified true beliefs which can be codified, and transferred (Wasko and Faraj, 2000; Nonaka, 1994; Galliers and Newell 2000). Knowledge transfer is defined and conceptualised differently by researchers but in this study knowledge transfer is considered as an interactive process. To this perspective, knowledge transfers is basically a social process that involves interacting changes between people in a learning process (Rosli and Rossi, 2015; Garravelli et al., 2002). Constitute with this perspectives, Rosli and Rossi, (2015) describe knowledge is actively constructed, and has some level of tacitness and thus the transfer of the knowledge is bi-directional in nature and requires active participation from people (Ryle, 1949; Polanyi, 1966; Stiglitz, 1999; Rosli and Rossi, 2015) whereby stress the importance of social aspect for successful knowledge transfer.

Knowledge-based view (KBV) of the firm regards knowledge as a crucial source of innovation and a potential element for creating sustainable competitive advantage in the firm (Spender, 1996; Grant, 1996). Cohen and Levinthal (1990) suggest that the accumulation of knowledge allows for more efficient utilisation of related knowledge and enables a firm to understand better and evaluate the nature and commercial potential of technological advancement, which in turn lead to innovation (Cohen and Levinthal, 1990; van Wijk et al., 2008). To identify the implications of knowledge transfer on innovation, it is crucial to understand what innovation is. Studies on the definition of innovation can be broadly discussed in two dimensions: i) in term of a process; ii) in the condition of the outcome. As opposed to the view of innovation as a process, innovation is defined as "the implementation of a new product or significantly changes product or process". In contrast, Quintane et al., (2011) discuss, in defining innovation as an outcome it entails of several characteristics such as being novel, useful, in use, or nontrivial (Jaffe et al., 1993; Levitt, 1960; Schumpeter, 1934; Utterback, 1971). Schumpeter (1934), discuss four types of innovation based on object change, i.e. product, process, marketing and organisational innovations. In a similar view, Damanpour (1991), describes innovation as "new product or service, a new production process technology, a new structure or administrative system, or a new plan or program on organisational members". This research

reflects innovation as an outcome as discussed by Schumpeter (1934) and Varis and Littunen (2010).

In sense of viewing knowledge as the raw material of innovation and knowledge transfer is closely associated with innovation (Argote and Ingram, 2000; Kogut and Zander, 1992; Lane, Salk, and Lyles, 2001; Powell et al., 1996; Tsai, 2001; van Wijk et al., 2008), therefore, firms collaborate with external partners to accumulate knowledge to sustain their competitive advantages when they cannot create the required knowledge in-house (Numprasertchai and Igel, 2005). Carayannis et al., (2000) suggest that collaboration between universities and firm is an important key to promote innovation. Thus, it is not surprising that the number of research collaborations between universities and firms has been increasing fast and many research firms are interested in this collaboration in their innovation strategy (Numprasertchai and Igel, 2005).

Perkmann et al., (2013), has classified two forms of university and industry collaboration: (i) academic commercialisation or entrepreneurship; and (ii) academic engagement. Academic entrepreneurship refers to patenting, licensing, joint-ventures, and spin-offs. This type of collaboration is usually based on the objective for academic invention and aims to gain financial rewards such as the selling of intellectual property (IP) (Perkmann et al., 2013). In contrast, academic engagement or also known as the academic partnership, refers to forms of interaction based on "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). This form of engagement focuses on research partnerships, collaborative research, contract research, and consulting (de Wit de Vries et al., 2018). This paper focus on the academic partnership in which partnership is defined as a formal collaborative arrangement between university and firm, where individuals and teams from academic and firm work together on specific projects with the objective to produce common output or to advance knowledge and new technologies" (Bekkers, et al., 2008; de Wit de Vries et al., 2018; Perkmann and Walsh, 2007; Santoro and Bierly, 2006).

Although firms can realise remarkable performance benefits by transferring knowledge from university, successful knowledge transfer can be difficult to achieve (Santoro and Bierly, 2006; Lockett et al., 2008; Bruneel et al., 2010). A long tradition of university-industry collaboration research has analysed challenges inherent to transferring knowledge. For example, Lockett et al. (2008) explore the challenges of knowledge transfer between universities and small medium enterprises (SMEs) in the UK, found that the main barriers to the success of knowledge transfer are lack of time or the different perceptions of time-scale, the bias incentives towards publishing research and teaching, and the 'cutting-edge' perception from the SMEs partners towards university research. In the same vein, Plewa et al. (2013), identify the common barriers to knowledge transfer within the partnership between university and firm are the differences in objectives, purposes, cultures, and norms.

