Using Knowledge Transfer Partnership Projects to Reveal Latent Dynamics in the Knowledge-Based View of Strategy

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IPR Statement

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Statement of Original Authorship

I certify that this dissertation reports original work by me during my University project.

Signature: 

Date:
Abstract

The Knowledge-Based View (KBV) is a well-regarded theory that places knowledge as the most strategically significant resource of the firm. Grant’s (1996) paper: *Towards a Knowledge-Based Theory of the Firm* triggered a wave of research and was one of the most cited papers in subsequent years. Yet, just over 20 years after the appearance of the KBV, there are still academic disputes on what the KBV has contributed to the competitive strategic management literature. The reason for prolonged debate stems from the nature of the theory itself. In short, that which is held to make the approach effective renders it as unclear to researchers seeking to explain it as it is to competitors seeking to replicate it. Researchers have tried to overcome the problem of causal ambiguity by isolating individual themes which consequently, makes them only partially useful in explaining both the overall strategy formulation of the firm and its subsequent effects.

This thesis makes its contribution by deliberately seeking a context where KBV would be most evident. The goal is to analyse how different KBV-themes are interlinked with each other and hence, this study will enable insight into holistic KBV strategy formulation. Special focus will be given to the role of knowledge among firms that engage in knowledge production and knowledge coordination. The chosen context to unveil the KBV as an act of strategy is knowledge transfer partnerships (KTP) since the main purpose of a KTP is to fill a strategically important knowledge-gap to achieve competitive advantage by using knowledge production and integration mechanisms. The overall goal is to unveil, ex-post and through a newly constructed knowledge-based value chain, how the different KBV-themes, as a holistic view, explain the achievement of competitive advantage and how such advantage could be sustained. The individual, project-based nature of KTPs require a qualitative, case-based research method which is applied to four KTP projects.

This study has the following theoretical, methodological and practical knowledge contributions: **First** – By extrapolating a specific KBV value chain which comprehensively links the primary knowledge processes of knowledge production, coordination and decision making with identified KBV knowledge elements. This allowed for a unique holistic view of the KBV of strategy which no other model in the identified literature provided. **Second** – By creating a distinctive KBV value chain construct, this thesis enables a reflective case study analysis in the understanding of complementary use of knowledge elements and knowledge processes more linked to SCA. **Third** – Identifying and defending the use of KTP as a strategic-fit case study environment for the KBV value chain construct. In doing so, this thesis is the first study to have successfully demonstrated how and why the KBV can be used for strategy formulation, while understanding latent dynamics of a holistic KBV of strategy to explain the success and failures within KTP projects. **Fourth** – The contribution to practice is through the creation, understanding and implementation of a complexity of knowledge model in developing strategy formulation for managers requiring to implement a knowledge-based view of strategy within knowledge production, coordination and decision making.
Acknowledgements

My particular PhD journey has been demanding to say the least. The uncertainty and the stress during so many years of full-time work and part-time studies were often hard to endure. At times, my learning process made me feel unsure about my writing skills, academic capability, and myself as a person. I almost gave up many times over the years and had strengthened parts of this thesis I thought were already quite strong. I understand the value in critically analysing the work of others but had to learn that the same is true for my own work. My PhD experience has been one of the most enriching experiences of my entire life. As I am approaching the end, I would like to thank the people who supported me and helped me through this journey.

I would like to start my acknowledgements by thanking Professor Dr Steven Henderson, my Director of Studies, whose support and academic rigour has been invaluable throughout the years. You already earned my academic respect during my MBA years, and over recent years, you have also earned my respect as a friend (very critical friend).

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Abbreviations

AC: Associate
AL: Academic Leader
CA: Competitive Advantage
CS: Company Supervisor
IP: Intellectual Property
IT: Information Technology
KBV: Knowledge-Based View
KE: Knowledge Elements
KT: Knowledge Transfer
KTP: Knowledge Transfer Partnership
KTPs: Knowledge Transfer Partnerships
RBV: Resource-Based View
SCA: Sustainable Competitive Advantage
SsKTP: Shorter Knowledge Transfer Partnership
SP: Superior Performance
Chapter 1: Introduction

The aim of this chapter is to give an outline view of a knowledge-based perspective of the firm. It will further outline the study justification and argue that a technology focus of knowledge may be challenged from a knowledge-based view perspective. This introductory chapter will pinpoint specific areas of the knowledge-based perspective and identify a gap in the respective literature that needs further critical discussion within the literature review chapter. Following this, the introduction chapter will have sub-sections including an outline discussion about the overall scope of the study, the overall research design, the research question and objectives as well as an outline section on the contribution of knowledge.

Since the 1990s the term ‘knowledge economy’ is increasingly used to stress the change in the ‘productive paradigm’ whereby developed countries move from manufacture to service industries. The Financial Times reported that the service industry in the UK accounts to almost 80 per cent, showing its 12th consecutive quarter of growth by the 31 March 2016 (Cadman 2016). In today’s economy, there is a similarity with the role of knowledge compared to the role of land in the agrarian economy and the role of capital in the industrial economy, until the early twentieth century (Grant 2002; Drucker 1993). There is also an increased focus on intangibles compared to tangibles (Zambon 2017; Stewart 1997) with predominance of services over goods (Rust and Kannan 2014; Grant 2002).

The shift towards a knowledge-based economy (Morel 2015) has increasingly placed knowledge as the most significant factor to achieve sustainable competitive advantage (SCA), whereby the importance of knowledge, as a source of SCA, attracted numerous authors in the past (Teece 1998; Hall 2006; Drucker 1992; Sveiby 1997; Toffler 1990) and present (Krishnaswamy 2017; Liao et al. 2016) and will, therefore, be further discussed in the literature review (section: 2.4.3). However, to protect valuable knowledge and achieve SCA, a key task of the firm is to keep value generating knowledge internal (Hernandez 2015; Nickerson and Zenger 2004; Rumelt 1984;
Barney 1982; Teece et al. 1997) and enhance efficiency and capacity by advancing the firm’s knowledge base (Wiklund and Shepherd 2003; Eisenhardt and Santos 2002; Grant 1996; Argote and Ingram 2000). Consequently, a common assumption in the strategy literature is for firm boundaries to encompass valuable competencies and core knowledge (Drucker 2017; Argyres 1996; Prahalad and Hamel 1990).

The question of efficient production and protection of knowledge linked to SCA has led to a peak interest in the mid-1990’s in new forms of organisations (Spender 1996, Stacey 1995, Nonaka and Takeuchi 1995, Wheatley 1994) including a resource- or knowledge-based perspective (Nickerson and Zenger 2004). Some researchers argue that any knowledge-based perspective is an extended arm of the Resource-Based View (RBV) (Curado 2006; De Carolis 2002) adding little to understanding SCA. The RBV argues that firm’s performance and ultimately success and failure lies within the firm’s ability to understand the strategically relevant resources and capabilities that link to their competitive advantage (Lin and Wu 2014; Barney 1991; Peteraf 1993) by ensuring that they are valuable, rare, inimitable, and non-substitutable (VRIN). Eisenhardt and Santos (2002) argue, that by viewing a knowledge-based perspective as a strategy, knowledge becomes a resource that can be acquired, transferred, or integrated supporting the RBV in achieving SCA rather than a unique theory of strategy. Hence, there is a need to further explain the link between superior competitive performance and the RBV in the literature review (section: 2.3.1) as well as the contribution of a knowledge-based perspective to explain SCA (section: 2.4).

The knowledge-based perspective is widely discussed (Garret and Covin 2015; Gunsel 2015) and places knowledge as the most strategically significant resource of the firm. The key knowledge-based question, in this thesis, is to understand effective ways of utilisation of a knowledge perspective by focusing on knowledge production, coordination of knowledge and decision-making. In doing so, this research focuses on the efficient production and protection of knowledge linked to SCA and is, therefore, less concerned with the minimisation of costs of transactions among various assets. Hence, this thesis will distance itself from any theory of the firm involving a
transaction cost logic and its behavioural assumption of opportunism (Ding et al. 2009; Nickerson and Zenger 2004).

One of the most cited papers, with over 17000 citations on Google Scholar (April 2018), linking the knowledge perspective to firm performance, is the paper by Grant (1996): Towards a Knowledge-Based Theory of the Firm. Grant’s (1996) paper is perhaps one of the most exciting and influential papers within a knowledge-based perspective and argues that most knowledge-based resources are intangible and therefore, placing idiosyncratic knowledge and its ambiguous causal nature, as the source of SCA.

Kakabadse et al. (2003) reviewed the knowledge management literature and established that the challenges of ‘knowledge’ have lasted as a constant debate and have been recorded since the fourth century BC by scholars such as Plato and Aristotle. Considering this long-lasting debate around knowledge, it is not surprising then, that the knowledge-based view (KBV) discussion has also lead to disputes within the field of strategy (Kamasak 2017; Håkanson 2010; Sousa and Hendriks 2006; Eisenhardt and Santos 2002; Spender 1996). Lack of clarity remains over whether research supports the KBV (Patriotta and Pettigrew 1999, cited in Eisenhardt and Santos 2002), or in fact strengthens other theories of strategy (Eisenhardt and Santos 2002). Scholars have linked strategy and the knowledge perspective to a range of different research topics, including organisational learning (North and Kumta 2018; Wang and Ahmed 2003; Kogut and Zander 1996) capability transfer (Jimenez 2014; Szulanski 1996; Zander and Kogut 1995), alliances (Ko and Joo 2013; Gomes-Casseres et al. 2006; Badaracco 1991), organisational performance (Mosconi and Roy 2013) and acquisitions (Pattinson and Preece 2014; Hébert et al. 2005; Singh and Zollo 1998; Bresman et al. 1999).

However, there has been a great appreciation for knowledge within individuals as a productive source (Jones et al. 2018; Lubit 2001) although a systematic literature review by Foss et al. (2010) suggest that the literature is not paying enough attention to individual level constructs, possibly due to the characteristic and complexity
challenges of knowledge, which will be further discussed in the literature review (section: 2.2). Hence, this study will have a focus on idiosyncratic knowledge and its ambiguous causal nature as the source of SCA (Mors 2010; Nonaka 1994). In the context of this thesis, knowledge ambiguity will refer to the lack of understanding of the linkages between action and outcomes (Lee et al. 2007; Simonin 1999) that are related to the know-how as a process of knowledge production, coordination and decision-making.

In the pursuit to manage knowledge, academic literature has focused on knowledge management (KM) (Heisig et al. 2016) building effective information technology (IT) systems (Omotayo 2015; Donate and Pablo 2015) often using the term ‘information’ and ‘knowledge’ interchangeably. Based on KM principles, firms have developed and implemented KM initiatives to increase the efficiency of business processes and productivity of their services (Donate and Pablo 2015; Nguyen & Mohamed, 2011). Moreover, innovation and SCA have been linked closely together and seen as a direct outcome of KM initiatives (Martin-de Castro 2015; Du Plessis 2007; Darroch & McNaughton 2002; Nonaka & Takeuchi, 1995).

However, this has resulted in traditional management models viewing the firm as information processing machines, whereby problem-solving is centred on what is input to the organisation, not what is created by it (Nonaka, Konno and Toyama 2001). This KM focus, risks, to either dilute diverse types of knowledge or follows Nonaka’s (1994) idea of ‘knowledge conversion’ from, e.g. tacit to explicit knowledge. Furthermore, it risks to de-scoping the essence of the firm as a knowledge-creating entity. It assumes clear and unambiguous descriptions of knowledge structures, problem-solving behaviour and managerial cognition. Grant (2002) argues that although flows of information and codified knowledge have characterised the information revolution of recent decades, the powerful tools of knowledge management are concerned with the idea and assumptions of tacit knowledge instead.
The goal of the thesis is not to contribute to the initiatives of IT-based KM discussion but instead to understand idiosyncratic knowledge as well as how and why the KBV is an adequate explanation for the firms SCA. Since knowledge, which may be linked to SCA must be VRIN (Meyer et al. 2015) and has an ambiguous causal nature, knowledge creation and firm performance is not well supported by empirical research (Su et al. 2016; Collins et al. 2001). Hence, this thesis will further investigate the KBV of the firm and shed light into knowledge processes of the firm and its management that are yet not fully understood.

The KBV has further implications for the basis of organisational capabilities and is aspiring to explain the SCA of one firm over another. Grant (1996) describes his contribution as follows: “The primary contribution of the paper is in exploring the coordination mechanisms through which firms integrate the specialist knowledge of their members.” (Grant 1996, p. 109). Although, existing literature including the KBV, contributes to the current understanding of the firm, there is limited understanding within the literature on how to place the KBV as an act of strategy formulation, leaving a gap in the firm’s role of efficiently producing knowledge (Nickerson and Zenger 2004) while also considering coordination of knowledge.

Teece (2000) linked the firm structure to knowledge exchange, to then form strategies for managing knowledge. On the one hand, Nickerson and Zenger (2004) identify that the two main arguments within the literature, discussing the firm’s efficiency in knowledge exchange, are fully contradictory. Some researchers argue that hierarchies restrict or avoid knowledge transfer by emphasising the authority given to direct others’ action (Krishnaveni and Sujatha 2012; Joia 2006; Conner and Prahalad 1996; Demsety 1991; Conner 1991). On the other hand, the opposite view claims that hierarchies exist to facilitate knowledge transfer (Nahapiet and Ghoshal 1998; Kogut and Zander 1996; Arrow 1974). There is also limited empirical support to show possible links between the complexity of knowledge and the optimal location of decision-making while considering the coordination challenges as well as the knowledge production process. Undoubtedly, the KBV has made a strong impact to
academic discussions but to understand how and why knowledge elements and possible mechanisms achieve SCA as a holistic construct, remains unclear, and hence, the literature review (section: 2.4.4) will identify KBV-themes that could be further investigated to help the KBV explain SCA.

The KBV still has major shortcomings to act as an ex-ante view of strategy formulation, let alone as a theory of the firm. The goal of this thesis, so far, is to find enough evidence to know, what to look for when using the KBV as an ex-post instrument to explain SCA within a case study formulation. Given the growing importance of evolving a knowledge-based strategy within a firm (Dayan et al. 2017; Ceptureanu 2016; Cusumano and Kahl 2015), this research seems timely to conduct in-depth research that focuses its attention on identified KBV-themes to discover if they can explain the creation of an SCA, either as a standalone theme or as a holistic theme construct that interlinks with one and another. An interpretative process of case study analyses through reflexive sense-making will allow this study to share insights into a holistic approach of the KBV and its remark within a competitive strategy formulation. Hence, the literature review will develop a research construct most likely to facilitate empirical research discussed thus far. To do so, a somewhat specific environment will be introduced (section: 2.5) to enable further investigation into the KBV and provide a fundamental step in advancing the KBV.
1.1 - Scope of this Study

This research explicitly centres on identified KBV-themes to introduce overarching KBV strategy concepts. There has been some previous work in related areas such as Social Networks (Borgatti and Cross 2003), Knowledge Integration (Guinery 2006), Knowledge Assimilation (Nemanich et al. 2010), Knowledge Transformation (Hotho et al. 2011) and Knowledge Sharing/Transfer (Siemsen et al. 2008), Alliances (Ko and Joo 2013; Gomes-Casseres et al. 2006; Badaracco 1991), Organisational Performance (Mosconi and Roy 2013), Acquisitions (Pattinson and Preece 2014; Singh and Zollo 1998; Bresman et al. 1999; Hébert et al. 2005) Organisational Learning (Kogut and Zander 1996; Kogut and Zander 1992), Capability Transfer (Szulanski 1996; Zander and Kogut 1995) and learning as a Dynamic Capability (Kale and Singh 2007).

Firstly, this thesis appreciates all previous work and their phenomena and processes within it and will draw upon some of the debates to aid the discussion in line with the research objectives. However, this thesis will limit its focus on a strategic KBV by using the KBV-themes as an interlinking holistic construct. Hence, gather a deeper understanding of possible links between the KBV and SCA.

Secondly, competitive advantage in this research is linked as an object of strategy formulation (Grant 2016; Vivas Lopez 2005; Porter 1985; Newman 1951; Day 1984). This research will mainly differentiate between superior performance and SCA. Superior performance is used to describe an initial advantage that can be explained through the KBV-themes. This research study does not assume that superior performance necessarily links to SCA as discussed in Barney (1991). Hence, Superior performance could be viewed internally (e.g. process or communication improvement within the company) or viewed externally (e.g. achieving a higher market share than its competitors). However, SCA may only be achieved if the firm is implementing a value generating strategy in which benefits cannot be duplicated, nor the same strategy be simultaneously implemented by current or potential competitors.
Thirdly, this research explicitly centres on Knowledge Transfer Partnership (KTP) projects between a university and industry as a favourable context to understand how identified knowledge-elements support or hinder the achievement of an SCA for the firm. The KTPs used in this thesis will create a somewhat specific and controlled environment and aid to minimise the possible ambiguous nature for this kind of study (further discussed in section 2.5). Moreover, this study will assume that not one KBV-theme on its own is enough to explain an SCA but instead cross-reference knowledge processes and KBV-themes to understand a more holistic view of the KBV.

Fourthly, recent academic literature seems to be focusing on building effective information technology. This technology focus results in traditional management models viewing the firm as information processing machines whereby problem-solving is centred on what is input to the organisation, not what is created by it (Nonaka, Konno and Toyama 2001). This focused view, however, risks diluting different types of knowledge. As this research study is centred on the understanding of tacit knowledge, and since tacit knowledge is embedded deeply within individuals, IT systems will not play a part in this study. Furthermore, any artificial intelligence research, although fascinating and likely to have an increasing impact in future knowledge management debates (Hanako 2016), is also outside the scope of this research study.

Finally, this thesis will not aim to show a perspective on one particular industry. Instead, it will select KTPs most likely to identify KBV dynamics and therefore, help understand the KBV across different industries. This is interesting as it places the later identified KBV-themes into a generic strategy framework.
1.2 - Research Design and Rhetorical Assumption

This thesis will extract the knowledge-based view themes from Grant’s (1996) original paper named ‘Toward a knowledge-based theory of the firm’. Once, the KBV-themes are understood, some key assumptions will be formed for each theme to place an anchor point from which discussions and analysis can focus upon.

Any rhetorical assumption is concerned with the chosen language of research. Hyland (2001) highlights the danger of authors eradicating themselves from their thesis to gain acceptance for their work. Any rhetorical assumption will influence the impression writers make on their readers and the first-person pronoun is a powerful rhetorical strategy for emphasising any contribution made (Hyland 2001) and will add tenor to their academic writing (Harwood 2006). Hu and Cao (2015) analysed 120 research articles and highlighted that intensity of using pronouns will also be affected by the choice or focus of research approaches such as qualitative versus quantitative research. As such, qualitative researchers tend to embrace themselves in rhetorical strategies of using an informal style while using personal voice (Creswell 2012). Hence, considering the methodology chapter (chapter 3), I may use analogy or refer to myself in the first-person pronoun, ‘I’, with exception of the literature review.

Figure 1 below shows the research design outline. To further understand the identified theme assumptions, qualitative case study research will be used as the main methodology to satisfy research objective number four and subsequently the overall research question. The reasons for choosing a qualitative research approach using case study analysis is discussed in depth in the methodology section. The identified case studies are Knowledge Transfer Partnership (KTP) projects which are placed as a context and discussed in the literature review subsection under ‘Knowledge Transfer Partnership’ (section 2.5). In short, the KTP case study will act as a strategic context by minimising ambiguity because of the KTPs’ limited use of knowledge actors and its strive to achieve an SCA to secure government funding. Furthermore, KTP projects focus on knowledge production, knowledge coordination and decision-making to achieve an identified SCA which is vital for this research study.
and hence, places KTP as a good research fit environment for subsequent research objectives.

<table>
<thead>
<tr>
<th>Phase ONE</th>
<th>Exploratory building of ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature Review</td>
<td>Identification of KBV-themes and construction of KBV assumptions</td>
</tr>
<tr>
<td>Phase TWO</td>
<td>Evaluation of Methodology</td>
</tr>
<tr>
<td>Methodology stance of ontological-, epistemological-, methodological-, and case study level</td>
<td>Pilot case study selection, interview and testing of initial analysis method</td>
</tr>
<tr>
<td>Phase THREE</td>
<td>Analysis and Conclusion</td>
</tr>
<tr>
<td>Analysis and discussion for each KBV theme</td>
<td>Refinement of literature review and methodology</td>
</tr>
</tbody>
</table>

**Figure 1: Research Design Outline**

After identifying the KBV-themes, a total of four different case studies will be selected, and 11 in-depth interviews with the key knowledge actors will be undertaken. However, one of the case studies is a shorter KTP and was mainly used as a pilot study to inform the main research study. In-depth interviews were undertaken, and Nvivo was used to help structure and identify patterns in the individual responses. This research was subsequently used to understand why and how the KBV-themes interact with each other and if the SCA achieved within the KTPs could be explained by the KBV-themes. In doing so, the analysis could satisfy the research question and add to the contribution of knowledge by giving new insight into the field of KBV and strategy formulation.
1.3 - Research Question and Objectives

To contribute to the KBV discussion, this thesis aims to investigate the previously highlighted absence of a holistic KBV study. In doing so, KBV-themes will be identified and linked to a firm's SCA. To formulate company strategy of decision-making, the degree of knowledge - while investigating the knowledge-elements and their role within knowledge production, knowledge coordination, and the aspects of organisational structure and design - will be considered.

The aim of this thesis, within the perspective of competitive theory, is to understand the causes for a firm’s performance which are related to the KBV-themes and the function of strategic choice in the decision-making process. To further explore this research area, the goal of this thesis is to investigate how and why the different KBV-themes are interlinked with different knowledge processes, to enable a discussion around a holistic knowledge-based theme strategy.

The following research question is identified as essential for research success. The research question will determine the most appropriate research design while establishing and considering the research philosophy, further discussed in the methodology chapter. The following confirms the research questions of this thesis:

**How (if at all) can the Knowledge-Based View be used to enact strategy formulation to achieve a sustainable competitive advantage?**

In order to achieve this research aim, and give an insight into the knowledge processes of knowledge production, coordination and decision-making, the KBV needs to be further understood. As outlined in this chapter and further discussed in the literature review, the ambiguous causal nature of knowledge introduces considerable challenges to pinpoint any knowledge elements that may be responsible for the achievement of an SCA. Since the research question above is expected to further understand the KBV as a holistic view of strategy formulation to achieve SCA;
this thesis has developed a further four research objective to satisfy the research aim. The first objective is:

**To specify and critically evaluate the KBV as an act of strategy formulation and associate themes key to a KBV**

In order to advance the KBV as an act of strategy formulation, the literature review needs to understand different types of knowledge and subsequent discussions about the SCA of the firm. A firm theoretical perspective needs to be discussed and linked to the KBV. Furthermore, for the KBV to be used as an act of strategy formulation, it is vital to gain a deeper understanding of knowledge elements that can be linked to SCA. Therefore, the KBV should be broken down into specific KBV-themes as well as understanding their theme assumptions and possible mechanisms that may inform knowledge processes.

The second objective is:

**To situate the KBV in a context favourable to unveil SCA for the firm**

The KBV holds that knowledge is the key determinant to achieve a competitive advantage for the firm. Knowledge that is rare, valuable, inimitable, non-substitutable and in-transferable will lead to knowledge ambiguity which in turn will hinder knowledge leakage to competitors but sustain the advantage. Adversely, this ambiguous nature of knowledge makes empirical study somewhat problematic, and the literature review has to critically discuss this and identify such research challenges. Hence, there is a need for the literature review to identify and critically discuss a research context that has the ability to overcome or minimise identified research challenges.

The third objective is:

**To develop a research construct most likely to overcome issues of causal ambiguity of knowledge**
Once, a context to minimise the challenges for empirical research is introduced, the next challenge will be to develop a research construct that can be used to gather enough data to satisfy the main research question. The value of specific knowledge elements within the knowledge production, knowledge coordination and decision-making process should be understood, and henceforth, any research construct should be in line with the identified research context, the knowledge processes and a robust link to the SCA of the firm.

The last objective to satisfy the research question is:

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To understand, how and why, the identified knowledge elements (if at all) explain SCA and how such knowledge elements can be used to recommend a holistic KBV strategy

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Once, the research construct is developed, this thesis will link the research construct to the research methodology while making sure that the research construct can be used in line with the chosen research methodology. The goal of the primary research is to fill some of the literature review gaps by gaining a fuller understanding of the knowledge elements by explaining how the research context achieved an SCA. This will then help to close the loop to the research aim, to formulate the KBV as an act of strategy formulation for decision makers, within the competitive strategy literature.

### 1.4 - Contribution to Knowledge

This thesis will explicate the Knowledge-Based View (KBV) as an act of firm strategy. In doing so, it is expected that the literature review will show that this is the first study to use a unique context to gather research data on the KBV as a holistic approach that could be used to formulise a KBV strategy for decision makers.

The KBV research literature is concentrating mostly on specific aspects of the KBV to draw conclusions. For example, some studies identify the efficiency of, for instance, integration mechanisms, from a firm performance view. However, such studies only use specific knowledge elements, for instance, knowledge transfer within their study.
Therefore, the majority of studies only give access to certain elements of the KBV but do not address the KBV as a full concept for strategy formulation. Moreover, most studies are challenged to pinpoint specific details that are essential to the firm’s achievement of SCA. Since the KBV argues that the knowledge that could lead to SCA is tacit and embedded deeply within individuals, there is a challenge of knowledge ambiguity. More broadly speaking, current studies do not unveil whether the KBV, as a holistic theme, results in a sustained or even temporary competitive advantage.

Another knowledge contribution is made towards organisational capability which is mainly linked to ‘broad-scale’ integration in the literature. The challenge is to identify knowledge elements and possible mechanisms for SCA when many individuals within a firm setting may not contribute to the achievement of a capability that is then linked to SCA. This thesis will unveil a context that has the ability to overcome challenges to link one stream of capability to an SCA using a limited number of knowledge actors responsible for the SCA. This will allow untangling and further understand knowledge transfer, specific knowledge production within individuals, individual absorptive capabilities, individual specialisation in knowledge acquisition, knowledge enablers that can be linked to specific knowledge mechanisms, the impact of the role of hierarchy and the impact of decision-making. Although challenging from a research study perspective, such a holistic view is necessary to gain a fuller understanding of the KBV to then either strengthen or weaken assumptions in order to enact the KBV as more than a theoretical “view”.

The type of contribution to knowledge, made in this thesis, is the confirmation and clarification of the existing KBV. The original theoretical framework from Grant (1996) is used, and KBV-themes are identified to be the foundation of the research study. In order to achieve a holistic KBV, assumptions in the literature review are identified which can be further analysed and understood. To unveil the ambiguous nature of knowledge, there needs to be a context that is in line with the main KBV assumptions and whereby a performance baseline can be traced back that is linked to an individual
(or group of individuals) in which the context of the performance activity is somewhat specific, structured, isolated and controlled from the outset.

All four case studies are based within a controlled ‘Knowledge Transfer Partnership’ environment which was set up to achieve a particular strategic benefit (competitive advantage) to fill a predefined knowledge gap. This allows the research study to have an unprecedented insight, through the use of ex-post in-depth analysis, that can explain the achievement of a particular SCA by explaining success and failure through the investigation of the KBV-themes. Hence, there is also a further contribution to knowledge within the overall understanding of KTP project in line with the KBV and explanation of SCA. From a KBV perspective, another contribution to knowledge is to have found an environment that can be used as a ‘strategic research fit’ to unveil how the identified KBV-themes explain an SCA. Hence, it is hoped that this insight into the details of the KBV-themes will trigger new discussions into in the field of the KBV and strategy formulation. The word ‘strategic research fit’ is used to express the high degree to which the case study environment can contribute to the understanding of the firms’ processes and mechanisms to achieve an improved competitive position.

Furthermore, it will emerge, that the KBV for a firm has particular challenges which can be overcome by using the KBV from a project perspective. This emerging KBV of project management has the potential to expose a new strand of future research. Furthermore, based on the methodology within this thesis, new propositions will be made in the form of KBV PRINCIPLES which will emerge out from the different KTP discussions. These PRINCIPLES are believed to be critical in following a KBV of project management and are hoped to be generic and not industry specific. Although, it is not within the scope of the thesis to further test those PRINCIPLES it will add to additional research for future academics.
Chapter 2: Literature Review

2.1 - Introduction

The aim of this chapter is to satisfy the first three research objectives in pursuit of answering the main research question. In doing so, this chapter will summarise the various theories, perceptions and discussions around the Knowledge-Based View (KBV) to provide solid theoretical foundation for the KBV and its implications on SCA of the firm.

The following two sections of this chapter will have a critical discussion around types of knowledge and their links to SCA. Furthermore, a firm theoretical perspective will be discussed to understand effective ways of utilising a knowledge perspective to explain firm performance.

The fourth section of this chapter will critically discuss the KBV and challenges of empirical research. Furthermore, it will identify KBV assumptions and provide a view of strategy before linking the discussion towards the KBV and SCA. Lastly, this section will identify the KBV-themes important for this research study and provide a critical debate on each identified KBV-theme, in line with research objective one.

To bridge the gap between theoretical understanding and practical strategy formulation, the fifth section of this thesis will explain how KTP projects have the potential to unveil the ambiguous causal nature and hence, are fit for purpose for an empirical research study. To do so, the unique nature of a KTP project will be further explained and linked to main KBV assumption and the causal ambiguity discussion. Once, such links are understood, the KTP will be mapped against all eleven identified KBV-themes as well as their assumptions to further strengthen KTPs as a case study.

The sixth section will satisfy the third research question by creating a knowledge-based value chain construct before the final section provides a literature review conclusion.
2.2 – Types of knowledge

Knowledge has multi-layered meanings, and the history of philosophy can be regarded as a continuous search for the meaning of knowledge (Dancy 1985; Halis 1985).

Georg von Krogh (1998) identified two major perspectives on the nature of knowledge. The revolution in computer science, systems theory, and neuroscience in the early 1950s provided insights to view knowledge from a “cognitivist perspective”. From this perspective, knowledge is universal, and the key task of the brain or any form of cognitive system is to represent or model a number of objects or events as accurately as possible. Hence, two cognitive systems should represent the same object or event, meaning that knowledge from the cognitivist point of view was able to be encoded and stored, is explicit, and easy to transmit. On the other hand, the “constructionist perspective” views cognition as an act of construction or creation rather than representation. Hence the cognitive system works when knowledge brings effective action. Krogh (1998) argues that knowledge is not universal and that knowledge resides within individuals who have senses and previous experience, hence, making the world that are unique to himself or herself.

“To the constructionist, some knowledge is explicit, but some is also tacit, highly personal, not easily expressed, and therefore not easy to share with others” (Krogh 1998, p. 132)

Both perspectives have their importance and impact on management theory and practice. However, considering the research question, this thesis will view knowledge management (KM) as more than data warehousing, developing expert systems, installing intranets or refining organisational routines (Krogh 1998). This thesis will not emphasise on technology as a strategic model to disseminate and generate new knowledge. Nonaka and Takeuchi (1995) already distanced themselves from viewing knowledge as a representation (cognitivist perspective) but instead, adopted the traditional definition on Plato’s discourses in the Meno, Phaedo, and Theaetetus, from
Takeuchi’s (2013) argues that a justified true belief suggest that knowledge is something that is objective and context-free. The Introduction Chapter already identified the importance of idiosyncratic knowledge within this study. Hence, knowledge is driven by human beings in an interactive process that is likely to be subjective and context specific.

However, to position a knowledge-based strategy, it is essential to appreciate potential types of knowledge and understand how various knowledge types could influence and improve a competitive position. Within the general knowledge-based discussions, two types of knowledge are defined, namely, explicit and tacit knowledge. The knowledge-based literature, almost always, links the organisational knowledge creation process as a dialogue between explicit and tacit knowledge (Nonaka 1994).

After Nonaka’s papers in the 1990s, the second most cited author is Michael Polanyi (1958 and 1966). The main view of knowledge in this thesis is based on Polanyi’s (1958) concept of knowledge that describes complete objectivity as a false idea and a delusion. Polanyi also distinguishes between learning a skill and acquiring knowledge. His riding a bicycle analogy is widely used as an example of tacit knowledge. Polanyi does not claim that tacit knowledge cannot be transferred but suggests that some types of knowledge may be more limited to transfer than others.

The ability to hit a football, from a distance, in order to score a goal may be gained as bodily-learned skills; others may come out from experience or by using language. The former will be of specific interest for this thesis. However, there are limitations to the use of language. To Polanyi, it is not words that have a certain meaning but the tacit element of confidence that the word will be understood. Polanyi suggests that all knowledge has an element of tacitness by which:
"the tacit cooperates with the explicit, the personal with the formal" (Polanyi, 1958, p 87).

Polanyi would describe tacitness as something personal such as a skill or ability to perform something or to resolve a problem that could be based on the individual’s experiences and learning. With the appropriate use of language, much, but probably not all, of this knowledge can be shared between individuals who share a mutually agreed language and meaning (Grant 2007). Polanyi refers to a predominantly tacit knowledge base that cannot be articulated as "ineffable" knowledge. (E.g. ask Ronaldo how he hits the ball on a free kick).

Grant (2007) examined some 60 papers from three major knowledge management journals and concluded that Polanyi’s work has frequently been misquoted or misinterpreted. Grant (2007) concluded that 42 percent were unlikely to have read the original work, based on the authors’ use of the related concepts. Moreover, around 23 percent seem to significantly misrepresent Polanyi’s work. Typical misinterpretations include:

- The most frequent occurrence is the suggestion that Polanyi identifies two types of knowledge --tacit and explicit -- and that this is an either/or state. This is really in direct contradiction to his view that all knowledge has a tacit element and that the degree of tacitness varies

- The suggestion that Polanyi was writing about knowledge in a corporate or organisational context

- That it is impossible to convert tacit knowledge to explicit knowledge; or that tacit knowledge is embedded in corporate processes and routines

- That tacit knowledge is the same as implicit knowledge; or that explicit knowledge is the same as information; or that explicit knowledge can be expressed in computer systems (Grant 2007, p. 176)
However, Nonaka (1994) clearly distinguishes between tacit and explicit knowledge and describes it as: “the epistemological dimension to organizational knowledge creation” (Nonaka 1994, p.15). Nonaka recognises that ideas are formed in the minds of individuals but also stresses the importance that interaction between individuals equally plays a key role in developing ideas. Hence, the organisational role in articulating, processing and possibly amplifying knowledge is of particular interest of this study.

Furthermore, Nonaka argues that ‘communities of interaction’ contribute not only to amplification but also development of new knowledge. He also acknowledges that such interaction might span departmental or organisational boundaries (Nonaka 2000, 1994) which is also of specific importance to this thesis. The extent of social interaction between individuals that share and develop knowledge is presented as a further dimension of organisational knowledge creation and referred to as: “the ontological dimension of knowledge creation” (Polanyi, 1958, p. 87).

This research is particularly concerned with a knowledge perspective as an act of strategy formulation hence, a further differentiation between ‘information’ and ‘knowledge’ is important. The terms knowledge and information are often used interchangeably but have a very clear distinction, as such “information is a flow of messages, while knowledge is created and organized by the very flow of information, anchored on the commitment and belief of its holder” (Nonaka 1994, p.15).

The table below extracted from Stenmark (2002) illustrates the challenges of taxonomy of knowledge, information and data as interrelated concepts:
Kogut and Zander imply that information is a form of knowledge by defining its quality as “knowledge that can be transmitted without loss of integrity” (Kogut and Zander 1992, p.20). It could be argued that this definition does not sufficiently separate information from knowledge as information may be described as a flow of messages, whereby knowledge is created by a flow of information. Others argue that information is more factual whereas knowledge includes beliefs and commitment (Matzler 2011; Nonaka 1994). Hence, essentially knowledge is related to human action (Habermas 2015; Nonaka and Takeuchi 1995).

For the purpose of this thesis, data (e.g. blue; this is; chair) is said to be simply existing (usable or not) and has no significance beyond its very existence. Information is more factual (e.g. this chair is blue) and its data has a specific perception which also means that there is some sort of meaning embedded. However, information on its own still lacks the subjective interpretation of the information. Compared to the individual who could not apply the information to action, another person may use the same information and understand and interpret it through past experience to make business decisions. Yet, the third person may be able to apply the information in a different context by using lessons learned from past experience which the other two individuals would have never considered (Lee and Yang 2000).
If one individual is colour blind, then the information that the chair is ‘blue’ will be different to an individual who is not colour blind. Knowledge is the more complex cognitive model behind this and other bits of information and has a higher degree of meaning. Hence, tacit knowledge is informed by action and involvement in a specific context.

Nonaka (1994) describes two models, namely: (1) ‘technical elements’ identified as concrete know-how, crafts and skills that apply to a specific context and (2) ‘cognitive elements’ which include mental models such as schemata, beliefs, and viewpoints to create perspectives of the individual involved. The cognitive element of tacit knowledge refers to his or her image and reality and vision for the future (Nonaka 1994).

From a knowledge-based perspective, it may be important for a decision maker to understand the degree of complexity of knowledge. It is already widely accepted that information can be easily transferred within a firm. Hence, the integration of information that the organisation has a blue chair available is not a real challenge.

However, this information may trigger knowledge within an individual that one of the sales rooms for woman clothing is predominantly pink and that a blue chair will increase sales. The complexity of knowledge to form this belief may be relatively explicit, and this belief could be transferred by formally communicating that some sales are lost because there is a high percentage of couples shopping. The assumption is that the male counterpart usually does not want to spend too much time in this room which means that the woman has no chance to spend enough time to trigger a purchase. In this case, the blue chair is used by the husband to sit and to leave the woman with more time to potentially trigger sales. In contrast, if an individual has worked several years in different salesrooms with different layouts, he or she may style a room by, for example, having the specific customer, the available equipment and month of the year in mind. However, if the individual cannot explicitly explain why this particular configuration will increase sales but just believes it will, then that
particular formulation of knowledge has a higher degree of tacitness than the previous example.

Considering the types of knowledge discussion so far, this thesis accepts the belief that explicit and tacit knowledge are not two distinct types of knowledge and almost all knowledge has tacit components (Chuang et al. 2016; Leonard and Sensiper 1998, Polanyi 1958). Hence, this thesis will refer to knowledge as a continuum in which the degree of the complexity of knowledge changes dependent on the amount of tacitness involved. The figure below is constructed to illustrate this degree and highlights some preliminary drivers that may influence knowledge production, integration and transferability.