In managing the challenges in partnerships between universities and firm, social capital has emerged as one of the significant theories to facilitate the transfer of knowledge. Santoro and Bierly (2006) found that the frequency of communication and trust are indeed significant facilitator of knowledge transfer within the partnership. Filieri et al., (2014) suggest that cohesive network configuration characterised by high levels of commitment, trust, fine-grained information exchange, and joint problem solving facilitate the transfer of knowledge within the partnerships between university and firm. In the recent study, the aspect of social capital such as trust, mutual reciprocal, shared meaning, unify codes, language and different activities (de.

wit. Vries et al., 2018; Al-Tabbaa and Ankrah, 2018), is noted to facilitate the transfer of knowledge within the partnerships. While these studies provide valuable insight into understanding the role of social capital in promoting knowledge transfer in the partnerships, however, gaps remain. It is argued that social capital deals with the connections of individuals or groups within and between social networks, which play a crucial role in knowledge transfer in university-industry collaboration (de wit de Vries et al., 2018), given its reported ability to motivate individuals (Wasko and Faraj, 2008) and acts as 'glue' that holds individuals together (Carayannis et al., 2000). There is paucity in understanding the interrelation between knowledge transfer, social capital and innovation within partnerships between university and firms.

One of the complexities in dealing with social capital theory is the number of definitions of the concept, which has led to different approach in accessing social capital. However, there is general agreement that social capital represents the social relationships of an individual or collective entity and the benefits accessed through those social interactions (Lin, 2001). Drawing on Nahapiet and Goshal (1998), social capital can be identified in three dimensions. The *structural dimension* of social capital as an overall pattern of connections and network structure between actors. It consists of network ties, network configuration and appropriable organisation. The strength of the ties depends on the frequency, intensity and intimacy of that relationship (Burt, 1992). The *relational dimension* refers to the kind of personal relationships that people have through their interactions within the network. There are four critical elements that essential within this dimension, which determine the behaviour of the individual within the network. The four elements are trust, norm, obligation and identification (Nahapiet and Goshal, 1998). Finally, the *cognitive dimension* refers to the shared meaning and shared understanding between people (Nahapiet and Goshal, 1998). This dimension consists of shared codes and common language and shared narrative story, myths and metaphor (Nahapiet and Goshal, 1998).

Social capital has been used by many scholars to explain how individuals, groups and firm manage relationships to access knowledge and generate innovation. At inter-unit level, Tsai and Goshal (1998) discuss the important of network centrality to have indirect impact on resource exchange or combination on product innovation. At inter firm level, Williams (2007), found that strong relationship increase the capacity of the receiving unit to understand knowledge transferred in strategic alliances, which enhanced the adaptation of the knowledge received to the firms' operations. In the similar context, Yli-Renko et al., (2001), indicates that strong ties are associated with greater knowledge acquisition, which in turn increase the capability for new product development.

Whilst, research has revealed the concept of social capital, knowledge transfer activities and innovation, however, these findings are particular analysed at macro level and not in the university-industry collaboration context. Moreover, research on the social capital has not explicitly integrate the connection between social capital, knowledge transfer and innovation outcome. Studies particularly refer innovation to new product development or refer to achievement of organisational performance through innovation activities or innovation capacity (e.g. Tsai and Goshal, 1998;Yli-Renko et al., 2001; van Wijk et al., 2008). In fact, according to Zheng (2008), subjective measure to innovation need to be used more in exploring the outcome of innovation. Hence, these limitations has reinforces for this paper to contribute to the literature on the social capital, knowledge transfer and innovation outcomes in the context of partnership between university and TBSFs.

As shown in Table 1, despite the high interest of research on university-industry collaboration based on social capital, it is surprising that not many studies have integrated knowledge transfers, social capital and innovation together. As aforementioned, knowledge transfer has been found as one of the key drivers for firm's innovation and social capital can be crucial in supporting the knowledge transfer between universities and firm. However, research into understanding the interrelation between knowledge transfer, social capital and innovation within the partnership is still scared. For instance, Filieri and Alguezaui (2014) have suggested that knowledge transfer, social capital, and innovation are complementary, and that future study should take the time to consider the three bodies of literature together.

Although we acknowledge few studies have highlighted the importance of social capital in facilitating knowledge transfer in relation to innovations, (as shown in Table 1) most studies have placed a heavy emphasis on the macro level whereas research from the micro level perspective has been scarce (Bjerregaard, 2010; Kim et al., 2014; Rajalo and Vadi, 2017). While firm-level perspectives are to be considered important influential in affecting the university-firm partnership, it is essential to gain a view from the micro level of the individuals' partners. As individuals can be the determines to openness and motivation to work together within the partnership (Bjerregaard, 2009; Rajalo and Vadi, 2017).

Apart from that, the concept of social capital is broad. However, the focus on the previous study mainly emphasises on the structural and the relational dimensions of social capital (e.g. Filieri et al., 2014; Hemmert et al., 2014; Santoro and Bierly, 2006). The evidence from the literature shows that there are needed to provide multidimensional of social capital. As discussed by Inkpen and Tsang, (2005) shared vision and common understanding among actors in the network help to facilitate the common understanding to achieve collective goals and outcome. Hence, the cognitive aspects of social capital can be crucial in promoting the transfer of knowledge to foster innovation within the partnership. Therefore, is it necessary to prevails all three dimensions of social capital in understanding into how they may influence knowledge transfer in fostering innovation within the partnerships between university and firm. The table 1 provides the summary of key themes adapted in this study.