![Complexity of knowledge diagram (Serkan Ceylan)](image)

**Figure 2: Complexity of knowledge diagram (Serkan Ceylan)**

The complexity of knowledge diagram (Figure 2) illustrates the complexity of knowledge as a simple continuum diagram. The diagrams lowest complexity of knowledge is assumed to be transferable without any loss of information. The diagram continues with the level of ‘relatively explicit’ and ‘expert level’ in which it assumes that the main enablers are common knowledge and common language respectively. With higher complexity of knowledge, the scale moves to be relatively tacit before it becomes highly personal. Ineffable knowledge is characterised as being un-transferable. This complexity of knowledge diagram will be used throughout the thesis to differentiate between lower and higher levels of knowledge complexity.
Nonaka and Takeushi (1995) argue in their SECI knowledge conversion model that an organisation creates new knowledge through the interaction between tacit and explicit knowledge. The four modes of knowledge conversion are widely discussed (Jaleel and Verghis 20015; Popadiuk and Choo 2006; Lee and Yang 2000) and are:

1. **Socialisation** – from tacit knowledge to tacit knowledge.
2. **Internalisation** – from explicit knowledge to tacit knowledge
3. **Externalisation** – from tacit knowledge to explicit knowledge
4. **Combination** – from explicit knowledge to explicit knowledge.

Understanding the relationship between these two kinds of knowledge is key to understand the knowledge production, knowledge coordination and decision-making processes which are identified as one of the three primary knowledge processes within this study and viewed as a social process between individuals (Popadiuk and Choo 2006).

To satisfy the research objectives, the complexity of knowledge and the interaction between tacit and explicit knowledge will be an important factor to analyse different knowledge elements. The following subsection will define knowledge elements as KBV-themes including its subsequent assumptions. Since knowledge is often idiosyncratic in nature, its value is closely related to the context in which it is used. Hence, a change in an organisational, managerial or strategic context within the same company could lead to different impacts on company performance (Carlucci et al. 2004) and therefore, SCA. The following subsection (section 2.5) will later argue how to fix a context by finding a strategic-research-fit to satisfy the second research objective as well as constructing a model that can unveil the value of knowledge elements and be used for strategy formulation using the KBV of the firm.
2.3 - The Firm Theoretical Perspective

The firm is the organisational framework of a business enterprise which includes human activity with the aim to satisfy customer needs at a profit.

The goal of this subchapter is not to have a detailed discussion of the history of the theory of the firm. Strategic management theories are usually based on both economic and organisational theory. Economic theories of the firm are mainly concerned with predicting firm's behaviour in external markets whereas organisational theory investigates behavioural aspects of the firm, overlooked by neoclassical economics.

This thesis will position itself based on the theories of competitive advantage (Porter 1980). Although, alternative positioning towards classical microeconomics (Ricardo 1817) or evolutionary economics (Nelson and Winter 1982) could have presented valid positions. However, the former two strands would generate different insights. While all three theories share a common set of assumptions that resources and capabilities may be heterogeneously distributed across firms and emphasise on understanding why some firms consistently outperform others, they also emphasise very different implications of those assumptions and show significant differences in, for example, adopting different definitions of performance (Barney 2001).

Organisational theory recognises the firm as a complex entity and tries to shed light into the internal structure of the firm construct and the relationships between its departments (Spender 1996). The goal of strategic management theories or indeed competitive theory is to understand firm performance and the causes of strategic choice.

Barney (1991) suggests that since the 1960s mainly one organising framework dominated the literature which proposes that competitive advantage is sustained by the firm’s ability to respond to environmental strategies that exploit internal strengths while avoiding internal weaknesses and eliminating external threats. Hence, research
has focused on segregating a firm’s opportunities and threats (Leih et al. 2014; Porter 1980), describing a firm’s strength and weaknesses (Sirmon et al. 2010; Hofer and Schendel 1978; Penrose 1958), and its competitive environment (Prajogo and Oke 2016; Lamb 1984) and analysing how these can be used together to choose strategy. Environmental models of competitive advantage, such as Porter’s (1980) five forces model, described external analysis of attractive industries based on attributes suggesting that attractive industries show higher opportunities and lesser threats.

Such environmental models placed less emphasis on the impact of idiosyncratic firm attributes (Porter 1990) due to its emphasis on analysing competitive positioning based on the firm’s environment. Hence, Barney (2001; 1991) suggests that this organising framework results in two simplifying assumptions:

**Assumption one:** Environmental models of competitive advantage assume that firms within an industry pursue the same strategies and have identical strategically relevant resources they control (Porter 1981; Rumelt 1984; Scherer 1980)

**Assumption two:** even if within a given industry, resource heterogeneity develops through, e.g. new entry, it will be short-lived due to their highly mobile nature (Barney 1986)

However, the challenge with the two assumptions is that they eliminate firm resource heterogeneity and immobility as a firm cause of SCA. Following the competitive advantage literature, to deconstruct the black box of the economist’s production function onto some fundamental components and interactions, which need to be identified to build confidence about what is useful to observe over time (Schendel 1996) a resource-based perspective emerged. Hence, Barney (1991) argued that any resource-based view of competitive advantage which examines the link between internal characteristics and performance could not be based on the same two assumptions mentioned earlier (Penrose 1958; Wernefelt 1989). Therefore, the following subsection will discuss the resource-based view further.
2.3.1 – Resource-Based View

At the heart of the resource-based view is the notion that a firm has different resources and internal capabilities (Hitt et al. 2016; Petegraf 1993). The classic approach to strategy formulation may appraise organisational competencies and resources as a basis for competitive advantage if they are distinctive or superior to rivals and matched appropriately to environmental opportunities (Andrews 1971; Thomson and Strickland 1990). The Resource-Based View (RBV) builds on the work of Penrose (1959) and one of the most essential contributions occurred from Wernerfelt (1984) with a notable research stream following Rumelt (1984), Barney (1986; 1991), Dierickx and Cool (1989), Conner (1991), Mahoney and Pandian (1992), Connar and Prahalad (1996), Kogut and Zander (1992) and Teece et al. (1997). Furthermore, the RBV includes a number of review studies such as Armstrong and Shimizu (2007) or Lockett, Thomson, and Morgenstern (2009).

The RBV of the firm suggest two alternative assumptions to the earlier mentioned organising framework assumptions and argues that a superior competitive performance derives from the heterogeneity and immobility of a firm’s resources also described as ‘sticky’ resources (Barney 1991, Grant 1991, Curado and Bontis 2006) and hence, heterogeneity can be long-lasting. The RBV developed as a complement to Brain’s (1968) and Porter’s (1997; 1980; 1985) ‘Industrial Organisation’ view, which put the determinants of firm performance into the industry structure outside the firm. Instead, the RBV focuses on internal resources of SCA in the pursuit of explaining why different firms in the same industry show different performances. Another strand of research emphasises the necessity of change in capabilities underpinning these sticky resources under a ‘dynamic capabilities’ view (Teece, Pisano and Shuen 1997) in which the development of a firm-specific resource rather than the exploitation is focused upon (Mowery, Oxley and Silvermann 1996).

The central proposition of the RBV is that competitive advantage is unsustainable if rivals can mimic or acquire strategically equivalent resources to implement strategies with the same value. However, not all resources will be responsible for SCA. The RBV
suggest that competitive advantage can only be sustained by acquiring and controlling resource that possess four attributes:

- **Valuable Resources**: such resources enable a firm to implement strategies that improve firm efficiency and effectiveness

- **Rare Resources**: A firm can only achieve an SCA through an implementation of a value creating strategy not simultaneously implemented by many other firms

- **Imperfect Imitable Resources**: valuable and rare resources are only a source of SCA if other firms cannot obtain them

- **Non Substitutable Resources**: For a firm to achieve SCA other firms should not have access to strategically equivalent resources which are not rare and imitable but have the ability to achieve the same benefit

The above mentioned four attributes are often referred to as VRIN resources and capabilities (Ketokivi 2016).

“The resource-based view perceives the firm as a unique bundle of idiosyncratic resources and capabilities where the primary task of management is to maximise value through the optimal deployment of existing resources and capabilities, while developing the firm’s resource base for the future” (Grant 1996, p.110)

The resource-based view focuses on a variety of resources, which is mainly criticised because of its all-inclusiveness nature which in turn drives the RBV theory towards tautology. It is argued that everything strategically useful for the firm can be argued as a resource (Kraaijenbrink, Spender and Groen 2010) including attributes such as economies of scale, cost leadership, learning curve economies and trust (Barney 2001; Barney and Clark 2007; Barney and Hansen 1994).
This thesis considers the RBV as an important framework for explaining the basis of a firm’s competitive advantage (Barney et al. 2011; Vorhies and Morgan 2005) and will use the understanding of VRIN attributes and their impact on SCA. However, the aim and objectives of this study have a particular focus in explaining the basis of a firm’s SCA by understanding how and why knowledge elements inform knowledge production, and organisational structure of decision-making. Henceforth, the knowledge perspective of VRIN would explain, for example, the imperfect imitation attribute through causal ambiguity. Causal ambiguity only exists when the link between knowledge controlled by a firm and a firm’s SCA is at best only understood imperfectly. Hence, the firm cannot know the actions the firm should take to duplicate strategies of the firm with the SCA (Barney et al. 2011; Barney 1991).

Over time, some of the focus of the RBV has shifted from physical resources to intangible assets (Hitt at al 2016). With the earlier mentioned shift from a resource-based to a knowledge-based economy, another strand of research has emerged and found itself in the competitive strategy debate emphasising on the knowledge-aspect as the strategically most important enabler to achieve SCA. This knowledge-based view of the firm, which believes that knowledge itself is the main driver for SCA will be the major focus to satisfy the research aim and objectives and thus, will be critically analysed in the next sub-section.
2.4 - Knowledge-Based View (KBV)

The early 1990s established a stream of research convergent to create what is now known as the ‘Knowledge-Based View of the Firm’. Some of the main streams for this view has been the analysis into resource/capability (Barney 1986; Barney 1991; Prahalad and Hamel 1990), epistemology (Polanyi 1962; Krogh et al. 1994) and organisational learning (Huber 1991; Levitt and March 1988) as well as key contributions in terms of a knowledge-based analysis of firm boundaries (Demsetz 1991), examination of knowledge-based organisations (Brown and Duguid 1991), view of the firm as a knowledge-processing institution Kogut and Zander (1992), and analysis of knowledge creation within the firm (Nonaka 1994).

Since the 1990s, the Knowledge-Based View (KBV) is a widely discussed view of the firm. Grant (1996): Towards a Knowledge-Based Theory of the Firm.

Figure 3: Past impact of Original Work (Google Scholar Citation 2017)

Figure 3 above shows the number of scholars citing Grant’s (1996) paper: Towards a Knowledge-Based Theory of the Firm between 1999 and 2018 (last update April 2018). The number of citation, when the paper first published in 1996, was considerably low and it was not until the early 2000s when the KBV contribution from Grant really established itself. A search on Google Scholar Citations reveals that Grant’s original papers were cited 1,242 times in 2016. However, many of the current citations result from the necessity to quote Grant on any article remotely relating to knowledge in a firm setting. Furthermore, there is limited holistic empirical research done on the KBV as an act of strategy which is in need of further attention. Holistic, in this research context, is defined as viewing the knowledge elements as an
intimately interconnected entity that is crucial in placing the KBV as an act of strategy formulation. Thus, not to view specific knowledge elements in isolation but as a holistic view of strategy formulation. Current research mainly concentrates on either specific knowledge elements, e.g. knowledge transfer (Wei and Miraglia 2017; Argote and Ingram 2000) or is linked to a specific knowledge process, e.g. Knowledge production (Machlup 2014; Matzler et al. 2011). The literature review could not identify any empirical study which highlighted all of the main knowledge elements and explained how and why knowledge elements link to the primary knowledge processes of knowledge production, knowledge coordination and organisational structure of decision-making, which are identified in the following subchapter. This gap in empirical research has resulted in a lack of explanation of how knowledge elements can be best utilised to achieve an SCA as an act of a KBV strategy formulation for the firm.

Krogh, Nonaka, and Aben argue that:

“in the knowledge-based economy a key resource of SCA and superior profitability within an industry is how a company creates and shares knowledge” (Krogh, Nonaka, and Aben 2001, p. 421).

The knowledge management (KM) literature distinguishes mainly between knowledge transfer and knowledge production (Krogh et al. 2001; Davenport and Prusak 1998). This thesis views knowledge transfer as one out of eleven knowledge themes (see Table 2) and knowledge production as one of the knowledge processes (see Figure 5). Knowledge creation typically happens in ‘communities of practice’ or other small sized groups. Knowledge transfer (KT) should be used selectively: ‘not everybody in the company needs to know everything at all times’ (Krogh et al. 2001, p. 425).

There appears to be a highly diverse range of views that cluster around several knowledge-based capabilities: knowledge integration (Grant 1996a; Grant and
Baden-Fuller 2004), knowledge protection (Hallwood 1997), absorption (Cohen and Levinthal 1990), creation (Nonaka 1994), and replication (Osterloh and Frey 2000). This thesis argues that the KBV and its identified themes could encompass all clusters and should not be viewed in isolation as they are incomplete and collectively often contradictory. Based on the aim and objectives of this thesis, the research study would be particularly interested to understand how and why such knowledge capabilities come into play within a specific organisational context and how such capabilities might affect the knowledge elements and knowledge processes.

In the context of knowledge creation, Simon (1991) addresses where knowledge is stored and who the ‘knowledge benefiter’ is. Krogh (2009) linked the individualist perspective on the locus of knowledge to cognitive psychology to describe learning mechanisms and processes. Krogh (2009) points out two major issues within cognitive theories. First, individual knowledge is limited as a problem representation; and second, the neglecting in cognitive science indicating, for instance, implicit learning and tacit knowledge. However, Simon’s contribution triggered discussions in differences and links between individual and collective knowledge in which Grant (1996) accepts assumptions on the locus of knowledge and further assumes that the role of firms is the application of existing knowledge, which is embedded within individuals, to the production of goods and services. Therefore, an objective of research should be to unveil the knowledge themes, enablers and context in which the knowledge of the individual is coordinated by the firm to produce new capabilities.

Since the focus of this study is upon the internal knowledge context and knowledge elements adopted to unveil a holistic KBV-theme strategy, the next stage is to understand the KBV assumptions.
2.4.1 - KBV: The Assumptions

For the KBV to be relevant to the aim and objectives in this thesis, it needs a consensus set of assumptions that can be validated and then followed as an act of strategy consideration. Furthermore, based on the aim and objectives of this thesis and in order to achieve any valid research study, any identified research context needs to be in-line with such assumptions. Hence, the following will highlight the main assumptions based on Grant (1996; 1996b; 2002). Subsequent sections may also pick up on assumptions highlighted in this section to show transferability of particular thought processes.

2.4.1.1 - Four Main KBV Assumptions

The KBV has four ‘main’ assumptions which need to be considered (Grant 1996b). Hence, it is important that any strategic research fit environment will satisfy and share light into the following assumptions:

**The first assumption** is that ‘knowledge’ is considered to be the most strategically important resource of the firm. This assumption is advocated by scholars like Spender (1996), who argue that organisations have two predominant goals, the generation and application of knowledge (Spender 1996). Knowledge-based capabilities are recognised to be one of the most strategically important capabilities for creating a sustainable competitive advantage (Ahmed et al. 2014; Weerawardena and O’Cass 2004; Camisón and Villar-López 2011; Simonin 2004; Nonaka 1994).

**The second assumption** is the differentiation between explicit and tacit knowledge (Polanyi 1962), with tacit knowledge being essential to achieve sustainable competitive advantage due to its limited transferability and causal ambiguity. The view that knowledge provides organisations with the potential to create and sustain competitive advantage is also widely spread (Bryant 2005; Spender 1996; Boisot 1998).
The third assumption is that tacit knowledge is acquired and stored in a ‘highly specialised form’ within individuals (Nonaka 1994; Lam 2000; Nonaka and von Krogh 2009). This assumption will be further discussed in the theme: specialisation in knowledge acquisition (Section 2.4.4.4).

The final assumption is that production needs a widespread range of knowledge (Grant 1996b). Grant links this assumption mainly to the imperfect imitability attribute and argues that a wider scope of integration creates greater causal ambiguity. However, this assumption will be further discussed within the organisational capability theme (Table 2 and section 2.4.4.8).

2.4.1.2 - Subsequent assumptions

Building on the four main assumptions, Grant (2002) introduced another assumption that knowledge is subject to economies of scale. Grant argues that decisions based on explicit knowledge should be centralised as it is transferred at low costs and achieves economies of scale in decisions (Grant 2002). Furthermore, Grant characterises that all knowledge has higher creation costs than subsequent replication. Economies of scale for knowledge and in particular explicit knowledge is ‘costly’ to produce and cheap to reproduce (Shapiro and Varian 1999). On the other hand, tacit knowledge tends to be costly to produce and costly to reproduce, but Winter (1995) argues that the replication cost will still be lower than those incurred in its original creation and therefore, all knowledge is subject to economies of scale.

The main aim of this thesis is to analyse, discuss and highlight, how and why the KBV can be used to generate SCA as an act of strategy formulation. To achieve this, the KBV has to be broken down into themes that describe aspects of a knowledge-based perspective which needs to be addressed. The KBV-themes are highlighted below, but it is important to recognise that these themes are interlinked.
2.4.1.3 - Specific Theme Assumptions

The following are all the eleven KBV theme-specific assumptions. The purpose is to identify the KBV theme assumptions made by Grant (1996) to explain later how and why (if at all) the assumptions are in line with the findings. The following subchapter (section 2.4.4) ‘KBV: The Themes’ will critically discuss the themes in more detail. This subsection and is merely for the purpose of listing the KBV theme-specific assumptions.

Some of the following assumptions may be criticized as being true by definition and hence, tautological, since some assumption may be argued as a central assertion of the KBV and therefore, could be argued as not needing any special attention within a research study. However, this thesis will use Barney (2001) defence that, at this level of definition, most strategic management theories become tautological. For example, Porter’s (1980) assertions of firm performance and industry attractiveness can be reduced to tautology. By observing that firms will outperform firms in attractive industries compared to unattractive industries and by linking industry attractiveness with the ability of firms to perform well. Of course, Porter specifies certain conditions that make an industry more or less attractive independent of firms in that industry.

Transferability theme assumption is:

💡 Explicit knowledge has high transferability whereas tacit knowledge shows low transferability

Capacity of Aggregation theme assumption is:

💡 Explicit knowledge can be more effectively aggregated to a single location than tacit knowledge
Appropriability theme assumption is:

Tacit knowledge cannot be directly transferred which makes it in turn not directly appropriable

Specialisation in Knowledge Acquisition theme assumption is:

KBV requires individuals to specialise in particular areas of knowledge while considering their absorptive capacity to increase the success of knowledge integration

The Overall Coordination within the Firm theme assumption is:

Minimising knowledge transfer but emphasising on absorptive capacity and henceforth coordination of people’s specialised knowledge will increase efficiency and success

The Integration of Specialist Knowledge theme assumption is:

Problem-solving and decision-making in groups are reduced to unusual, complex and important tasks as the firm is maximising efficiency through the other formal integration mechanisms.

The Role of Common Knowledge theme assumption is:

There is increased organisational gain in knowledge production if integration mechanisms involve common knowledge between individuals

The Role of Organisational Capability theme assumption is:

The more individuals are used to broaden the integration of knowledge scope within each capability the more difficult imitation becomes.
The Role of Organisational structure and design theme assumption is:

Knowledge production, integration and decision-making put emphasis on efficiency, and therefore organisational structure and design will be determinant of success.

The Role of Hierarchy in Decision-making theme assumption is:

If a firm is integrating knowledge which is possessed by individuals in tacit form, then hierarchical coordination will fail.

Location of Decision-making theme assumption is:

Co-location of decision-making will produce better decisions if the nature of the knowledge is in tacit form.
2.4.2 - KBV: A View of Strategy

As mentioned earlier, there is a continuing debate, whether the KBV can actually be used as a theory of the firm. However, by shifting the focus from institutions to internal context and knowledge elements, much of the debates in the introduction chapter over the nature of the firm and the KBV contribution to the firm theory lose critical strength.

"Whether the firm is viewed as a solution to transaction costs, a nexus of contracts, a bundle of property rights, or a device for reallocating risk, is of secondary import" (Grant 2011, p. 547)

Grant himself argued, in one of his later publications, that the KBV is a set of ideas about the existence and nature of the firm.

"The emerging knowledge based view of the firm is not a theory of the firm in any formal sense" (Grant 2002, p. 135)

Furthermore, the debate around placing the KBV as a theory of the firm does not impact the research question. On the other hand, the view as an act of strategy does. Eisenhardt and Santos (2002) argued that a ‘knowledge focus’ and its impact on the field of strategy has yet to emerge. There is a vast amount of empirical research based on the knowledge perspective reaching from knowledge sharing, knowledge leaking and relative innovation performance (Ritala et al. 2015) to the impact of profound knowledge on leadership and strategy (Watson 2017). This scattered approach of the literature has resulted in the lack of empirical research of a holistic KBV-theme perspective to shed light into knowledge processes and possible connections between those two to strengthen the KBV as an act of strategy formulation.

An early attempt to integrate a knowledge perspective to the theory of strategy contextualised knowledge of firms through accumulated knowledge assets, called stocks, and knowledge streams within and across the firm, called flows, whereby
superior stocks and streams are understood as sources of SCA (Dierickx and Cool 1989). Continuing on this emphasis of strategic importance of knowledge as an advantage, Kogut and Zander (1992) claimed that firms are better than markets in the creation and transfer of knowledge within the organisation. The notion is that knowledge is held within individuals and is embedded in organising principles in which knowledge actors voluntarily cooperate within an organisational context. Knowledge is considered as a strategic resource (Storey and Barnett, 2000). However, the question remains on why KM has only limited use as a strategic tool and is underutilised (Dayan et al. 2017).

The earlier ‘types of knowledge’ discussion already defined knowledge as a justifiable personal belief whereby the emphasis is on the conscious act of creating meaning. The creation of knowledge depends on the absorptive capacity of the individual and their existing knowledge and organising principles and hence, the firm evolves in a path-dependent way, through recombination of existing knowledge into new knowledge and wider integration of that knowledge.

In what could form the basis for a theory of strategy, this thesis argues that the ability to create and coordinate strategically important knowledge, based on specific knowledge-based themes, will determine the firm’s ability to make superior decisions compared to competing firms. Therefore, a firm’s ability to deter competitive imitation maybe based on a breadth versus depth trade-off between:

(1) Continuous specialisation of knowledge holders to improve tacitness of the knowledge domain and therefore hinder imitation

(2) Replicate and transfer knowledge within the firm to accelerate the rate of growth with the subsequent danger of imitation

In competitive environments, SCA is only achieved through continuous innovation (Kanagal 2015, Eisenghardt and Santos 2002). Grant (1996) articulated in his original
paper that tacit individual knowledge is the source of sustained competitive advantage as it is both unique and immobile.

To be able to advance and contribute to the KBV as an act of strategy formulation, fundamental insight is needed to unveil how SCA is achieved through the firm ability to produce, transfer and integrate the specialist and tacit knowledge of individuals since, that knowledge lies within individuals and not the organisation. Until scholars can unveil and understand knowledge elements and their theoretical and practical interlink with one and another, this view cannot form a theory of strategy.

2.4.3 - KBV: Sustainable Competitive Advantage

The concept of competitive advantage can be tracked back in the economics literature for centuries, but it was Newman (1951) and latterly Day (1984) and Porter (1985) who linked competitive advantage as an object of strategy. The idea emerged that ‘superior performance’ is the consequence of competitive advantage and subsequently results in higher financial performance (Porter and Millar 1985; Reed and DeFillippi 1990). According to Barney (Barney 1991), a competitive advantage is sustained by implementing a value generating strategy not simultaneously implemented by current or potential competitors. Any understanding of how a firm can protect its competitive advantage, for a longer period of calendar time, forms an important research issue. On the other hand, Rumelt (1984) argued that a competitive advantage is sustained if it continues to exist after competitor efforts to duplicate that advantage have ceased. However, this thesis will follow the definition of ‘sustained’, as a longer period of calendar time. The ‘longer period’ is satisfied when the firm still holds its competitive advantage between the ex-post primary research and the initial achievement of a competitive advantage within the chosen case study.
There seems to be a general agreement that knowledge and knowledge management represent the most important competitive advantage factor for organisations (Toffler 1990; Quinn 1992; Stewart and Ruckdeschel 1998; Umemoto 2002). The first assumption of the KBV, stated above, was that knowledge is considered to be the most strategically important resource of the firm. Proponents argue that the heterogeneity of knowledge is the main determinant of SCA and superior performance (Decarolis and Deeds 1999, Winter and Szulanski 2001). Hence, the primary challenge for a knowledge-based firm to achieve SCA is to protect the knowledge from competitors but at the same time have a strategy which enables the firm to create (Kogut and Zander 1992), transfer and coordinate knowledge efficiently (Grant 1996b) within the organisation. To put this into a magician’s analogy, the question is: How do managers make sure that the firm can replicate the rabbit appearing out from the hat throughout the firm, without knowledge leakage to competitors?

The KBV argues that success in obtaining an SCA is attributed to the organisational ability to disseminate knowledge effectively (De Geus 1997) by achieving internal replication (Grant 1997) as invisibly as possible (Peteraf 1993). Grant himself refers to the invisibility as avoiding external replication (Grant 1997). The earlier discussion on types of knowledge (section 2.2) stated that the most critical distinction in the KBV is between explicit and tacit knowledge. Explicit knowledge is described by Grant as transferable at low cost due to its ease of articulation, also described as knowing about. Tacit knowledge is less suited to transfer and described as knowing how (Grant 1996a; Nonaka 1994; Grant 1997; Polanyi 1966).

Kaplan and Norton (2001) point out that most theories fail to address the performance aspect which is vital when linking strategic decisions to SCA. The RBV subchapter (section: 2.3.1) already argued that the firm could only achieve SCA if a resource, including knowledge, is VRIN. Hence, explicit knowledge as a standalone resource cannot produce an SCA as it fails to be both rare and imperfectly imitable. However, “tacit knowledge is argued to be difficult to imitate, to substitute, to transfer
and it is rare” (Ambrosini and Bowman 2001, p. 811). Hence, knowledge production and coordination that can be linked to SCA involves a higher degree of knowledge complexity and since tacit knowledge has a causally ambiguous nature, making links to actual company performance is difficult to identify and therefore, imposing considerable limitations on measurement (Lippman and Rumelt 1982).

This view is also supported by Reed and Defillipi (1990) who suggests that barrier to imitation is raised with the presence of causal ambiguity. Petraf (1993) states that causal ambiguity restricts rivals to choose which resource to imitate, let alone how. However, there is a contradictory view which opposes such positive effects of causal ambiguity and is concerned with the difficulties to transfer their resources (Szulanski 1996; Simonin 1999). Others go further and argue that causal ambiguity can directly impede firm performance (Law 2014; King and Zeithamel 2001). If managers cannot identify the source of their competitive advantage, it will subsequently result in under-utilisation of such resource. This could even result in resource loss caused by ignorance (Ambrosini and Bowman 2010; Ambrosini and Bowman 2005; McEvily et al. 2000). This conflict is also known as the causal ambiguity paradox (Powell 2006). Hence, the earlier mentioned firm’s ability to sustain a competitive advantage may be based on a depth (continuous specialisation of knowledge) versus breadth (replicate knowledge) trade-off.

The achievement of SCA is best explained by the end of the magician’s show. In other words, the trick did work, and the audience does not understand the trick. Somehow the company pulled the rabbit called SCA from its hat, but unlike the magician, who is in control of the magic show and knows exactly when his/her sleight of hand is happening, the firm is often not sure how they did it as the mechanisms to unveil the rabbit seem very complex. Unarguably, the knowledge of how to pull the rabbit from the hat is important in order to pull the rabbit out again. In this case, by using the KBV as a strategy and by making sure that the appearance of the rabbit stays a mystery for its audience and other competing magicians to guarantee a unique act.
2.4.4 - KBV: The Themes

The purpose of this section is to take the earlier sustainable competitive advantage (SCA) discussion and identify KBV-themes. This will aid in answering the first objective:

To specify and critically evaluate the KBV as an act of strategy formulation and associate themes key to a KBV

The following table below is mainly derived from Grant’s (1996) paper: Towards a knowledge-based theory of the firm, to provide a clear starting point. The table is an overview and breaks the KBV into its key themes by considering its strategic areas, and assumptions before each KBV-theme will be discussed in more detail (section: 2.4.4.1 – 2.4.4.11).

<table>
<thead>
<tr>
<th>KBV-themes</th>
<th>Strategic Area</th>
<th>Theme Explained</th>
<th>Assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transferability</td>
<td>Knowledge specific</td>
<td>Based on Barney 1986 (cited in Grant 1996, p.111) the KBV recognises transferability of a firm’s resources and capabilities as a critical determinant for sustainable competitive advantage. Main distinction between explicit and tacit knowledge.</td>
<td>Explicit knowledge has high transferability whereas tacit knowledge shows low transferability.</td>
</tr>
<tr>
<td>Capacity of aggregation</td>
<td>Knowledge specific</td>
<td>Knowledge potential for aggregation is important for the efficiency of KT. KT involves both transmission and receipt which could be individual or organisational level. Absorptive capacity of the recipient is important (Cohen and Levinthal 1990, cited in Grant 1996, p.111). The KBV links the ability to aggregate and transfer knowledge to the optimal location of decision-making authority.</td>
<td>Explicit knowledge can be easier transferred to a single location than tacit knowledge.</td>
</tr>
<tr>
<td>Appropriability</td>
<td>Knowledge specific</td>
<td>Appropriability in the KBV links to the market value of knowledge and unless the knowledge is protected by patents or copyright, it will generally be inappropriable by means of market transaction.</td>
<td>Tacit knowledge cannot be easily transferred which makes it in turn not directly appropriable!</td>
</tr>
<tr>
<td>Specialisation in knowledge acquisition</td>
<td>Knowledge specific</td>
<td>Tacit knowledge which is linked primarily to SCA is stored within individuals. This also means that individuals acquire and store existing knowledge and create new knowledge. Therefore, the efficiency in knowledge production is linked to individual absorptive capacity.</td>
<td>KBV requires individuals to specialise in particular areas of knowledge while considering their absorptive capacity to increase success of knowledge integration</td>
</tr>
<tr>
<td>Coordination within the firm</td>
<td>Organisation specific</td>
<td>The KBV argues that the fundamental goal for the firm should be to coordinate the efforts of many specialists. Transferring knowledge is not seen as an efficient approach to integrating knowledge. Individual specialist knowledge should be kept by minimising knowledge transfer but emphasising on the importance to achieve effective integration of many people’s specialised knowledge.</td>
<td>Minimising knowledge transfer but emphasising on absorptive capacity and henceforth coordination of people’s specialised knowledge will increase efficiency and success</td>
</tr>
<tr>
<td>Integration of specialised knowledge (coordination within the firm)</td>
<td>Organisation specific</td>
<td>The KBV argues that the type of interdependence within a task determines the mode of coordination deployed. The KBV points to four mechanisms for integrating specialised knowledge: (1) rules and directives, (2) sequencing, (3) routines (Thomson 1967), (4) group problem solving and decision-making (Koenig 1976).</td>
<td>Problem-solving and decision-making in groups are reduced to unusual, complex and important tasks as the firm is maximising efficiency through the other formal integration mechanisms.</td>
</tr>
<tr>
<td>The role of common knowledge (coordination within the firm)</td>
<td>Organisation specific</td>
<td>Although individuals are required to have specialised knowledge, there is a need to have some common knowledge for knowledge integration to work. The KBV identified five different types of common knowledge which fulfil different roles in knowledge integration: (1) Language, (2) Other forms of symbolic communication, (3) Commonality of specialised knowledge,</td>
<td>The KBV argues that there is organisational gain in knowledge production if individuals can share and integrate aspects of knowledge which are not common between them (Grant 1996, p.115)</td>
</tr>
<tr>
<td>Organisational capability (coordination within the firm)</td>
<td>Organisational structure/design</td>
<td>Role of hierarchy in decision-making (organisational Structure/design)</td>
<td>Location of decision-making (organisational Structure/design)</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
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</tbody>
</table>
| Organisation specific                                   | Appropriating the returns to knowledge depends upon the firms’ arrangement to inhibit knowledge leakage and thus protect the firm’s competitive advantage. The result is a strategic view on organisational structure by the KBV which argues that the knowledge based model differs from the traditional bureaucratic model. | The KBV recognises that hierarchy has emerged as an efficient solution as firms’ face two main problems: the coordination (technical problem) and cooperation (divergent goals of individuals) problem. 
⇒ Link to knowledge integration: hierarchy is ineffective as a mechanism for knowledge integration (Grant 1997, p.453) | The KBV is mainly concerned with co-location of decision-making. Co-location is based on the idea that, decisions requiring tacit knowledge should be decentralised, whereas decisions requiring explicit (e.g. statistics) knowledge can be centralised. |
| (4) Shared meaning, (5) Recognition of individual knowledge domains. | The broader the integration of knowledge scope is within each capability the more difficult imitation becomes. This is due to the complexity of a wider scope integration which creates greater causal ambiguity and greater barriers to replication | “Once firms are viewed as institutions for integrating knowledge, a major part of which is tacit and can be exercised only by those who possess it, then hierarchical coordination fails” Grant 1996, p.118 | Co-location of decision-making will produce better decisions if the nature of the knowledge is in tacit form |

Table 2: Key Knowledge-Based View Themes
2.4.4.1 - Transferability

The KBV follows the research that knowledge can be present as explicit and tacit knowledge (Polanyi 1966). Whereby explicit knowledge is supposedly easier to communicate and transfer as it can be codified (Nonaka 1994). Explicit knowledge can be easier articulated, documented or formalised, for instance, in the form of procedures, forecasts, production schedules or manual and can, therefore, be systematically shared.

In contrast, tacit knowledge is implicit in nature and harder to conceptualise, it has a degree of subjectivity, and is often highly ambiguous (Venkitachalam and Busch 2012). Hence, making it very difficult to articulate and disseminate within the organisation and therefore, seen as a potential source of SCA (Lecuona and Reitzig 2014). Polanyi (1966) describes it as ‘we can know more than we can tell’. Tacit knowledge shows an important cognitive dimension, including beliefs, perspectives and mental models. Researchers argue that tacit knowledge shows slow knowledge transfer as it develops interactive over time through shared experience. Therefore, ‘know how’ is within individual skills sets as a result of learning by doing (Mooradian 2005; Polanyi 1966; Nonaka 1994). However, the types of knowledge have been discussed in the earlier section.

According to Barney (1986, cited in Grant 1996, p.111), the transfer of a firm’s knowledge is a critical determination for sustainable competitive advantage. However, the balance is to minimise or at least to control knowledge leakage to other firms while fostering internal knowledge transfers (Argote, 1999). Kang, Rhee and Kang (2010) argue that knowledge by itself does not create value and competitive advantage until it can be shared and transferred within the firm and further argue to externalise and integrate tacit knowledge for firms’ SCA.

This study is particularly interested in the mechanisms to transfer knowledge across individuals inside the organisation. If the degree of tacit knowledge is increased, then Grant (1996) would argue that it can only be revealed through its application. Kogut
and Zander (1992) also highlight that transfer is slow, uncertain and costly for such knowledge that can only be observed through its application. Others argue that knowledge (tacit) is not measurable in itself and can only be identified through the observation of action (Kaplan et al. 2001). This leads to a different challenge on how to measure knowledge transfer, especially knowledge with higher degrees of tacit knowledge. However, observing the ‘magic show’ is of minor strategic use if the firm cannot unveil either the magic or the trick.

One particular challenge is to know when knowledge transfer in an organisational context really happened. For empirical research to be of value, one would need to test the knowledge leading to an SCA before the knowledge transfer process and then do another test after the supposed transfer to see if it succeeded. This would have multiple challenges. This thesis argues that, if it is possible to explicitly test a tacit knowledge transfer leading to SCA then that tacit knowledge was already made explicit and hence would be contradictory to its purpose and characteristic. Hence, testing changes in knowledge to unveil KBV-themes to explain SCA will not be attempted in this study.

Another more plausible measurement option would be to investigate changes in performance against a baseline. This concept links to the idea of ‘organisational capability’ which comes closest to capturing the notion of organisational knowledge, which will be discussed as an individual theme further below. The organisational capability concept allows researchers to specify organisational knowledge as productivity activities that an organisation can perform (Grant 2011). This performance-based approach in measuring knowledge was used to highlight the degree of productivity-gains of fast-food stores because of experience in other stores of that franchise (Darr, Argote and Epple 1995). Although this approach would show how overall knowledge transfer affected performance, it may lack specific individual knowledge transfer mechanism as it takes the whole firm as a baseline. This approach would not satisfy the research aim which would like to gather a more in-depth
understanding of the KBV-themes including how and why knowledge production and coordination took place within a specific context.

Another challenge to measure any change in knowledge from an in-depth perspective is that knowledge may reside in multiple repositories (Argote and Ingram 2000; Walsh and Ungsion 1991; and Levitt and March 1988). Such repositories could include, e.g. the physical structure of the workplace, or individual members who transfer knowledge within standard firm routines which may not be obvious. Hence, in order to capture changes in knowledge within individuals, it is important that those repositories are either eliminated or controlled. There may be different people working on our magic trick which may or may not play a crucial role in the achievement of SCA. Hence, the control of repositories is another major challenge that needs to be understood.

Taking the above points into consideration, it seems to be important, for the aim and objectives for this study, to have a performance baseline for the firm. The performance baseline would not be used to see the difference in performance but to know that an SCA has been achieved in a specific context. By having a fixed context and an already achieved SCA, the knowledge actor’s responsible for the SCA can be researched as long as the multiple repositories challenge can be overcome. Hence, the specific context of the performance activity needs to be somewhat structured and controlled from the outset. The knowledge-based value chain construct subsection will discuss this further (section: 2.6.1).

2.4.4.2 - Capacity of Aggregation

Knowledge aggregation can be both individual and organisational level. Current literature views most organisational level knowledge aggregation as the problem of integrating ‘data’ from various information sources into a so-called unified knowledge base (Zeng and Fikes 2005). However, based on the focus of the research aim and objectives, arguments against the use of information systems in this empirical study formulation were already discussed. Although an organisational level knowledge
aggregation view may be important, this thesis will concentrate on the individual level of knowledge aggregation. This assumes that knowledge absorption depends upon the recipient’s ability to add new knowledge to existing knowledge (Grant 1996) and hence, to achieve superior performance, aggregation of knowledge into a company structure will bear no effect unless the individual or group of individuals can stipulate some meaning from it. The central question is, how feasible and effective is it to develop further knowledge by connecting and building upon different pieces of knowledge? (Katzy et al. 2000). This is also in line with the third ‘main assumption’ that knowledge is created by individuals and efficiency in knowledge creation and storage is based on the individual’s ability to specialise (Simon 1991). Hence, capacity of aggregation also affects the efficiency of knowledge transfer and therefore, should be used in the context of the optimal location of decision-making.