Table 1. Overview of recent literature in university-industry collaborations based on social capital and knowledge transfer.

Articles	Concepts									
	Knowledge Transfer	Social Capital			Innovation	Unit of Analysis		Methodology	Context of research	Key insights
		Structural	Relational	Cognitive		Micro	Macro			
de wit Vries et al., (2018)	√	√	√	X	√	√		Systematic Literature review	Partnership	Trust Communication Intermediaries Experience
Filieri et al., (2014	√	√	√	X	X		√	Case Study	Commercialisation	Trust Communication
Santoro and Bierly (2006)	√	X	√	X	X	√		Survey	Partnership	Trust

Al-Tabbaa and Ankrah (2018)	√		√	√	√	X		√	Case Study	Partnership	Trust Mutual reciprocal Shared meaning Unify codes Structural connection Uncommon interaction activities Sensitivity of structural connection
Hemmert et al., (2014)	√		X	√	X	X		√	Survey	Partnership	Trust
Locket et al., (2008)	√		√	X	X	X	√		Case Study	Commercialisation	Trust
Bruneel et al., (2010)	√		X	√	X	X		√	Survey	Commercialisation	Trust
Carayannis et al., (2000)	√		X	√	X	X		√	Survey	Commercialisation	Trust

Table 1. Overview of recent literature in university-industry collaborations based on social capital and knowledge transfer (Source: Authors)

Research Context and Design

The empirical setting: Knowledge Transfer Partnership (KTP)

The Knowledge Transfer Partnership (KTP) or formerly known as Teaching Company Scheme is a collaborative scheme involving knowledge-based partner (university) 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 the past 40 years. The scheme aims to facilitates the transfer of knowledge and help business in the UK to innovate, to provide business-based training for academics in order to enhance their business and specialist skills within the context of the project, to stimulate and enhancing business relevant education and research undertaken by the university partner, and to increase the extent of interactions by businesses with the knowledge base and increase business awareness of the contribution the knowledge-based can make to business development and growth (KTP, 2010; Innovate UK, 2018).

The scheme can last between 12 and 36 months, depending on the type and the need of the project (Innovate UK, 2018). The main component of KTP is the associate partner who is employed by the university and spends their time based in the company partner. The associate works under the joint supervision of an academic advisor/supervisor (who is an academic working for the academic partner) and a business advisor/supervisor (working for the business partner).Following the completion of the project, KTP often delivers significant increased profitability for business partners as a direct result of the partnership through improved quality and operations, increased sales and access to new markets (Innovate UK, 2018). The impact of the scheme between 2013-2014 were around £211 million in changes to annual profits of UK companies (Innovate UK, 2014).

Nevertheless, due to social interaction and learning process between the three partners, and the KTP scheme is not only concerned with the transfer of explicit knowledge (Tiler and Gibbons, 1991) the KTP scheme would provide a relevant context for exploring the role of social capital in knowledge transfer between university and TBSFs to foster innovation. The context offers opportunities to reveal the micro-dimensions of knowledge transfer process as well as the social elements contributing to university- firm partnership to achieve innovation.

Technology-Based Small Firms (TBSFs)

It is widely recognised that small firms make a significant contribution to economies and so understandable that there is a persistent empirical research theme that addresses issues of small firm growth (Macpherson and Holt, 2007). In the UK, there are 5.6 million small business registered in the UK at the start of 2018, of which accounted 99.3 per cent of all private sector businesses (FSB, 2018). In the start of 2018, the small business combined annual turnover was £2.0 trillion.

Due to the competitive environment changes; technology-based firms need to adapt faster and continuously exploit and improve their knowledge. Knowledge transfer is particularly significant in technology-based firms as its activities and nature of their business requires knowledge to be constantly updated and renewed (Lane and Lubatkin, 1998; Filieri and Alguezaui, 2014). Small firms have been identified to have constriction in skills, abilities, knowledge, and technology in comparison to large firms. Cavusgal et al., (2007) found that inter-collaboration is important for small firms' growth because of the potential of the external knowledge resources to support small firms' growth. Considering with the need of TBSFs to innovate and to continue to grow and thrive in todays' market, , therefore it is significant to understand the elements that could facilitate knowledge transfer through partnership with university in achieving innovation.In this research, TBSFs is defines as independently owned firm with less than fifty employees operating in high-technology sectors as listed in tables 1 in appendix. Some of the sectors included are electronic equipment and components, electrical components, and software development.