2.4.4.3 - Appropriability

Appropriability refers to the market value of a resource and the ability of the resource owner to receive a return equal to the value created by the resource (Teece 1987). The literature has two main areas of appropriability. One is mainly linked to the rent-appropriability whereas the other is linked primarily to sustainability discussions.

The term rent and the economies of rent appropriation stem predominantly from the economics literature and are discussed in industry structure, agency, and transaction cost economics literature (Coff 2003). The industry structure literature argues that buyers and suppliers may have bargaining power to bargain away rents (Porter 1980). However, the focus of this research is less concerned with a specific industry structure but emphasises its aim and objectives within the firm hence; this literature will not be further investigated within the appropriability discussion.

The transaction cost economics (TCE) literature offers a similar perspective to the agency theory literature, where individuals are assumed to act opportunistically to appropriate rents. The focus is on transaction specific rent producing investments (Coff 2003). Transaction cost economics is in-line with the neoclassic economics
which emphasises on exchange/transaction as the predominant economic activity. Grant (2011) argues that TCE has been particularly useful to understand circumstances in which markets fail, but offers limited insight to the efficiency of the firm. The primary focus of management is upon production in which coordination is a key organisational challenge, and the firm becomes an instrument for purposeful adaptation (Ghoshal and Moran 1996). Agency theory focuses on managerial rent that may contradict shareholder preferences (Jensen and Meckling 1976). It focuses on the incentives and monitoring to minimise agency costs to increase stakeholder-rent. However, this thesis focuses on the creation, coordination and integration of knowledge. Therefore, the appropriability discussion within this thesis will focus appropriability from the perspective to sustain a competitive advantage within the firm and henceforth, will link appropriability to the market value of knowledge.

Teece (1988) describes regimes of appropriability that determine whether an advantage can be sustained. Patent and intellectual property protection is referred to and associated with the nature of knowledge. However, Grant (1996) argues that knowledge as a resource has a unique challenge of appropriability. The challenge from a KBV perspective is that explicit knowledge is generally easy to acquire and anyone who possesses it, can potentially sell it without losing the knowledge itself. On the other hand, the challenge with tacit knowledge is that it cannot be directly transferred and therefore, is not directly appropriable. Appropriability of tacit knowledge can only be achieved through its application of productive activity (Grant 1996). Bierly and Daly (2002) argue that appropriability is determined by the degree to which competitors can understand and imitate the firm’s knowledge and hence, appropriability is determined by the following factors.

(1) Effectiveness of legal instruments protecting intellectual property. For example, to achieve patent protection, knowledge must be codified and explicit. Thus, it is possible to sustain an advantage even if the knowledge used is primarily explicit. However, protection through patents would need knowledge conversion of ‘externalisation’ (tacit to explicit) which maybe be
costly. Partial codification could make the tacit knowledge accessible to competitors which may perhaps result in rivals using the knowledge without violating the patent (Coff 2003).

(2) Industry lead times. Long lead time for competitors to replicate a firm’s knowledge base allows the firm to generate high initial profits and build on the existing complexity of knowledge.

(3) The nature of the knowledge responsible for the competitive advantage of the firm. The higher the complexity of knowledge, the more difficult it is for the competitor to understand and imitate.

The above points and in particular discussions around tacit knowledge already highlighted that the complexity of knowledge is a source of sustainability in itself and earlier mentioned modes of knowledge (socialisation; internalisation; externalisation; combination) should, therefore, be carefully considered. A particular interest for this study will be placed around if and how the market value of knowledge is considered within the firm.

2.4.4.4 - Specialisation in Knowledge Acquisition

The KBV links efficiency to individual capacity to acquire, store and build new knowledge. Hence, this theme is very much linked to the ‘absorptive capacity’ of the recipient (Cohen and Levinthal 1990).

The third ‘main’ assumption of the KBV is that tacit knowledge is acquired and stored in a ‘highly specialised form’ within individuals. So far, there is a strong argument that tacit knowledge is positively linked to the firm’s SCA and that specialist knowledge is stored within individuals resulting in efficiency gains which are predominated by the absorptive capacity of the individual. Hence, the focus of this thesis is to view this theme from an individual knowledge actor perspective.
There is a growing literature of absorptive capacity from a firm level (Chang et al. 2012; Gebauer et al. 2012; Zonooz et al. 2011). However, in line with the earlier ‘transferability’ and ‘SCA’ discussion, and the overall research aim and objectives, the focus will be solely on the individual’s absorptive capacity and the link to the specialisation in knowledge acquisition theme.

Studies in cognitive science justify the need of prior related knowledge to assimilate and use new knowledge (Cohen and Levinthal 1990). Associative learning suggests that prior knowledge enhances learning because memory is developed by creating connections with pre-existing concepts. Thus, Bower and Hilgard (1981) suggested that the breadth, differentiation and linkages across categories into which prior knowledge is organized, permits the knowledge recipient to make sense of and, in turn, acquire new knowledge (Garcia-Villaverde 2018; Cohen and Levinthal 1990).

The literature also suggests that problem-solving skills, which are a particular focus of this thesis, as it will be linked to the location of decision-making, develop in similar ways. In this case, problem-solving methods typically constitute the former knowledge that enables the knowledge recipient to acquire related problem-solving skills. This thesis is in line with Cohen and Levinthal (1990) who argue that there is no need to differentiate the modes of development between problem solving and learning capabilities due to their similarities. Although precisely what is learned could vary:

“learning capabilities involve the development of the capacity to assimilate existing knowledge, while problem-solving skills represent a capacity to create new knowledge. Supporting the point that there is little difference between the two” (Cohen and Levinthal 1990, p.130).

To develop an effective absorptive capacity intensity of effort is critical (Martinkenaite and Breunig 2016). Harlow (1959) argues that transfer of knowledge is hindered and little transfer will follow to the next series of problems when acts of practice with a
problem type discontinues before it’s sufficiently learned. Similarly, within individual knowledge storing, Lindsay and Norman (1977) noted that:

“the more deeply the material is processed the more effort used, the more processing makes use of associations between the items to be learned and knowledge already in the memory-the better will be the later retrieval of the item” (Lindsay and Norman 1977 p.355 cited in Cohen and Levinthal 1990)

Taking the above points into consideration, there should be a particular emphasis on the absorptive capacity of individuals and specialisation in knowledge acquisition. The knowledge actors would need to be clearly identified. The research should highlight any strategic trade-off between dissemination and specialisation of knowledge and understand why, for example, specialisation over potential integration was used and how (if at all) the complexity of knowledge played any role within a specific context.

2.4.4.5 - Coordination within the Firm

The KBV argues that one of the fundamental goals of the firm is to coordinate knowledge of knowledge holders and requires the individual’s engagement (Reagans and McEvily 2003; Hansen 1999; Szulanski 2000; Granovetter 1973; Nahapiet and Ghoshal 1998). Thus, attention in knowledge management literature has shifted toward people-centric issues (Muller 2014; Thite 2004; von Krogh et al. 1996), personality traits (Cabrera, Collins and Salgado 2006; Wang and Yang 2007) and affective commitment (Martin-Perez and Martin Cruz 2015; Cabrera et al. 2006; Ulrich 1998).

This thesis is mainly concerned with how the firm coordinates the efforts of the knowledge specialist to achieve SCA. The earlier discussed transferability theme highlighted that tacit knowledge, which is primarily linked to SCA is hard and costly to transfer. Hence, knowledge transfer may not be seen as the most efficient approach to knowledge integration when linked to SCA. Furthermore, personality and intention to share knowledge may be of importance to understand the research aim and Wang
and Yang (2007) argue that further studies are needed to understand the personality aspect within knowledge integration due to inconclusiveness.

Matzler et al. (2011) tried to overcome the issue of inconclusiveness by focusing on ‘affective commitment’ which is argued to influence organisational relevant outcomes by linking it to knowledge sharing as a determinant for strategic success of firms. Matzler et al. (2011) built and tested hypothesis such as ‘The documentation of knowledge positively affects knowledge sharing’ and argues that affective commitment and documentation of knowledge positively influence knowledge sharing. However, this study neglects the differentiation of degrees between tacit and explicit knowledge, and no attempt is given to correlate any personality traits or activities of individuals to an SCA.

Grant (2002) argues that knowledge management is not yet fully understood, probably due to the lack to fully consider the nature and characteristic of knowledge (Grant, 2002). Eisenhardt and Santos (2002) argue that traditional strategy literature has neglected knowledge integration despite the theoretical importance of coordination within the firm to KBV arguments. They also argue that not surprisingly then, there is a real lack of research stream to address fundamental issues of strategy such as the nature of competitive advantage.

So far, this thesis argued that individuals must specialise in knowledge to create and store knowledge that can be linked to SCA. Gupta and Polonsky (2014) argue that specialisation in knowledge increases efficiency in learning. Demsetz (1991) also argues that one specialist maybe dependent on knowledge of another specialist hence, knowledge creation also creates the need for integration. However, a process that requires knowledge actors to participate in a full knowledge exchange of each other’s individual knowledge bases would undermine previous gains from specialisation.
Since specialised knowledge transfer is not seen as an efficient approach to integration, emphasis should be given to achieving effective integration on many people’s specialised knowledge. The challenge of organising a range of individual knowledge, raises the problem of cooperation and coordination. The former results from disparate goals of organisation members whereas cooperation is concerned how to integrate diverse efforts of individuals. Although, the data findings and analysis’ chapter (Chapter 4) may highlight opportunism (Zhou et al. 2014; Williamson 1975), or agency problems (Kostova et al. 2016; Bjorkmann et al. 2004) the focus will remain on the coordination process within the firm. A magician and the actor team may like to put a magic show together, but without the aspect of coordination, the show will never take place. Grant (2002) suggests that focusing on the knowledge aspect in the process of production of goods and services helps to clarify the issues of coordination.

Taking the above discussion into consideration, the coordination within the firm theme will focus on the integration of specialised knowledge and the mechanisms for integrating knowledge, the role and types of common knowledge within the integration process as well as the KBV on organisational capability. These themes strongly interlink to the coordination theme and will be discussed below.

2.4.4.6 - Integration of Specialised Knowledge

Knowledge development, particularly ‘social’ knowledge production within an organisational framework cannot be taken for granted as knowledge leading to SCA is predominantly embedded within individuals. The KBV argues that the type of interdependence within a task determines the mode of the coordination process deployed. However, before the mechanisms for integrating specialised knowledge will be discussed further below, this thesis will identify three enablers for knowledge production and transfer which will aid in the integration discussion.

Autonomy as an enabler for knowledge creation and transfer: Nonaka, Toyama and Konno, (2001) argue, that the permission to act autonomously as far as circumstances permit, enables knowledge creation. This also improves new ideas, as knowledge
generation is conducted in a less planned but more innovative way. Moreno-Luzon and Lloria (2008) argue that autonomy increases motivation when a context is created which encourages the involvement and commitment of individuals to create new knowledge by also allowing necessary freedom for its creation and absorption. Hence, any context for this research should enable autonomy for knowledge creation. The following chapter ‘Knowledge Transfer Partnerships’ (section: 2.5) will discuss this further.

Care as an enabler for knowledge creation and transfer: Krogh (1998) places “care” as one specific quality of firm relationships that enables organizational knowledge development (Krogh 1998). The source of knowledge creation and the willingness to transfer knowledge may be easily destroyed in the social process. Krogh, Ichijo and Nonaka believe that:

“… knowledge development, especially social knowledge development of organizations, cannot be taken for granted since knowledge is very fragile in them. Since individual knowledge can be easily killed, organizational knowledge development as social activity can be quite difficult or, in the worst case, impossible” (Krogh, Ichijo and Nonaka 2001, p.30)

Krogh, Ichijo and Nonaka (2001) argue that the social process of sharing does not happen naturally, as, e.g. organizational members may not show interest in the knowledge of others. For knowledge to develop, individuals must care about their own observation, reflecting on it, nurturing it despite possible criticism, and connecting it with the people whom might have an interest in it (Von Krogh and Roos 1996). Krogh, Ichijo and Nonaka (2001) offer both a conceptual discussion and a case study based on the Japanese firm. They argue that care is an enabler for knowledge creation and transfer by nurturing trust among employees. High care organizations are characterized by employees who help each other, are accessible, and share collectively the same value for care. Hence, care increases motivation and alignment in cooperation aspects as an act of mutual appreciation.
Socialization as an enabler for knowledge creation and transfer: Socialisation refers to the extent of individual members to feel part of the firm and share their values. Ideas closely related to this are, amongst others, the level of trust, the degree of common values and the level of commitment to the task and to the firm (Moreno-Luzon; Perisand and Gonzalez 2001). Socialising is partly dependent on the degree of collaboration activities within the firm. Furthermore, a collaborative firm culture may foster socialisation outside firm boundaries which in turn may affect on a general positive organizational climate and strengthen relationship building.

Since autonomy is believed to encourage involvement and commitment of individuals to create new knowledge and since care effects well-being and corporation with the company, those enablers will in turn affect socialisation and are, therefore, interdependent.

It is important to clarify the idea between individual knowledge and organisational knowledge in the context of knowledge integration and the linkage to SCA. A number of authors (Berg 2013; Dawson 2000; Spender 1995; Nonaka 1994; Kogut and Zander 1992) centre ‘organisational knowledge’ in their analysis which in turn dilutes the mechanisms through which individuals link together their idiosyncratic knowledge bases. This literature review already argued the difference between data, information and knowledge and established that knowledge which is linked to SCA resits within the individual. Hence, this thesis distances itself from accepting ‘organisational knowledge’ on its own without recognising that specialised knowledge can only reside in individuals and that there could only be collective knowledge of individuals as a result of knowledge aggregation and integration would be somewhat contradictory to the KBV discussions so far. Grant (2011) argues that:

“The key to efficiency in knowledge integration is to create mechanisms that economize on learning” (Grant 2011, p. 545)
To achieve integration of idiosyncratic knowledge, Grant (1996) proposed four mechanisms for knowledge integration which will be discussed below. Those four mechanisms integrate individual specialised knowledge by considering efficiency. Efficiency of knowledge integration mechanisms is seen in the KBV literature as one of the most important determinants with strategic implications, as, e.g. Krogh (2009) argues that the cost of sharing knowledge often outweighs the reward.

**Rules and directives** – This mechanism is viewed as standards with the purpose to regulate interaction between individuals or the interaction between individual and, e.g. plans, policies and procedures. Behaviour formulisation, which is a design variable for standardising work processes, achieves production efficiencies by means of regulations (Moreno-Luzon and Lloria 2008). Rules and directives enable communication at low costs, especially if it affects a number of individuals (Desetz 1991). Dependent on circumstances, it can also use the tacit knowledge of individuals to form, e.g. a set of procedures for quality control by maximising efficiency gains towards time, cost, and communication; without the need to try and teach idiosyncratic specialised knowledge to the rest of the workers.

**Sequencing** - This mechanism is concerned with the sequencing of tasks (Demsetz 1991; Grant 1996; Nelson and Winter 1982) by minimising redundant communication among workers (Hurnonen et al. 2015). Sequencing minimised communication and continuous coordination refers to the assignment of task activity using the individual’s relevant knowledge independently through having separate engagement intervals (Nelson and Winter 1982).

**Routines** – This mechanism could be seen as a simple sequence. However, routines have the ability to enable complex patterns of interaction in the absence of other coordinating mechanisms (Canonico et al. 2012; Grant 1996; Munkvold 2006). There are two main dimensions. First, considering examples such as operations of fast food restaurants (Leidner 1993) or auto racing pit crews (Grant 1996), routines have the ability to simultaneously support individuals’ within their specific task activity.
Second, routines can be viewed from a mutual adjustment perspective which triggers a higher degree of informality. Mutual adjustment or dialogue between individuals and groups is an important coordination mechanism for knowledge creation and integration (Armbrecht et al. 2001; Kogut and Zander 1996; Nonaka and Takeuchi 1995; Palmer 1998; Von Krogh 1998). It is a simple coordinating mechanism using a process of informal communication. It is naturally used in the very basic organization structure and unexpectedly in the most complicated and uncertain (e.g. production needs specific knowledge) because it is the only one that works under very challenging circumstances (Mintzberg 1989).

Joyce, McGee and Slocum (1997) argue that informal contacts could be more significant than formal structures in reaching the organisation’s objectives. However, informal contact allows the creation of redundancy (Nonaka 1991; Nonaka and Takeuchi 1995), which is defined as the existence of information greater than the requirement of its firm members (Moreno-Luzon and Lloria 2008). In other words, if more information is shared and received then necessary. Hence, redundancy may be viewed as contradictory to the efficiency gains of a more formal routine establishment but may facilitate other KBV coordination themes such as ‘the role of common knowledge’. Since focus is given towards a holistic KBV approach such linkages may be important as it may lead to knowledge creation and coordination facilitation. Hence, further empirical analysis into this possible conflict is needed.

Group problem solving and decision-making – This mechanism is linked to communication and interactive-intensive and personal forms of integration (Berends et al. 2004; Grant 1996). The mechanism is widely researched in field studies, e.g. multi-disciplinary innovation projects (Van Aken et al. 2012; Huang and Newell 2003; Carlile 2002), and in experimental studies (Okhuysen and Eisenhardt 2002; Stasser et al. 1995). With the exception of the mutual adjustment perspective, the other above mechanisms seek integration efficiency through avoiding rich communication and learning. However, this mechanism is more time-consuming in its knowledge integration and therefore more costly. Ditillo (2004) argues that increased task
complexity needs increased interaction. Whereas (Nickerson and Zenger 2004) argue that the higher the problem complexity, the more challenging it may become to identify and solve problems with multiple actors involved. This challenge could further magnify if the group does not share at least some types of common knowledge.

Grant points out that:

“*efficiency in organizations tends to be associated with maximizing the use of rules, routines and other integration mechanisms that economize on communication and knowledge transfer, and reserve problem solving and decision-making by teams to unusual, complex, and important tasks*” (Grant 1996, p. 115)

Considering this debate on the integration of specialist knowledge and the pursuit of efficiency gains linked to coordination and the KBV, this thesis would like to gain further insights into the identified four mechanisms and understand their role within the integration of knowledge that could be linked to SCA. For example, by considering the efficiency discussion, this thesis would expect a minimised use of group problem solving and decision-making due to the intensity of communication and therefore, time needed against the other modes of knowledge integration.

### 2.4.4.7 - The Role of Common Knowledge

The above-discussed integration mechanisms include the idea of efficiency and emphasises on the first three formal mechanisms with the idea that increased knowledge sharing will increase costs and therefore, outweigh the benefits. However, this thesis only partially supports the view of Krogh (2009) who argues that firms should incentivise the context for individual knowledge integration, by minimising the need to create costly common knowledge. Common knowledge will be discussed in this section and include language, symbolic communication, commonality of specialized knowledge, shared meaning, and recognition of individual knowledge.
domains. To integrate separate knowledge areas which are specialised within the individual knowledge actors, there is need for intersection in the form of common knowledge.

The work by Cowan et al. (2007) on developments in innovation networks investigated the firm level aspects that influence the selection of a partner firm. They conclude that past collaborations increase the likelihood of successful future collaboration as familiarity can build common knowledge, shared meaning and trust.