Empirical data collection

Given its exploratory nature, this research uses a qualitative approach in order to provide in-sight of the phenomenon study. Using qualitative based survey, semi-structure interview were conducted with 43 key individuals that involved at KTP project. The relevant of the interview number is based on Guest et al., (1995) suggestion that noted between twelve to thirty number of interviews is appropriate to gain an overview picture of phenomenon under study. Each interview lasting between 45 and 60 min, conducted over a 6-month period. The format of a semi-structured interview is chosen because it allows the researcher to gain 'probe' answers, where the researcher wants the respondents to provide in depth explanations of the phenomena (Saunders, et al., 2016). This will add significance and depth to the data obtained (Saunders, et al., 2016). All interviews are in English, audio recorded with permission of interviewees, and subsequently transcribed as soon as possible after the interview to preserve the quality of the data (Gibbert et al., 2008).

The study selects interview participants (see Table 2) based on their involvement with KTPs (research associate, academic supervisor and business advisor), and specifically chosen

through purposeful sampling, and through snowballing, which ensures that all participants have the experience necessary to answer the research questions and meet the objective of this research. A letter was email to all the forty-three participants and followed by face-to-face interview.

The semi-structured interviews employ open-ended questions that encourage the participants to relate their knowledge transfer experience. The questions are divided into five main parts:

i. The background information's of the interviewee's and the role and involvement in KTP
ii. Understanding the description of KTP, knowledge transfer and innovation
iii. The overall outcome of the projects? And innovation outcome from the project?
iv. The challenges and problem occur during the knowledge transfer activities?.
v. The role of social capital in knowledge transfer activities

The interview questions are adapted from previous studies (e.g. Dhanaraj et al. 2013; Tsai, 2001; Yli-Renko et al., 2001). In addition, the research also developed questions based on the research objective and research questions proposed in this study (Saunders et al., 2016). The interview questions were pilot tested by conducting interviews with four academic staff from the University of Salford that have relevant experience in partnership with TBSFs.The aim of pilot study was to test the questions for clarity and determine the time required for interviewing. We refined the interview questions on the basis of this pilot.

The validity of the study was ensured throughout the research process from the research design to the robustness of the final findings (Brinberg and McGrath, 1985). Throughout the analysis we took several approaches to ensure the validity of our study. We ensure that multiple respondents within the partnerships were interviewed to allow for the possibility of different viewpoints to be captured, establish comparability and enhance the reliability of the research data. The interviewees checked the summarized transcripts of their interviews.

Table 2. Interview participants.

No	ID Code	Role	Sector focus
1.	P01	Research Associate	Software company
2.	P02	Research Associate	Software company
3.	P03	Research Associate	Software development & consultancy
4.	P04	Research Associate	Software development & consultancy
5.	P05	Research Associate	Security and related activities
6.	P06	Research Associate	Telecommunication
7.	P07	Research Associate	Telecommunication
8.	P08	Research Associate	Security and related activities
9.	P09	Research Associate	Software development & consultancy
10.	P10	Research Associate	Web/internet services
11.	P11	Research Associate	Technology devices
12.	P12	Research Associate	Technology devices
13.	P13	Research Associate	Software development & consultancy
14.	P14	Research Associate	Wearable technology
15.	P15	Research Associate	Software development & consultancy
16.	P16	Research Associate	Software development & consultancy
17.	P17	Research Associate	Web/internet services
18.	P18	Research Associate	Web/internet services
19.	P19	Research Associate	Software development & consultancy
20.	P20	Research Associate	Software development & consultancy
21.	P21	Research Associate	Software development & consultancy
22.	P22	Research Associate	Web/internet services

23.	P23	Research Associate	Security and related activities
24.	P24	Academic Supervisor	Security and related activities
25.	P25	Academic Supervisor	Software company
26.	P26	Academic Supervisor	Software development & consultancy
27.	P27	Academic Supervisor	Telecommunication
28.	P28	Academic Supervisor	Web/internet services
29.	P29	Academic Supervisor	Software development & consultancy
30.	P30	Academic Supervisor	Technology devices
31.	P31	Academic Supervisor	Software company
32.	P32	Academic Supervisor	Technology devices
33.	P33	Business Advisor	Web/internet services
34.	P34	Business Advisor	Security and related activities
35.	P35	Business Advisor	Software company
36.	P36	Business Advisor	Software company
37.	P37	Business Advisor	Software development & consultancy
38.	P38	Business Advisor	Software development & consultancy
39.	P39	Business Advisor	Telecommunication
40.	P40	Business Advisor	Software company
41.	P41	Business Advisor	Technology devices
42.	P42	Business Advisor	Web/internet services
43.	P43	Business Advisor	Software development & consultancy

Table 2. Interview participant (Source: Authors)

Data Analysis

The data analysis for this study we follow thematic analysis outlined by Braun and Clarke (2006). Braun and Clarke (2006) outline a six stage process for analysing data which this researcher implemented; i) become familiar with the data; ii) generating initial codes drawn out from transcriptions; iii)searching for themes by building upon the initial codes; iv) reviewing themes emerging from the last activity; v) defining and naming themes and; vi) write up of the findings and analysis. NVivo 9 is used to help in facilitating the qualitative content analysis of the transcripts produced from the semi-structured interviews. Despite that conceptual decision, judging and interpreting are mainly done by the researcher; NVivo simplified and speeded up the mechanical aspects of data analysis.