Individuals can share and integrate aspects of knowledge which is not common between them with the help of common knowledge (Grant 1996). Furthermore, Grant stated that:

“Transferring knowledge is not an efficient approach to integrating knowledge”
(Grant 1996, p. 114)

The quote above refers to the discussion that if two individuals work on a task, efficiency is not maximised by the individuals trying to learn everything they know from each other, but by establishing a mode of interaction and minimising the time spent transferring knowledge between the two individuals.

The previous section discussed the more efficient means of knowledge integration within the KBV, and Grant focuses directly on how knowledge integration is conducted within organisations. However, Spender (2002) suggests that Grant is unclear if coordination requires the generation of new knowledge. Kreiner (2002) calls the challenge to cope with both, the existing knowledge and new knowledge creation the ‘double-sided concern’. Kalling and Styhre (2003) argue that the two are entangled and intertwined. This thesis views knowledge production and knowledge coordination as knowledge processes which can be interlinked and will inform each other. Knowledge processes will be further discussed in the knowledge-based value chain construct (section: 2.6.1)
This thesis will consider five main types of common knowledge with different roles in knowledge integration:

(1) **Language** - This common knowledge type sees the source of meaning in language. Interaction is fundamental for integration mechanisms, specifically rules and directives and group problem solving as both rely upon verbal communication (Grant 1996). Nonaka et al. (2000) argues that close physical interaction is important in shaping common language thus supporting individual members’ to have knowledge exchange through participation (Hurnonen et al. 2015) which is particularly important for group problem solving and in-line with the view that group work can be classified as integration practice (Becker 2002).

(2) **Other form of symbolic communication** - This common knowledge type extends the efficiency and intensity of communication to include symbolic communication such as literacy, numeracy, familiarity with statistical models or software. This codification deals with the formalisation of crucial knowledge (Tounkara and Arduin 2014). Chwe (2013) explains that common knowledge is more than just an individual receiving a message, it also is concerned with the existence of a ‘shared symbolic system’ which allows individuals to know how the other individual understands it.

(3) **Communality of specialised knowledge** - This common knowledge type extends the platform that language provides on communication and argues that the level of sophistication achieved is dependent on the individual actor’s commonality in their specialised knowledge. Hence, Grant (1996) argues that the paradox to this is that there would be not much gain in integration if two individual actors have identical knowledge. Still, entirely separate specialist knowledge of individual actors would mean that integration cannot happen beyond primitive levels.

(4) **Shared meaning** - This common knowledge type is based on the organisational learning literature to integrate different experiences and understandings in which Grant (1996) points to the role of common cognitive schema (Spender 1989; Weick 1979), analogy (Nonaka and Takeuchi 1995), and stories (Brown and Duguid...
The KBV understanding is that knowledge conversion, especially if there is a high complexity of knowledge, will involve knowledge loss which will increase with the complexity of knowledge. In such cases, a shared understanding of a knowledge base will rectify some of this potential knowledge loss and is, therefore, an important type of common knowledge especially with increasing knowledge complexity.

(5) **Recognition of individual knowledge domain** - This common knowledge type is based on the assumption that a shared understanding of different actors facilitates and increases the efficiency of coordination activities (Grant 1996). Since different actors work on a common goal, it is important to engage with the right actor for a specific task. Unnecessary knowledge creation, by neglecting other individual knowledge domains, will be costly. Also, giving specific tasks to individuals who have less knowledge or skills in particular areas is equally as costly as absorptive capacity of individuals may also be task dependent, e.g. to give a creative task to an individual with a particular strength to follow detailed processes but lacking out of the box thinking and vice versa may not give the best possible results.

**2.4.4.8 - Organisational Capability**

From an organisation point of view, the capabilities of a firm can be categorised into different capabilities, for instance, technological capability (Bell and Pavitt 1995) or organisational capability (Ulrich and Lake 1990; Bell and Pavitt 1995). Technological capability includes IT capability and other technical but non-IT capabilities (Sobanke et al. 2014; Li et al. 2006). There have been several studies considering organisational capability from an IT perspective somehow blurring the lines of the distinct technological capability and organisational capability categories. Some studies observe the IT capability with a resource-based perspective (Wu and Chiu 2015; Tippins and Sohi 2003; Bharadwaj 2000). The resource-based perspective emphasises advantages from internal organisational resources that are heterogeneous, unique, and difficult to imitate (Barney 1991; Prahalad and Hamel 1990). However, for the
purpose of this research and for the reasons discussed in earlier sections, the IT or resource-based perspective is outside of the scope of this research.

Nelson and Winter (1982) define a firm’s capability as the:

“input-output combinations achievable with all possible mixes and levels of activities known to the firm” (pp. 63–64).

This thesis will link organisational capability to knowledge coordination and integration to make future discussions more relevant and in line with the aims and objectives of this study.

North and Kumta (2018), suggests that competitive advantage is created by developing new organisational knowledge. March (1991) supports the concept of organisational knowledge and refers to the knowledge integration mechanism as ‘knowledge exploitation’ and knowledge production as ‘knowledge exploration’, whereas Spender (1992) refers to the integration as ‘knowledge application’ and to the production as ‘knowledge generation’. However, from a KBV point of view, the organisational capability is seen as the outcome of knowledge coordination, which requires effective integration of various individuals with disparate specialist knowledge.

“If the strategically most important resource of the firm is knowledge, and if knowledge resides in specialized form among individual organizational members, then the essence of organizational capability is the integration of individuals’ specialized knowledge” (Grant 1996b, p.375)

Grant further argues that organisational capability from a KBV is linked to the complexity of a capability which is critically dependent on the scope of the knowledge of many individuals. Hence, the organisational capability is limited by degree of knowledge integration rather than volume of knowledge production.
Sustainable competitive advantage depends on the inimitability of the capability which is linked to specific superior performance. Grant (1996) argues that such inimitability is directly linked to broadening the knowledge scope by using many individuals:

“The broader the scope of the knowledge integrated within a capability, then the more difficult limitation becomes. The complexity of ‘broad-scale’ integration creates greater causal ambiguity and greater barriers to replication” (Grant 1996, p. 117)

Taking the above points into consideration, this thesis is particularly interested in how and why the complexity of capabilities depend upon the scope of knowledge coordination and integration. The literature review assumption is that wider scope integration creates greater causal ambiguity and therefore, greater barriers to replication. Hence, a focus of this thesis will be to investigate this assumption by understanding how the identified case studies use (or not use) integration scope to achieve an SCA.

2.4.4.9 - Organisational structure and design

Grant (2002) highlights that the area of organisational structure and design is one of the most potentially interesting areas of the KBV application. This section will link the debate primarily to the organisational structure for decision-making within a KBV.

This thesis is mainly concerned with the firm’s ability to impede knowledge leakage and therefore, protect and sustain a competitive advantage. Furthermore, the goal of this study is to understand how organisation structure and design is used within a KBV strategy formulation. Hence, organisational structure will be linked to knowledge production and coordination while putting emphasis on efficacy and therefore, a debate between centralisation versus decentralisation. The specific focus of this study is based around the themes role and hierarchy in decision-making and location of decision-making which will be discussed in more depth in the following section.
Organisational hierarchy, rules and regulations, and reporting relationships are comprised within the organisational structure (Herath 2007) and are considered a means of coordination and control in which firm actors can be engaged in the direction of organisational effectiveness (Krakel 2017; Mills and Smith 2010). While the discussion around coordination described eventual processes of production and integration and the types of knowledge required for such processes, the division of tasks between individuals and departmental structures and their interfaces should be explained within the organisational structure and design. Organisational structure and effectiveness have been studied widely, but how a structure passes on its influence on organisation effectiveness is insufficiently acknowledged (Zheng et al. 2010). Organisational effectiveness is:

“the degree to which an organization realizes its goals” (Daft, 1995, p. 98).

This thesis will define and view organisational effectiveness as the efficiency in achieving the knowledge production and coordination outcome as well as making the right decision. Therefore, the aspect of knowledge is central to organisational effectiveness. Argote and Ingram (2000) argue that performance is explained by what the organisation comes to know. Whereby, knowledge production and coordination contribute to improved performance (Epple et al. 1996; McEvily and Chakravarthy 2002).

Effectiveness has been linked by earlier studies to centralisation as the most studied dimension (Rapert and Wren, 1998). In short:

“the extent to which decision-making power is concentrated at the top levels of the organization” (Caruana et al. 1998, p. 18).

However, high centralization has received some critiques as it, for instance, inhibits interactions among organizational members (Krakel 2017; Gold et al. 2001) and reduces the opportunity for individual growth and advancement (Kennedy 1983).
On the other hand, to achieve a greater level of communication (Holtzhausen 2002) and increase motivation and employee satisfaction (Elnaga and Imran 2014; Dewar and Werbel 1979) a decentralised structure has been favoured. Schminke et al. (2000) link decentralisation to increased responsiveness to market conditions. Furthermore, less centralised environments support lateral and vertical communication and enable ‘experts’ to have a greater say in decision-making than the designated authority (Rishipal 2014; Burns and Stalker 1961). Hence, the organisational management literature mostly concludes that flatter structures facilitate knowledge management success (Pandey and Dutta 2013; Gold et al. 2001; Grant 1996; Damanpour 1991) and positively related to the effective production and integration of knowledge in the firm (Beveren 2003; Gold et al. 2001; Grant 1996; Nonaka and Takeuchi 1995). However, contributing factors of organisational structures and principles of organisational design within the KBV discussion are still underdeveloped. Henceforth, there is limited ability to explain developments (Grant 2011; Grant 2002) or explain how a KBV strategy can influence organisation structures and design.

Before the focus is given to the implications of the role of hierarchy and the location of decision-making, project management as a movement in management thinking during the 20th century will be highlighted. The second objective of this thesis is to investigate a unique environment that can overcome issues of causal ambiguity, and the next subchapter will identify knowledge transfer partnerships as such an environment. Since knowledge transfer partnerships are delivered and managed in a project environment, project management excurses within the organisational structure and design discussion may be advantageous for future discussions.

Traditional project management approaches such as ‘waterfall methodologies’ (Giachetti 2016, Royce 1970), followed the scientific approach to management and the division of work and decisions making. One division is the delivering team who specialise in delivering outputs, whereas the other division are managers, who specialise in decision-making. It is basically a sequential process model and most effective when the problem is well defined, and the solution is well understood.
(Verma et al. 2014; Basili et al. 1994). This implies that the surrounding knowledge needs to be of explicit nature. Outgrowing methodologies from waterfall, such as PRINCE2, can have different outputs of production running simultaneously and linking to one another but are still very clear about decision-making rights based on hierarchy and therefore, follow the division of work and decision-making.

A more recent development within project management is agile-based projects (Moran 2015). Agile projects are considered to have a flat organisation structure, which considers flexibility to increase efficiency in delivering outputs. In the core of any agile development is the agile manifesto established in 2001 by the ‘Agile Alliance’, Beck et al. (2001) who states:

“We have come to value:
- Individuals and interactions over processes and tools.
- Working software over comprehensive documentation.
- Customer collaboration over contract negotiation.
- Responding to change over following a plan.

That is, while we value the items on the right, we value the items on the left more” (Beck et al. 2001, p. anon)

There is also a growing research stream that is based around the idea and issues surrounding the implication around knowledge within project management (Todorović et al. 2015; Ahern et al. 2014). However, the literature is lacking a direct link that could be established to the KBV as an act of project strategy.

Project management offices (PMOs) and their potential to act as knowledge brokers between projects, and between project and top management (Pemsel and Wiewiora 2013) has been widely discussed. Thiry and Deguire (2007) analysed developments around project-based organisations (PBO) and recognised that PBO are struggling to integrate knowledge and structures and that projects are often viewed as “singular ventures”. Bredin (2008) however, intended to increase the understanding of human
resource management in project-based organisations by developing a conceptual framework, by drawing on the capabilities perspective on project-based organisations. Keegan and Turner (2002), looked into the management of innovation within PBO and asked the question if PBOs provide a context supportive of innovation. Corvers et al. (2016) place projects in the context of ‘Problem-Based’ and ‘Project-Based Learning’ for sustainable development. Whereas Pryke (2017) published the first book demonstrating how to apply the principles of social network analysis to managing complex projects.

Considering the second thesis objective - to situate the KBV in a context favourable to unveil SCA for the firm, and considering that projects are temporary organisational structures built to satisfy a project objective that may be linked to superior performance, the project-based approach may be beneficial to unveil SCA of the firm and will be further discussed in section 2.5.

2.4.4.10 - Role of Hierarchy in Decision-making

Achieving coordinated action by integrating the activities of individuals with different knowledge domains and specialisation encounters two problems: cooperation and coordination (Gulati et al. 2012; Grant 1996).

Grant (2011) argues that ‘classical’ organisation theorists such as Weber and Fayol have focused on the hierarchy of authority view within organisations which resulted upon cooperation and neglected the coordination aspect which would have allowed attention of the integrative role of hierarchies. This overemphasis of cooperation has left coordination issues primarily to system-based approaches and general system theory (Grant 2011). Grant concluded that the complexities of knowledge integration, even without cooperation conflicts, is not trivial and even more profound once a higher degree of tacit knowledge is involved.
Grant (1996) highlights that cybernetics and system theory includes hierarchy as a coordination mechanism which supposedly minimises cooperation and coordination issues (Aoki 1990) and refers to Simon (1981) who argues that within complex systems, hierarchies emerge because of their problem-solving advantages. The efficiency of complex systems is linked to the use of multiple socialised units to group activities and individuals. Substructures show a higher intensity of interaction than those between the substructures. This idea, that hierarchies are organised around intensity of interaction permits ‘near decomposition’ which is fundamental to Simon’s concept. The principle of using intensity of interaction to group units and structure hierarchies is also used by Thompson (1967) who differentiates between the most intense, reciprocally interdependent interaction where the output of one organisational division is used as an input by the other as a cyclical situation. The intermediate, sequential interdependence is often referred to in the context of assembly lines. The loosest form, pooled interdependence is referred to a state where each organisational unit performs separate to each other. Grant (2002) states that the most intense interdependencies, within the knowledge-based perspective, is the integration of tacit knowledge in team-based activities.

Within the analysis of authority and control of hierarchical approaches, organisational theory has typically failed to extricate the role of managers in, firstly, the coordinating efforts of specialist individuals; and secondly, alignment of individuals and organisational goals.

“Once firms are viewed as institutions for integrating knowledge, a major part of which is tacit and can be exercised only by those who possess it, then hierarchical coordination fails” (Grant 1996, p. 118)

The challenge for managers is to identify mechanisms for knowledge integration while preserving the continued knowledge specialisation in knowledge production. The particular challenge arising here is twofold:
First, there is a common understanding that any system of knowledge production, where one individual is required to learn what every other individual knows, in a given structure, is inherently inefficient (Grant 2011) and would consequently defeat advantages of specialisation.

Second, higher-level decisions are of poor quality, due to barriers of vertical knowledge transfer, when those decisions require immobile lower-level knowledge (Grant 2011; Grant 1996).

Consequently, new demands and understanding on organisational structuring based on the knowledge economy is needed (Wang and Ahmed 2003). One response to the deficiencies of hierarchy, which found a place in the organisational discourse, are team-based structures which have proven to be favoured in organisational redesign. Team-based structures offer autonomy and responsibility to meet the shifting aspirations of employees (Rapp et al. 2016; Doorewaard et al. 2002). There is a recent range of evidence regarding the connection between team responsibility structure and team performance (Chang et al. 2017; D’Innocenzo and Mathieu 2016; Jong et al. 2016). Another challenge for team-based structures is that membership needs to be fluid if production needs many specialist individuals in which some individuals’ knowledge base may be needed within multiple teams (Grant 1996). Therefore, movement of instant specialist knowledge implies movement of individuals and therefore, membership within multiple team structures.

This discussion leads to the literature around adaptability. This thesis discussed earlier that hierarchies emerged and linked to the advantage of adaptability which is supported by Simon (1981) and Thompson (1967) and used by subsequent scholars. Weick (1976) linked adaptability to the concept of ‘loose coupling’ where departments can vary independently which, therefore, supports the earlier discussion of ‘pooled interdependence’. Furthermore, loose adaptation leads to opportunistic reworking of changing circumstances in which individual modules can
adapt without the need of continuing coordination with other units. This, in turn, opens up the question of how such interfaces should look like. Grant (2002) states:

“That critical issues for organisational design are then the allocation of the activities of the organization into separate modules and definition of interfaces between the modules” (Grant 2002, p. 143).

If those modules are not viewed within functional teams, then the earlier mentioned view on project structures may be favourable.

Based on the earlier cooperation versus coordination discussion, Grant (1996) argues that Western firms combine the roles of cooperation and coordination. Placing coordination outside the formal hierarchy may be favourable. Earlier discussion showed that a project environment is a team-based, temporary organisational structure. Hence, a typical project approach is outside the formal hierarchy and can be used non-hierarchically, which also permits an organisation to access lower-level, highly complex individual-based knowledge and supports multiple memberships of projects for individuals. Atkinson (1999) argues that Project management does not use traditional, functional teams, and therefore, this thesis would argue that project management environments may be used as a strategically fit environment to potentially focus projects primarily on a knowledge-based view. The following subsection 2.5 will look into a possible project-based context.

2.4.4.11 - Location of Decision-making

The implication for the distribution of decision-making in this discussion will focus on the balance between centralisation and decentralisation hence, it follows from the ‘role of hierarchy in decision-making’. The aim of this section is less to discuss the linkage between decision rights and ownership per se, as this drives a discussion into the theory of the firm which is not the focus of this research. However, Agency theory was mentioned earlier to highlight the problems of divergent goals within individuals.
The previous section established that the quality of decision-making could be affected by the barriers of vertical knowledge transfer. Grant (2011) argues that there is a weakness of scientific management and hierarchal models in particular, which assume that managers have accessibility to the knowledge of their subordinates.

Nevertheless, there are two strategic options. The first option is that decision-making can be allocated to the individual specific knowledge holder or group of specific knowledge holders, who then have to establish a mechanism for decision-making. The second option is that decision-making is centralised to the desired location. Nickerson and Zenger (2004) argue that high degrees of different types of knowledge for knowledge integration results in high degrees of knowledge sharing and hence, favour consensus-based decision-making over centralised decision-making. The earlier section already discussed that less centralised environments support lateral and vertical communication and enable ‘experts’ to have a greater say in decision-making than the designated authority (Rishipal 2014; Burns and Stalker, 1961). Hence, the organisational management literature mostly concludes that flatter structures are facilitative to knowledge management success (Islam et al. 2015; Foss et al. 2010, Gold et al. 2001; Grant 1996; Damanpour 1991) and positively related to the effective production and integration of knowledge in the firm (Beveren 2003; Gold et al. 2001; Grant 1996; Nonaka and Takeuchi 1995).

However, the KBV does recognise that lower complexity and therefore, more explicit driven knowledge could be transferred at low cost and aggregated to a central location which would support the earlier identified subsequent assumption of economies of scale in decision-making, with examples given as single corporate treasury or purchasing of standardised items (Grant 2002).

On the other hand, the implicit assumption is that, if decisions require specialisation of knowledge and if that specialisation results in high complexity of knowledge, especially if the common knowledge between knowledge holder and decision maker
is limited, then centralised decision-making will be of poorer quality then co-location of decision-making.

In order to satisfy the first research objective and advance the KBV as an act of strategy formulation, this thesis discussed different types of knowledge and undertook a subsequent discussion about the SCA of the firm. A firm theoretical perspective was discussed and linked to the KBV. Furthermore, KBV was broken down into more specific themes that could be linked to SCA as well as understanding their assumptions and possible mechanisms that may inform knowledge processes.