Findings

The following sections present the findings on how social capital dimensions behaviour influence the transfer of knowledge in fostering TBSFs innovation. The results illustrate the tension occurs upon transferring the knowledge in the partnership between university and TBSF and how social capital induced the challenges and facilitate the transfer of knowledge and fostering innovation.

Knowledge transfer and Innovation

In accessing the knowledge transfer process through partnerships between university-TBSFs, evidence shows that the one of the key features of knowledge transfer are a bi-directional process, on-going process of interaction between individuals, involves learning and leads to actions. Data analysis shows that technical capabilities of associates and the commercial knowledge of the business partner together shapes the knowledge base of the company which eventually lead to innovation.

'As associate...he is technically capable in an academic sense…but in the commercial world…he knows less… so, he is learning some from us... he learned how to engage with customers, partners, and how to work in a team…he got more rounded view …of what it is like to works on a project with lead to commercial development. We, on the other hand, learned new knowledge from him, we now much better understanding about a specific issue we want to solve…it is kind of improvement on some of our knowledge… (Business Advisor, P33)'.

The focus of the companies remains on the improvement of product rather than process, our findings indicate that bi-directional learning leads to a change in perspective of business owners due to the partnerships introducing new concepts.

'the academic team are research active; we are working in the state of art of technology, we are aware of what technology are available and, most probably, most of the small company may lack that, sometimes they focus only on product development, they didn't aware of the process of getting the product to deliver/ productivity more effectively and profitable. We embedded the research in the company and helped them in their product delivery/ productivity to boost their productivity' (Academic supervisor, P25).

The empirical evidence shows that knowledge transfer significantly influences on process innovation rather than the product innovation. The improvement of process enhances the organisation efficiency whilst reducing the cost. This also reinforces the bi- directional learning and provides opportunities for the associate's professional development.

'the implication of knowledge transfer in this project varies; for example, we change the criteria from the traditional organisation process to a new solution that we provided a new computer-based solution. And that particular solution, it increases organisational efficiency and saving more money... We also upgrade the company manual process to automation. On the other hand, on academic research, we did some novel research on visual analytics and how that research sort of bring new innovation to the industry and save tremendously amount of money and increase efficiency. We are also writing a paper on this new research' (Research associate, P12).

Structural Dimension

During the knowledge transfer process, it was clear that all three dimensions of social capital dimensions influence the transfer of knowledge in achieving innovation. Regular communication through formal activity such as meeting has been found to influence the transfer of knowledge in managing the different expectations from stakeholders in delivering innovation. It was found that regular formal meetings with all the stakeholders help to recognise the problem and solve problem within the partnership. Formal meeting as well was identified to promote clarity of the partnership and thus develop a foundation of shared understanding between partners.

'through the weekly meeting or monthly meeting, in that meeting usually… we describe the scope of this project and inform what we are doing and who is responsible and the progression that we have made so far…. It's useful to share progress and highlight challenges' (Research Associate, P08).

And

> *'regular meetings were a big help. Meetings ensured any issues were discussed, and solutions could be made as soon as possible' (Academic Supervisor, P29).*

More importantly the evidence reveals that structural processes enhance relational types between the different partnerships. Another important finding is continuous interactions develop more informal relationships at the micro level which have a significance influence on knowledge transfer activities. The informal networking activities such as company lunch have been found to facilitates the transfer of knowledge by building close interaction or friendship-based relationship between members within the partnership. The friendship-based relationship allows partners to feel more open and more comfortable in giving more input towards the project.

> *'We meet day to day basis…the relation that we build it sort of friendly basis, this relationship allows us academic to learn business working style and eventually help us to understand each other…' (Research Associate, P14).*

> *'We went out for lunch. We also have a Christmas party and another social event. Even before KTP and KTP enduring it as well… social interaction I think has helped quite a lot…when you have those conversations outside the work then afterward, it is easier to chat about knowledge transfer' (Research Associate, P03).*

While face-to-face communication has been found to be seen as important condition for transferring knowledge, in particular to have quick response from other actors, online platform has to been seen as one of important condition for create understanding and manage the expectations among actors and eventually facilitate the knowledge transfer.

> *'I did like a blog to the introduction of KTP and the timeline... showing the information on what is it I am doing... I have received positive feedback. I received comments and questions on the matter…it is a good way for them to bring questions and I was able to reply to those…It is a good way to manage those expectations definitely… It is a lot easier than address it individually to each person…. the blog is helpful because it is quite a small company…I look how could they will go forward in terms of the communication. In terms of reach out to everybody in the company, I think that turned out to be the best option…since everybody has easy access to it…' (Research Associate, P06).*

Relational Dimension

Our findings identified that reciprocal relationship between partners has been found to be helpful in facilitating the transfer of knowledge within the partnership. At the micro level, the success of knowledge transfer activities depends on mutual benefits which was found to be linked to motivation of all the partners.