A need for an environment to link SCA to the KBV-themes is emerging that can unveil and either strengthen or weaken some of the assumptions deducted or made. Hence, the following section will have an in-depth discussion to justify such an environment.
2.5 - Knowledge Transfer Partnership (KTP)

The sections above highlighted some major challenges for empirical research which this chapter will address while placing a Knowledge Transfer Partnership (KTP) as a strategic research fit to satisfy the second research objective:

To investigate a unique environment with potential to overcome the main issues of causal ambiguity

As well as overcoming the causal ambiguity challenge, the case study also needs to have the capacity to shed light into, and not hinder any of the four main assumptions of the KBV derived in the earlier section. The four assumptions are:

- knowledge is considered to be the most strategically important resource of the firm
- that there is a difference between tacit and explicit knowledge with tacit knowledge being essential to achieve SCA
- that tacit knowledge is acquired and stored in a ‘highly specialised form’ within individuals
- that production needs a widespread range of knowledge

Furthermore, this chapter will provide some more information to understand KTPs. The Methodology chapter will place KTPs as the main case study example which will be used to satisfy the third objective. Therefore, this section will form a rationale to have found an environment which can retrospectively observe and gain some insight into the KBV’s ‘magic’ (reference to previously used analogy).
2.5.1 - KTP Background

The KTP programme and its predecessor, the Teaching Company Scheme has a track record of over three decades to create impact in the area of SCA and Innovation. It is currently headed by the Technology Strategy Board and supported by 12 other public sector funding bodies including research councils and government departments. The Teaching Company Scheme was based upon the teaching hospital idea ‘learning by doing’ and originally funded under the Science and Technology Act 1965 and established in 1975 by the Science and Engineering Research Council. The standard funding for KTPs usually covers 300 projects a year and an additional £30m was announced by Innovate UK to support an extra 200 KTPs during 2017 (Hastings 2017).

“The benefits of this investment are projected to be a £211 million increase in annual profits for businesses involved, 450 new jobs and 6,000 company staff trained” (Innovate UK 2015)

KTP is nowadays seen as an important way for universities to interact with businesses, helping them to improve their productivity, performance, develop innovative solutions and increase competitive advantage by closing their identified knowledge gap (KTP 2009).

Every KTP project has a proposal (application) and an end project report. The proposal can be used to find suitable KTPs as it will discuss the knowledge gap to be filled and explain the strategic importance of the KTP. The end project report will reflect on the outputs identified at the start and discuss how successful the KTP was perceived by the KTP Key Stakeholders. The report will also highlight outcomes such as increased sales because of the KTP activity and may even have the benefits which will state, for instance, 15% increase in sales during the period of KTP activity. However, it is envisaged that most of the benefits will be realised after KTP closure which means that this information should be gathered from the Key KTP Stakeholders with a time gap (ex-post) so benefits can be identified and linked to SCA. Consequently, the use of the end project report is not essential to satisfy the aim of this thesis. However, it
would be important to select KTPs based on their project proposal and end project report. Furthermore, the methodological approach to the selection and use of reports will be discussed during the methodology chapter.

2.5.2 - Main KBV Assumptions and KTPs

The literature review, so far, highlighted main assumptions which would need to be considered and therefore, any strategic research fit environment would need to be in-line with those assumptions to place clarity into a KBV. This has proven to be one of the major challenges for any empirical research concerning the KBV.

The first main assumption identified in the KBV literature review is that: Knowledge is considered the most strategically important resource of the firm. From the outset, this is true from a KTP perspective. Within a KTP project, the University acts as the knowledge base, the firm as the knowledge seeker with a previously identified knowledge gap, and a recent graduate (Associate) as the knowledge benefiter who will receive the knowledge from the knowledge base and the firm to produce new knowledge. This new knowledge is then hoped to fill the strategically identified knowledge gap. Since the knowledge gap is directly linked to a capability that is believed to achieve competitive advantage, it is fair to say, that a KTP is built around the belief that knowledge is one of the most strategically important resources of the firm.

The second main assumption identified in the KBV literature review is the: Differentiation between explicit and tacit knowledge. The KTP should theoretically be very strong to shed light on this assumption. The KTP is linked to a firm’s achievement of an SCA, and since SCA in itself is linked to tacit knowledge, there is scope for the KTP to differentiate between those two knowledge domains.

The third main assumption identified in the KBV literature review is that: That tacit knowledge is acquired and stored in a highly specialised form within individuals. To
start with, KTPs have to go through a very rigorous application process in order to be approved. The forecasted output of the KTP is specified in the application process, and the outcome is to achieve superior performance by filling the knowledge gap which the organisation identified. Any KTP places the ‘Associate’ as the main knowledge benefiter to fill the identified knowledge gap and who should, therefore, acquire and store highly specialised knowledge.

The final main assumption identified in the KBV literature review is that: Production needs a widespread range of knowledge. KTPs operate outside the ‘Business As Usual’ structure of the organisation and therefore, somehow limit a truly widespread range of knowledge as discussed by Grant (1996). However, there is a spread of knowledge between the Associate, Company Supervisor and Academic Supervisor. Furthermore, the limited and controlled participant number in size overcomes the challenge that the achievement of SCA may not be linked back to a particular individual or small group of participants which was a major limitation of previous research undertaken and discussed earlier in the literature review. Furthermore, there may also be other participants that are used as and when a particular knowledge is needed, and this should be very clear within the KTP environment.
2.5.3 - Causal Ambiguity and KTPs

The main challenge discussed in the literature review is the causal ambiguous nature of knowledge. Knowledge is ambiguous in the sense that the relations between the knowledge and the desired outcome of a product are unclear (Simonin 1999), especially when linked to SCA (Kim et al. 2013; Ambrosini and Bowman 2010; Barney 1991; Reed and DeFillippi 1990) first used in Lippman and Rumelt’s (1982) analysis of uncertain imitability and interfirm profitability differences. They stated that:

“It may never be possible to produce a finite, unambiguous list of factors of production responsible for the success of firms” (p. 420).

The authors also linked the discussion to tacit knowledge per se:

“Frequent transactions between people or between people and complex tools give rise to unique transfection-specific skills that are, to use Polanyi’s word, unspecifiable” (p. 420)

Later discussions explain firm resources that link to SCA with the occurrence of causal ambiguity (Barney 1991; Reed and DeFillippi 1990). Causal ambiguity protects a competitive advantage from imitation by rivals but at the same time may hinder the firm to replicate it within the boundaries of the firm. This also means that the opportunity to conduct empirical links in this area becomes very limited. The KBV argues that tacit knowledge is deeply embedded within individuals as specialised knowledge is mainly linked to SCA.

This challenge may be best explained by reusing the magicians’ analogy: The audience does not believe in the existence of magic but watching the magician do his show they cannot say for certain that it was not magic happening in front of their own eyes. The audience also does not know where the sleight of hand happened, so they are left in the dark. Therefore, this thesis is trying to detect an ‘Environment’ where the ‘Mechanism’ of the magician’s trick becomes somehow visible (Further explained in
the Methodology chapter). The KTP will tell which magic trick is being looked at because it identified the knowledge gap which is linked to the SCA before the KTP commences. To now uncover the truth, the act needs to ensure that the viewer is not distracted by any other events, such as other actors who are not contributing to the magic but may be a cause for distraction. Knowledge Transfer Partnerships (KTPs) reduce distraction because they operate outside the ‘Business AS Usual’ structure of the organisation and therefore, have a limited participant number. Those KTP actors are pre-defined and have their roles and responsibilities set out in the knowledge creation, transfer and integration process. This overcomes the challenges that any achievement of SCA may not be linked back to an individual or small group of participants.

Knowledge Transfer Partnerships provide an environment where the creation of a competitive advantage is the purpose of the project itself and whereby the method shows the ability to map the KBV-themes to this somewhat ‘isolated’ knowledge activity. Therefore, the KTP provides a best-case scenario for empirical research. In other words, not only does a KTP provide a limited ‘community of practice’ which is pre-defined but it has also unveiled that this community has taken a particular rabbit out of their hat. In other words, the researcher will already know the key magic show participants, the researcher also knows that the magician is the associate who is set up to create the knowledge needed to achieve the SCA.

The earlier identified KBV-themes will be used to link to the KTP environment to give further insight on how KTPs are justified to be a strategic research fit environment with the potential to overcome the main issues identified including causal ambiguity. This will then satisfy the second research objectives highlighted at the beginning of this section.
2.5.4 - Mapping the KBV against KTP

Using the KBV-themes identified and critically discussed earlier, this section maps the KBV against KTPs and pre-empt some possible concerns. This thesis argues that the knowledge specific themes need to be considered before empirical research into the organisational specific KBV-themes can take place. Therefore, they will be seen as prerequisites for the KBV and are discussed further below.

This thesis has chosen KTPs as strategic research fit environment because of their high potential to support the KBV-themes with empirical evidence. This transfer report also argues that the associate not only receives knowledge from the knowledge base (Academic) to the knowledge seeker (Company) but also creates new knowledge which is important to close the firm’s pre-identified knowledge gap.

Hence, knowledge is the critical input in production and the main source of value which are two important factors for the KBV (Grant 1996b). The assumption is that the specialisation in knowledge acquisition takes place in the form of the associate who generates new tacit knowledge. Therefore, this thesis argues that the associate is the key stakeholder in this partnership who is able to create the highest degree of tacit knowledge linked to the SCA. The associate will gain knowledge from the academic which is very subject specific and also gain knowledge from the Company Supervisor which is company specific, enabling the associate to make connections and deep learning to solve the knowledge gap, the company could not solve otherwise. Hence, the KTP is in line with the importance of achieving specialist knowledge (Harlow 1959; Lindsay and Norman 1977; Grant 1996) by placing the associate as the main knowledge benefiter.

Below is a summarising discussion of the knowledge specific KBV-themes and how the KTP relates to them.
2.5.4.1 - Transferability

The assumption is:

- Explicit knowledge has high transferability whereas tacit knowledge shows low transferability.

As tacit knowledge is not easily created or transferred, the main challenge is to identify where tacit knowledge is created and transferred within a firm, before starting any kind of empirical research. Considering the ambiguous causal nature of knowledge, this is and was a major challenge for any researcher so far. Tacit knowledge is understood to be transferred slowly (Kogut and Zander 1992) if at all. Classic KTPs have a time span between one to three years to fill an isolated knowledge gap. Hence, there is a strong possibility that the KTP time span is long enough to be able to transfer tacit knowledge as well as create new tacit knowledge as discussed above.

One particular challenge highlighted in the KBV-themes’ transferability discussion is to know when and how the knowledge transfer in an organisational context really happened. This information should be accessible from the key KTP stakeholders.

The literature review also discussed the knowledge measurability problem and concluded that the firm’s performance as a baseline option was too broad to satisfy the research question and would not unveil the internal mechanisms as such. On the other hand, KTP gives a focused view of specific outputs and should even allow to recognise which output(s) are strongly linked to an SCA achieved by the KTP project. There is by default only one main knowledge benefiter who receives technical knowledge from the Academic Leader whereby a strategic fit to the company requirements is achieved by the knowledge transfer of the Company Supervisor. In the end, it will be the performance abilities of the associate to solve the knowledge gap which in turn created the SCA.
Another challenge identified in the KBV discussion earlier is to measure any change in knowledge from an in-depth perspective as that knowledge may reside in multiple repositories. As a KTP is outside the normal ‘business as usual’ structure, most other repositories do not fall within the KTP. Also, the individual participants are limited and controlled.

2.5.4.2 - Capacity of aggregation

The assumption is:

- Explicit knowledge can be more effectively aggregated to a single location than tacit knowledge

KTPs are projects whereby the major transfer happens between Academic Leader, Associate and Company Supervisor. Hence, the associate should be the key person in the knowledge production process, and their absorptive capacity will be of special interest.

The second objective for KTPs is the dissemination of such knowledge. Here, it is envisaged to understand the mechanism of choice for each case study and to judge efficiency in possible knowledge creation and KT activities while considering the degree of knowledge complexity. Furthermore, this may highlight the economies of scale discussion from the earlier subsequent assumptions discussion.

2.5.4.3 - Appropriability

The assumption is:

- Tacit knowledge cannot be directly transferred which makes it in turn not directly appropriable
As already discussed in the relevant KBV-theme, the appropriability discussion within this thesis will view appropriability from the perspective of sustaining a competitive advantage.

Appropriability in the KBV links to the market value of knowledge and unless the knowledge is protected by patents or copyright, it will generally be in-appropriable by means of market transaction. The KTP case studies should unveil which parts within the knowledge production are patented and/or have a copyright attached to it and what degree of knowledge it references to. Grant states that:

“Tacit knowledge is not directly appropriable because it cannot be directly transferred; it can be appropriated only through its application to productive activity” (Grant 1996 p.111)

As mentioned earlier, KTPs are linked to filling a knowledge gap within the firm to achieve some competitive advantage which should result in increased performance, ergo the bottom line. Hence, there should be an opportunity to identify a tangible value for a specific knowledge area which predominantly exists because of the application of new tacit knowledge.

2.5.4.4 - Specialisation in Knowledge Acquisition

The assumption is:

KBV requires for individuals to specialise in particular areas of knowledge while considering their absorptive capacity to increase success of knowledge integration

The KBV links efficiency to individual capacity to acquire, store and build new knowledge. Hence, the KBV theme discussion very much focused on the absorptive capacity of the recipient (Cohen and Levinthal 1990).
The KTP case studies are relatively small companies where most company actors have their own specific knowledge areas. Considering that the main recipient for a KTP is the associate, the absorptive capacity of the associate becomes very important. KTP partners are carefully selected during the KTP application process and Associates are appointed with the particular KTP outcome in mind. This thesis also argues that the associate is the main individual to acquire and store existing knowledge and create new tacit knowledge.

2.5.4.5 - Coordination within the firm

The assumption is that:

- Minimising knowledge transfer but emphasising on absorptive capacity and henceforth coordination of people’s specialised knowledge will increase efficiency and success

The previous KBV discussion established that since knowledge increases the efficiency in knowledge creation it also creates the need for integration of the efforts of individuals once applied to production.

Grant (2002) suggests that focusing on the knowledge aspect in the process of production of goods and services will help to clarify the issues of coordination. A KTP places the knowledge gap and the fulfilment of that knowledge gap through knowledge production and dissemination as the main aim of the project. Henceforth, the KTP aim is in line with Grant’s suggestion to help shed light into the coordination mechanisms.

The KBV discussion also argued that a process that requires individuals to participate in a full knowledge exchange of each other’s individual knowledge bases would undermine previous gains from specialisation (Demsetz 1991). Hence, the KTP will
also be used to see how far the knowledge exchange between individuals reach which have contributed to the SCA.

2.5.4.6 - Integration of Specialist Knowledge

The assumption is that:

- Problem solving and decision-making in groups is reduced to unusual, complex and important tasks as the firm is maximising efficiency through the other formal integration mechanisms.

The previous KBV discussion established three enablers: Autonomy, care and socialising. As well as four main integration mechanisms for integrating specialist knowledge, namely, rules and directives, sequencing, routines and group problem solving and decision-making.

This thesis argues that the first two mechanisms represent formal mechanism, whereas the third mechanism is viewed in Grant’s (1996) original paper as a formal mechanism too. However, earlier discussions under the ‘integration of specialist knowledge’ discussion also points to mutual adjustment (Armbrecht et al. 2001; Kogut and Zander 1996; Nonaka and Takeuchi 1995; Palmer 1998; Von Krogh 1998) which has informal roots. The fourth mechanism is informal and highly interactive. A tendency to view mechanisms as a predominantly formal act when considering organisational efficiency makes sense. Nevertheless, the fact that knowledge linked to SCA is deeply embedded within individuals and is not readily accessible or even identifiable by others, bears a risk that predominantly formal mechanisms may discourage out of the box knowledge sharing due to the knowledge fragility which was discussed within the context of potential knowledge creation and transfer enablers. Since ‘capacity of aggregation’ of knowledge is also dependent on the absorptive capacity and cognitive development of individuals, efficiency and streamlining a knowledge processes may be contradictory to knowledge production, coordination and innovation. The KTP should unveil what sort of mechanisms were
used in the knowledge integration process that lead to SCA and if enablers played a role within this process.

### 2.5.4.7 - The role of common knowledge

The Role of Common Knowledge theme assumption is:

> There is increased organisational gain in knowledge production if integration mechanisms involve common knowledge between individuals.

The literature review highlighted five different types of common knowledge which is considered to fulfil different roles in knowledge integration. The previous ‘specialisation in knowledge acquisition’ theme linked the ability to achieve complex tacit driven knowledge to individuals absorptive capability and hence, the need to specialise in a particular knowledge domains. However, for knowledge integration to work, the KBV also argues that there needs to be a degree of common knowledge. Hence, the KTP will analyse how and which types of common knowledge are leading to the integration mechanisms with the biggest impact on SCA.

### 2.5.4.8 - Organisational Capability

The Organisation Capability theme assumption is:

> The more individuals are used to broaden the integration of knowledge scope within each capability the more difficult imitation becomes.

The literature review also identified that organisational capability in the KBV context is concerned with knowledge integration rather than production. Reference is made to the dilemma for managers to consider, that greater breadth of knowledge subsequently results in groups of individuals with lower levels of common knowledge.
The KTP case studies will be used to unveil, firstly, if knowledge production and integration are as clear cut as the KBV suggest; and secondly, if there is evidence that a ‘broad-scale’ integration is used for the capabilities that have actually led to the SCA realised by the case studies.

2.5.4.9 - Organisational structure and design

The Organisational structure and design theme assumption is:

Knowledge production, integration and decision-making put emphasis on efficiency and therefore organisational structure and design will be determinant to success.

The literature review highlighted that organisational structure and design has the potential to influence the efficacy of knowledge production and integration as well as decision-making in order to achieve an SCA. Therefore, the result is a strategic view whereby the KBV distances itself from traditional bureaucratic models.

Here, the KTP case studies will be used to identify common organisational structures and designs between the case studies whereas the following two themes will concentrate on the hierarchy aspect and location of decision-making.

2.5.4.10 - Role of Hierarchy of Decision-making

The role of hierarchy theme assumption is:

If a firm is integrating knowledge which is possessed by individuals in tacit form, then hierarchical coordination will fail.

The literature review highlighted that organisational theory has typically failed to extricate the role of managers within the analysis of authority and control of hierarchical approaches in, firstly, the coordinating efforts of individual specialists;
and secondly, alignment of individuals and organisational goals. It was argued that especially within complex systems, hierarchies emerge because of their adaptation and problem solving advantages. On the other hand, it also stated that hierarchy may fail in the knowledge integration context. The KTP theme conclusion in this chapter will therefore consider both, this theme and the ‘coordination within the firm’ theme to draw conclusions.

The KTP will also be used to identify mechanisms for knowledge integration by judging if and how mechanisms are used to preserve the continued knowledge specialisation in knowledge production, which was identified as a specific issue in KBV literature.

Moreover, the discussion so far concluded that movement of instant specialist knowledge implies movement of individuals and therefore membership within multiple team structures, which the KTP should be able to unveil, whereas the KBV focuses on the idea of avoiding/minimising KT as it is a costly and ineffective mechanism for knowledge integration.

The KBV literature discussion also argued that ‘modules’, if not viewed as functional teams, can be linked with project structures which the KTP case study analysis could show as favourable or unfavourable in the KBV context.