> *'Even though, that every individual has different in objective and expectation, however there got to be somebody for everybody...reciprocal relationship…the reciprocal relationship that creates a win-win situation and smoothes the transfer of knowledge…' (Business Advisor, P40).*

Reciprocal relationships not only lead to motivation of the partners but also enhance the mutual trust based on credibility, expertise and proven outcome, which plays a significance role in facilitating of knowledge transfer in achieving innovation.

> *'Basically, everyone has trust in me for my expertise…and it has been easy for me to transfer the knowledge…' (Research Associate, P22).*

> *'Trust can help in the transfer of knowledge and firms is trusting you more when they (the firm) starts to see the outcome/improvement from the project…being able to prove the works you are promised would definitely reduce the tension in transferring the knowledge…' (Research Associate, P18).*

Cognitive Dimension

When analysed the cognitive aspect, our findings indicate that shared language enables actors to create mutual understanding and facilitate knowledge transfer. While related experience and similar education background were identified to develop shared language between partners, short business courses for research associate also have been found as one medium to help in creating shared meanings with business partners.

> *'Before KTP started, we attended some courses to learn about business. It has been helpful to gain some understanding about them…however, I think that the course should also be introduced to the business advisor as well…so that they understand the project better' (Research Associate, P15).*

> '*Industry have some expectation, sometimes they don't have a science and engineering background; in that case, you have to identify the problems and what the solution. You have to communicate the solution what is possible what is not possible that is understand by them….is more on communicating in the language that they understand so that you are on the same page…' (Research Associate, P17).*

The analysis also showed that it is essential to select the right academic associate that posit interest to work in the business industry in the future. The research associate that assert interest and enthusiasms to work in business industry not only were found to have shared interest with the business wanted to make knowledge transfer to achieve innovation. Shared interest also was found to linked with long term commitment in knowledge transfer and facilitate the transfer in achieving innovation.

> *'The interest should be aligned with the company demand and what the company want. For example, they (academic researcher) probably have the skills but does not consistent with the enthusiasm to be in the firm; it can be view as a risk. On the other hand, if the academic researcher skills are lower, the motivation and interest are in the business, and moving similarly with company…it is sync. Although it is always tricky, but it is possible to reduce the challenges in knowledge transfer' (Academic supervisor, P33).*

> *'My priority is benefiting the company, I am interested in seeing the outcome and applied research in the commercial world…so I maximise my effort to benefit the company and remain in the scope of project…' (Research associate, P22).*

The empirical evidence also recognised the goal clarity among partners within the partnership between university and TBSFs facilitates knowledge transfer in fostering innovation. When objectives in the partnerships are clearly stated and documented well, a foundation of common understanding facilitate the transfer of knowledge among partners.

> *'It is important to have clarity of the partnership since at the beginning... All stakeholders should be aware of the objectives of the project and what are the goals and objectives that the knowledge transfer is to achieve at the end of the partnership' (Academic supervisor, P34).*

Table 3. Key themes reveal from analysis

Social capital	Key features of knowledge transfer	Innovation outcomes
Structural • Strong ties with partners through frequent communications • Close relationship or friendship-based relationship through continuous interactions and informal networking activities • Interactions mediums via face-to-face and online platform. • Proximity between individuals members	• Rely on interactive process between partners • Bi-directional process • Link to capability of actions • Involve learning (i.e.: implementing of the knowledge)	• Product innovation-introduction of new goods and improved of existing good that has positive return to TBSFs • Process innovation-new way of delivering product or service • Market innovation-new way of marketing firms' product or service; such as using digitalised platform • Organisation innovations-introduction of new unit such as R&D unit
Relational • Reciprocal and trusted relationship with partners • Trusted relationship based on credibility, expertise and proven outcome. • Norms of cooperation with openness from partners personality • Identification of belonging to the team		
Cognitive • Shared language with similar experience and related background • Shared interest with partners based on individual's enthusiasm/personal objectives • Shared interest through similar experience • Goal clarity through clear identification of partnership objective and documentations		

Table 3. Key themes reveal from analysis (Source: Authors)

Discussion

This paper explores the role of social capital on knowledge transfer in fostering innovation within the partnership between universities and TBSFs. Through the social capital lens, we investigate at the micro-level analysis by focusing on the individuals' level of interactions.

As shown in Table 3, this paper identified that knowledge transfer through partnerships between universities and TBSFs has contributed to several types of innovation outcome. Consistence with our innovation definition from Schumpeter (1934) we identified four forms of innovation; i) organisation innovation (new R&D unit); ii) product innovation (introduction of improved goods, prototypes); iii) process innovation (new way of delivering product/service); and iv) market innovation (new way of marketing product/ service; digitalised platform).

Combining our findings, we proposed a conceptual model, as depicted in Figure 1, illustrated the different elements of social capital that support knowledge transfers and eventually lead to innovation outcome within the partnership between university and TBSFs. In establishing the structural connections, actors within the partnerships between universities and TBSFs used different activities and different platform to promote regular communications among the actors. The medium of interactions is via face-to-face, or by applying online platforms such as emails, and blogs. These mediums helped to promote shared understanding and gives partners the ability to interact more and enhanced the knowledge transfer, and subsequently contribute to innovation outcome. Frequent communication allows actors to be active in engaging in knowledge transfer where it supports the transfer of tacit and explicit knowledge (Filieri et al., 2014; Lane and Lubatkin, 1998; Tsai and Ghoshal, 1998).

In order to benefit from social capital within the partnership; we revealed that actors within the partnership between universities and TBSFs relationship does not limit their interaction to formal networking activity such as meeting, and training. Partners were found to engage in informal networking activities. While formal networking such as meeting is key to recognise and solve problems occurs in knowledge transfer, the activities beyond formal networking has been noticed to leads to a close relationship or friendship-based relationship. The friendship-based relationship allows partners to feel more comfortable and are more open to discuss challenges and suggest or giving more input towards the project.

The relational dimension of social capital is also identified to play a fundamental role in knowledge transfer to achieve innovation outcome within the partnership between university and TBSFs. One of the components of the relational dimension that influence the transfer of knowledge in fostering innovation is trust. While, prior research has suggested that trusting relationships evolve from frequent social interactions (Gulati, 1995; Moran, 2005; Tsai et al., 2014). As two actors interact, their trusting relationship becomes more genuine and enables them to perceive each other as trustworthy (Tsai et al., 2014). However, in this study, we found that trust is based on the partners' competence and capability (Nahapiet and Goshal, 1998). We found that the ability to fulfils partners promise and obligations in the partnership has facilitated knowledge transfer among partners. Based on our analysis, trust-based competence is consistency with Ring and Van de Ven, (1992) study, that noted trust will emerge between partners when they have completed transactions in the past, and they perceive one another as complying with norms of equity and reciprocity.

In considering the relational capital, we also reveal that identification in where individuals see themselves as one with other partners has facilitated knowledge transfer in fostering innovation outcome. We found that a sense of shared identity or feel belong in the team creates concern for achieving concern outcomes and therefore motivates individuals' effort in transferring knowledge to help enhance the partner' outcomes (Nahapiet and Ghoshal, 1998). Other aspects of the relational capital which emerged in this study is social norms; openness and cooperation norms for knowledge transfer has been found to support knowledge transfer within the partnership. We found that openness and cooperation norms create actors to work together in a team and facilitate knowledge transfer. As found by Nahapiet and Goshal, (1998), strong cooperation norms, can create expectations of teamwork, which facilitate individuals' willingness to transfer knowledge. This would enable firms to internalise university knowledge inherent in researchers exploring fundamental ideas who seek to materialise these ideas into innovative technology and products (Yusef, 2008).

Our study also reveals the significance of goal reciprocal in facilitating knowledge transfer to foster innovation within the partnership between universities and TBSFs. Reciprocal goal is identified important as typically, both partners has different in objectives but were outset because of the reciprocal benefits. Hence, partners are more willing to transfer knowledge to received benefit in return. In fact, reciprocity was found to enhance the desire to learn and motivate actors to invest the necessary resource in facilitating learning (Yoo et al., 2016).

Concerning the cognitive dimension of social capital, our study found that shared language between partners promotes mutual understanding and thus facilitate the transfer of knowledge. Within the partnerships between universities and TBSFs, we identified that typically, both partners have a similar educational background and related experience. Cognitive capital creates based on shared language and experience were identified to smooth the transfer of knowledge and create a mutual context between partners. In fact, knowledge transfer is described as a social process between partners, as such knowledge transfer requires lots of narratives and joint work, in this process meaningful communication is sustained through shared language between actors (Boisot, 1995).

Another aspect of cognitive capital, which received prominence, was goal clarity among partners members within universities and TBSFs. Goal clarity was found to reduce partners conflict by facilitating the negotiation and establish a common goal (Inkpen and Tsang, 2005). When objectives in the partnerships are clearly stated, a foundation of common understanding facilitates the transfer of knowledge among partners (Das and Teng, 1998; Inkpen and Tsang, 2005). Our study also reveals the significance of shared interest between partners in facilitating the transfer of knowledge to foster innovation. As Fukuyama, (2001) discussed, common shared interest or passion has been found to promote collective action among members.

Figure 1. Conceptual model of role of social capital in facilitates university-TBSFs knowledge transfer in fostering innovation.

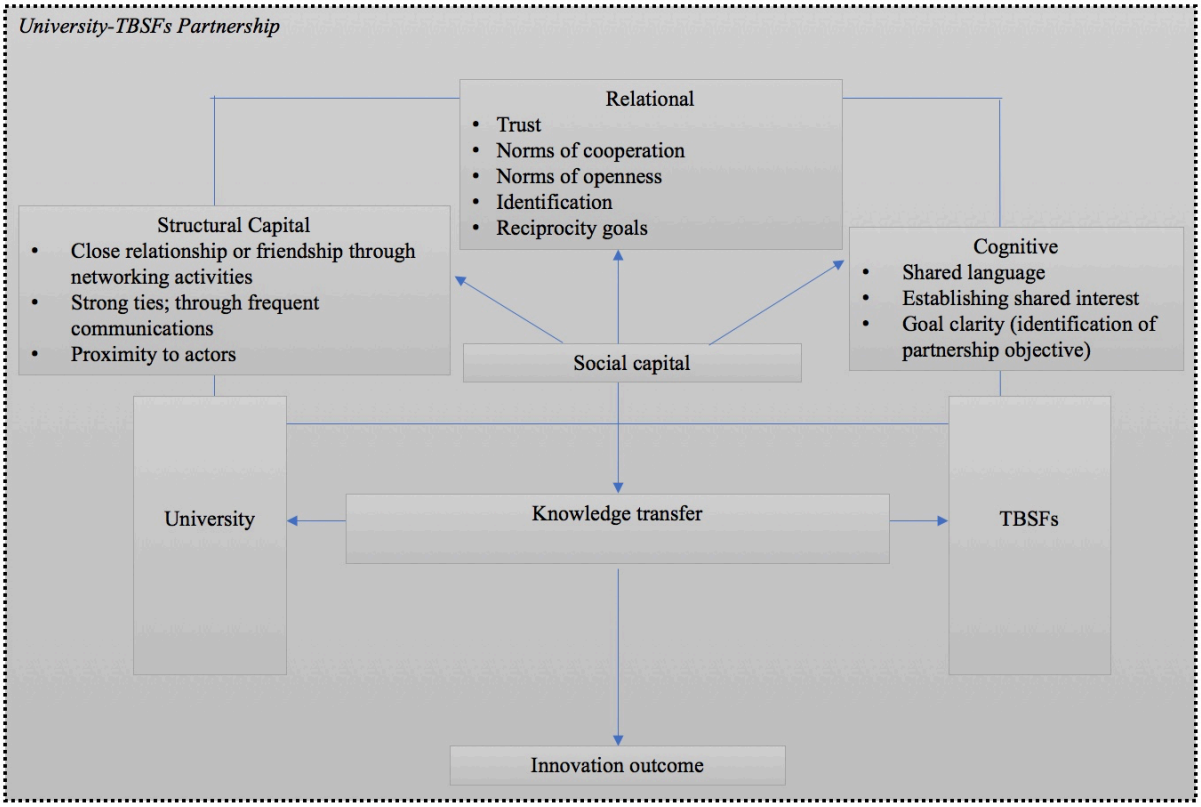

Figure 1. Conceptual model of role of social capital in facilitates university-TBSFs knowledge transfer in fostering innovation (Authors).

Conclusion

In answering how does social capital influence knowledge transfer to foster innovation in the context of partnerships between universities and TBSFs? We answer that social capital significantly influences the transfer of knowledge in achieving innovation. Our conceptual model established interrelation between social capital, knowledge transfer and innovation developed at micro-level. Social capital arises from the interaction between both universities and TBSFs actors were found to have significant impact on knowledge transfer in fostering innovation within the partnership.

In response to the limitation of the interrelation between knowledge transfer, social capital and innovation and the need for further conceptualisation and development (Alexander et al., 2016; Fillieri et al., 2014), this paper makes a theoretical and empirical contribution. Theoretically, we provided a more comprehensive view of different elements of social capital that facilitate the transfer of knowledge in achieving innovation outcome in the context of partnerships between university and TBSFs. Besides, the new insight gained from the study of partnership with TBSFs and their innovation outcome is fundamental, contributed to the development of measuring innovation output within the university-industry partnership.

Empirically, our study provided in depth understanding at assisting diverse stakeholders within the partnership. Business managers can be well prepared when targeting resources to support these relationships. In particular, knowledge transfer office, universities (and other agencies) that involves in such partnerships could emphasise explicit mechanisms and resources for future partnerships, as this will help to facilitates the transfer of knowledge to achieve innovation.

Although qualitative study is often challenged in regard to their generalisability (Gerring, 2007), our 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). However, the extent to which these findings and conclusions can apply to other contexts would depend on the degree to which such settings match the situation and conditions presented in this study (Tsang, 2014). It is suggested that future research should develop the proposed model into testable propositions to be used in other context thus facilitating empirical generalisation of knowledge transfer in fostering innovation.

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