2.5.4.11 - Location of Decision-making

The location of decision-making assumption is:

- Co-location of decision-making will produce better decisions if the nature of the knowledge is in tacit form

The literature review highlighted the discussion between a centralised versus decentralised decision-making structure. The two strategic options discussed are:
First, decision-making is centralised to the desired location. The discussions, so far, identified that only decisions requiring a low complexity of knowledge, which can be codified, should be centralised due to its relatively low cost and easier transferability. This was also linked to the achievement of economies of scale in decision-making. The KTP analysis will be used to either strengthen or weaken this assumption especially in the context of achieving an SCA.

Second, decision-making can be allocated to the individual specific knowledge holder or group of specific knowledge holders who then have to establish a mechanism for decision-making. It is envisaged for the KTP to unveil two aspects to this.

(1) Firstly, to see if there is any resemblance between high complexity of knowledge and the decisions made by the knowledge holder including possible strategic decisions.

(2) Secondly, what the established mechanisms for decision-making are especially for co-location including multiple individuals with idiosyncratic-knowledge.

So far, this thesis made a case to link KTPs as a strategically good fit environment for any KBV discussions. A KTP is conducted outside normal organisational structures and hence, happens in an isolated and somewhat controlled environment, trying to achieve superior performance by closing an identified knowledge gap. This in turn creates an opportunity to link increased company performance to the specific KTP context and even to the individual, for instance, the associate. Therefore, there is a clear link to the specific knowledge hence, providing a unique opportunity to minimise causal ambiguity. To satisfy research objective two, this thesis has investigated a unique environment with the potential to overcome or minimise the main empirical research issues identified. However, to understand how the thesis will link the KBV-themes to a KTP project further, and to build groundwork to fulfil the third research objective based on primary research, this thesis will establish a research construct that supports the discussions so far.
2.6 - Value Chains

The value chain is a concept first popularised by Porter (1985) and suggests that there is added value of production or delivery of services and therefore, shifts attention to internal activities to explain competitive advantage. If a firm is to achieve a competitive advantage by delivering value to the end user, the ability to understand which activity and/or process is important in creating that value and which are not, is of interest. The value chain invites the strategist to focus on pre-set of activities within the firm (Johnson et al. 2017).

The value chain is linked to production activities of the firm, from the inputs up to the final customer delivery as well as after sales, whereby each activity of the chain adds value to the firm’s product or service. Value itself is measured by total revenue, and a firm is profitable if the value it produces exceeds the cost of creating the product or service (Ermine 2013). Clegg et al. (2017) argues that value is multifaceted and not limited to monetary terms only. Porter (1985) has identified and categorised the generic value-adding activities into primary and support activities. The primary activities are directly concerned with the creation and delivery of a service or product (Johnson et al. 2017). For example for a manufacturing business this would include inbound logistics, operations, outbound logistics, marketing and sales, and services. Each of the primary activities are also linked to support activities which improve the effectiveness of primary activities. Such support activities include procurement, technology development, human resource management and the firm’s infrastructure. The value chain has made an impact over the past years, especially to map out a firm’s shortcomings and strengths. The main downside of this model, however, is to objectively measure competitive strengths, especially when trying to map the entire value chain of the firm (Van den Berg and Pietersma 2014).

As discussed earlier, there have been several attempts to discuss specific KBV themes using performance-based research. The main limitation of this approach is that it only reveals changes from a whole company perspective and lacks the ability to analyse specific knowledge elements (Grant 2011; Darr, Argote and Epple 1995). Other
studies focus on a particular aspect such as ‘routines’ and explain how they help in the integration of specific knowledge (Hong and Snell 2015). The challenge with the KBV is that it needs to consider knowledge production, coordination and decision-making to achieve an act of strategy. For example, ‘routines’ are only one variable of many to integrate specialist knowledge, which portrayed in isolation may be misleading. Even if other variables alongside routines are considered, the integration process is also linked to the degree of complexity of specialist knowledge (section: 2.2), common knowledge, absorptive capacities of individuals, specialisation in knowledge acquisition, and the organisational structure and design to consider coordination and decision-making.

The value chain analysis has been extended to various applications, e.g. beyond the study of individual firms into a so-called ‘global value chain’ (Zamora 2016) or by further focusing into the firm, e.g. the value of knowledge within the firm. The former is of specific interest within this research study.

This thesis has already discussed knowledge as the strategically most important enabler to sustainable competitive advantage and discussed ambiguous nature of knowledge when linked to SCA. The history and use of Porter’s value chain is around well-specified products and services but not the production of knowledge. The goal of this thesis, within the context of competitive theory, is to understand how and why firm performance can be explained within a specific context and from a knowledge-perspective which can be related to the KBV. Hence, Porter’s generic value chain will be of limited use. Instead, any chosen model needs to support the earlier identified knowledge assumptions and analyse primary knowledge activities as well as supporting knowledge activities, which will be discussed later in this chapter.

There have been several attempts to create a Knowledge Value Chain (KVC). Lee and Yang’s (2000) attempt is based on a KM framework. This KVC model consists of a knowledge infrastructure (including requirement, storage capacity, customer-supplier relationship and chief knowledge officer and management) and a knowledge process
(including acquisition, innovation, protection, integration and dissemination). Wang and Ahmed (2005) addressed the issue of knowledge management implementation by developing a pragmatic knowledge value chain by using knowledge processes (e.g. identification, codification and storage) and knowledge enablers (e.g. knowledge culture, knowledge sharing and knowledge benchmarking). Other scholars followed the idea to have knowledge processes and knowledge enablers. Ermine (2013) created a KVC for knowledge management using knowledge processes (e.g. Knowledge identification, codification, acquisition, storage, dissemination), knowledge management enablers (e.g. Knowledge system, knowledge culture, organisational memory, knowledge sharing, and knowledge benchmarking), and organisational capabilities such as new product development or organisational learning. Another attempt by Carlucci et al. (2004) draws their value chain from a resource and competence-based view by identifying strategic, managerial and operational dimensions of knowledge management.

Carlucci’s et al. (2004) model is interesting as it is less concerned with financial performance but competence based performance. Hence, competitiveness is linked to the realisation of a strategy which is based on the creation and development of competencies. The cognitive nature of such competencies allows the identification of main processes for the development of competencies (Ermine 2013; Prahalad and Hamel 1990). Ermine (2013) used the identified assets from Carlucci et al. (2004) knowledge process wheel and characterised them as knowledge processes.

Most KVC models mentioned above, refer to the KBV in some form. However, the main downside of the knowledge management models above is the missing link between the knowledge processes and the KBV knowledge elements including their role in the firm’s achievement of SCA. Furthermore, most KVC fails to make the link to decision-making or agree with views such as Powell (2001) that a KBV model starts with a shared understanding between the knowledge worker and decision maker. The basic assumption is illustrated in the figure below:
The crucial step in the above figure (4) is the highlighted link (encircled) between the knowledge worker and the decision maker. Simon (2001) describes this step as communicate knowledge, where knowledge is transferred to a decision maker. However, the assumption here is that firstly, knowledge transfer would always be possible and secondly, that knowledge transfer is the most effective activity in a KVC model. There seems to be a gap in the literature to have a holistic view incorporating all identified KBV themes, and instead, the literature focus on knowledge transfer and shared understanding between the decision maker and knowledge worker. However, the earlier KBV-theme discussion already highlighted that knowledge transfer may not be the most effective way to achieve knowledge production or coordination. Hence, there is a need to construct a generic KVC that has no such assumptions while keeping themes such as knowledge transfer separate and instead distinguishing between knowledge production, knowledge coordination and decision-making as primary processes.

This thesis will aim to understand how and why particular knowledge elements support the primary knowledge processes, which in turn will help to use the KBV as an act of strategy formulation to achieve SCA. Furthermore, the following section will contribute to the discussion around the third objective in this thesis:

**To develop a research construct most likely to overcome issues of causal ambiguity of knowledge**
2.6.1 - Knowledge-Based Value Chain Construct

This section will assist with the challenge on building an understanding of how and why, if at all, KBV knowledge elements and the identified primary knowledge processes play a role within the firm’s achievement of an SCA. Therefore, this sub-section intends to help with building a knowledge value chain construct to satisfy the research objective four.

The inability of the firm to understand the impact of strategies based on knowledge initiatives is of major concern. As discussed earlier, so far, the KBV failed to show how the identified KBV themes generate value to achieve an SCA. By not being able to understand the value adding benefits of each KBV theme against the primary knowledge processes, it is difficult to justify the investment of, for example, time, to achieve the complexity of knowledge needed to gain SCA.

Henceforth, formulating research strategy with the ability to link knowledge elements and identify where knowledge is aggregated to and which individual plays a role in the formation of SCA, seems very challenging and not surprisingly, the KBV has been struggling to act as an overall strategy process for the firm. Dayan, Heising and Matos (2017) also suggest that knowledge management is not understood as a strategic tool. Although their research outcome shows that managers consider knowledge as a strategic tool and acknowledge its importance, there is a gap between acknowledgement and strategic implementation.

In order to contribute to the discussion, this thesis identified KTPs as a good research fit with the opportunity to overcome many challenges to give empirically useful data. Furthermore, the KTP was also discussed and is in line with the main KBV assumptions.

The research aim of this study is to investigate the KBV in which the KBV-processes may be used to explain SCA. This thesis will refer to the earlier identified KBV-themes, mechanisms and the theme specific assumptions as knowledge elements (KE). These
KE are flexible and link to a specific context. Within the ‘business as usual’ firm structure, more than one context may be possible as different operations and routines are embedded within different substructures, which would jeopardise relevant research outputs for this study. The context needs to be fixed and transparent to make any meaning of the flexible KE. Another difficulty is, that not every context and its KE would lead to SCA and hence, the only way to have a certain link between the KE and SCA is to use an ex-post case study where the SCA can be unveiled by reflective sense-making and whereby the SCA itself can be linked to an output, outcome and benefit (which is the SCA). The link between output, outcome and benefit will be discussed in relation to figure 5 further below.

The attributes of the KTP are key for this research as the KTP itself is set up to fill a strategic ‘knowledge gap’ of the company that is linked to specific outputs and outcomes resulting in a benefit which is leading to the SCA of the firm and hence, allowing this study to analyse the KE by trying to explain the output from a KBV theme perspective.

As discussed earlier, KTPs deliver an environment where the creation of an SCA is the project itself and is operated outside the ‘Business AS Usual’ structure of the organisation providing a somewhat ‘isolated’ environment. Outputs are linked to outcomes resulting in one or more benefit which are measurable. The SCA which

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**Figure 4**: Context, Knowledge Elements and Output in KTP environment (Serkan Ceylan)
derives from the output and outcome are build using a context (which is the KTP itself) and KE (See Figure 4 above).

‘Knowledge Element’ mechanisms are usually hidden and may be defined as “...underlying entities, processes, or structures which operate in particular contexts to generate outcomes of interest” (Astbury and Leeuw 2010, p.363).

Therefore, the KTP is not only providing and fixing the context but also the outcome and therefore, KE directly linked to SCA should be identifiable. This also means that the only variable is within the KE where the analogy of the sleight of hand is actually created. Hence, placing the KTP as a very strong case scenario for empirical research. In other words, not only does a KTP have limited actors who are responsible for a particular SCA, but it is also known (through the KTP end project report) that those actors have taken a particular rabbit out of their hat. This will, in turn, enable the research study to look very closely at the KE and identified assumptions (general KBV assumptions as well as KBV-theme specific assumptions) while explaining how and why the firm has achieved an SCA.

Having established that KTPs can fix the context and output which leads to a particular SCA, the next step, to satisfy the research aim, is to be able to holistically analyse KE. In order to do that, the earlier discussed knowledge value chains will help to inform a KBV value chain. The above-illustrated context, knowledge elements and outputs model (Figure 4) will also be considered to create a syntactic construct for data gathering.

However, as already discussed earlier, above mentioned KVC models have a technological focus of knowledge primarily within the knowledge management literature, which does not fit with the research objective as this view would be contradictory to the earlier identified ‘main KBV assumption’ two, which highlights the importance of the individual over technology. Furthermore, there seems to be a lack of justification for the identified value components and an absence of the
‘context’ aspect to increase the chance of more relevant research outcomes. This research seeks to create a value chain construct which allows for analysis as a strategic tool for internal firm activities to recognise which activities are more valuable to the firm in order to achieve SCA.

This thesis has previously discussed the ambiguous nature of knowledge that is directly linked to SCA and the shortcomings of empirical research in relation to the KBV-themes as a holistic view on strategy. The intention of this section is to come up with a general knowledge-based view value chain construct to define an interpretative model which explains the link between primary KBV knowledge processes and supporting KBV knowledge elements. This KBV value chain construct will enable a specific view into knowledge processes and the ability to make holistic conclusions on how different supporting knowledge elements explain SCA within the firm. For this reason, the earlier discussion within the literature review conducted a review and analysis of KBV-themes and subsequent assumptions, which are now understood as the knowledge elements. Since value creation, which is based on knowledge, is often indirect and long term (Carlucci et al. 2004), KTPs were identified as a good match to satisfy the research objective three in order to minimise the ambiguous causal nature of knowledge. Furthermore, the construct below (figure 5) will help identify the variable knowledge elements that achieved the SCA from a KBV perspective. The KBV value chain construct may assist future researchers to construct cases and configure the KBV value chain model further for their context and therefore, make it easier for future scholars to build on and collect evidence.

Spender (1992) distinguishes between knowledge generation or creation and knowledge application as a dual role of firms whereas Grant’s (1996) KBV discussion is more concerned with knowledge application. Grant also claims that:

“If knowledge is specific to a particular team production process, then knowledge creation cannot be separated from knowledge application – both occur within a common organizational context” (1996b p.113).
A KTP is part of a specific team production process, and although it is undertaken within an organisational context, this context is limited by the KTP itself. The KTP is outside the ‘business as usual’ narrative and provides an exceptional insight into possible KE activities which have achieved SCA. The earlier KTP chapter has established that the desire to achieve SCA together with an identified knowledge gap is the trigger for any KTP project. The context to fill the knowledge gap is through knowledge transfer from academic leader to associate as well as some contextual company knowledge transfer from academic supervisor to associate. Hence, the associate is likely to be the main individual to create new knowledge.

The discussion above highlighted that this thesis will concentrate on the somewhat hard to detect KE. Figure 4 above, mentioned that the context, process, and outcome will be part of a value-adding knowledge chain construct which leads to SCA by adding KE as a main component to achieve the output which in turn links to the outcome (further discussed in methodology chapter 4) and benefits to having a clear link to SCA. The KBV Value Chain Construct has five distinct boxes as illustrated in Figure 5 below.

Figure 5: Knowledge-Based Value Chain Construct (Serkan Ceylan)
The following will explain the five boxes in Figure 5. The first box, ‘Context’, is defined as initiatives and activities to generate new ideas or objects. In other words, the ‘context’ through which knowledge can be created. The methodology section will later argue that such context should be fixed. Knowledge Elements (2nd box) refer to the ‘variable’ aspect of the knowledge-based value chain construct in which the output is created. The knowledge elements comprise of KBV themes, possible underlining mechanisms and assumptions. Output refers to an immediate product which is created by using the ‘context’ and ‘KE’ which could be tangible or intangible. ‘Outcome’ is defined as the knowledge being adopted and embedded as a new product or service through the use of the output. Whereas the last box, ‘Benefit’, is the measurable improvement resulting from the outcome which can be linked to SCA.

Figure 6 below illustrates a more detailed KBV value chain. The KBV value chain comprises of primary knowledge processes of knowledge production, knowledge coordination and structure of decision-making. Those primary knowledge processes are further supported by supporting knowledge elements. Since this KBV value chain is placed in the middle of the knowledge-based value chain construct, and since the context and outcome which is linked to SCA is fixed, this research study can understand how and explain why the supporting knowledge elements interact with the primary knowledge processes to create an SCA of the firm.

Figure 6: KBV value chain model (Serkan Ceylan)
The primary goal of any strategic management theories of the firm is the determinants of strategic choice (Grant 1996a). Therefore, this KBV Value Chain Construct assumes that any knowledge creation should be triggered by the firm's desire to achieve SCA which represents the trigger for this construct. Hence, Figure 5 and 6 above, illustrate a generic construct and model with the potential to overcome some of the major issues discussed so far. Mitchell and Boyle argue that one of the main challenges of knowledge and knowledge creation is the lack of a clearer conceptualisation of knowledge (Mitchell and Boyle 2010). There are three typical knowledge creation measurements: knowledge as a process, knowledge as an output and knowledge as an outcome system (Mitchell and Boyle 2010). Although, there is a difference between those knowledge measurements they will add little to satisfy the research question. This construct is different to Mitchell and Boyle (2010) in the sense that it does not ask about definitions of knowledge creation (Production) to then differentiate the knowledge production to be defined as a process, output or outcome. However, it uses a value-adding process that is based on the critical KBV discussion within this thesis. Furthermore, this model allows to further investigate the knowledge processes with particular focus on KE. For example, this model can investigate a specific KE, for instance, the integration of specialist knowledge within the coordination process to gain insight how a specific case study used the four integration mechanisms of rules and directives, sequencing, routines and group problem-solving. The findings can then also be cross-referenced to the following knowledge process of decision-making to understand the structure of decision-making for those various mechanisms hence, allowing not only for an individual but also a holistic view.

The KBV Value Chain Construct presents components starting with the knowledge ‘context’ which is triggered by the firm’s desire to achieve SCA or in its minimum a superior performance. At this stage, the company will generate new ideas (Styhre et al. 2002) to fill an identified knowledge gap. This literature review proposed to use a Knowledge Transfer Partnership (KTP) as the actual context. The KTP fixes the ‘context’, ‘output’ (e.g. new sales system) and ‘outcome’ (increased sales) box and
therefore represents a strategic research fit environment which was discussed in detail within the previous section. Since this ex-post investigation provides insight of how the output and outcome relate to the benefit (SCA), the KBV can be investigated through the lens of the KBV value chain to try and explain success or failure of knowledge activities.

### 2.7 - Literature Review Conclusion

The discussion in the literature review chapter determined the importance of knowledge and critically analysed the KBV and its importance in the current competitive strategy literature before breaking the KBV into 11 themes to satisfy the first research objective:

**To specify and critically evaluate the KBV as an act of strategy formulation and associate themes key to a KBV**

By doing so, it highlighted particular challenges of empirical research and differentiated between modes of knowledge conversion and degrees of knowledge complexity to aid later discussions for strategy formulation. Four main assumptions were formulated as well as one subsequent assumption which generated particular attention in recent years. Eleven KBV themes and subsequent assumptions were discussed to aid empirical research needs.

The second research objective this literature review needed to satisfy is:

**To situate the KBV in a context favourable to unveil SCA for the firm**

The literature review discussion highlighted that traditional strategy literature has neglected the nature of characteristic of knowledge and knowledge integration despite the theoretical importance of coordination within a KBV argument. This discussion also includes a considerable lack of research streams to address fundamental issues of knowledge and the link to SCA and the source of such advantage in this context. The challenge of the causal ambiguous nature of
knowledge and the challenges of sound research methods remains a challenge to truly use the KBV as an act of strategy formulation. The literature review identified the need for an environment which can link an SCA to KBV-themes, while also overcoming the identified KBV assumptions and minimise the challenge of knowledge ambiguity. Such an environment is important to further understand the KBV as an act of strategy formulation and either strengthen or weaken some of the assumptions made by the KBV literature. Hence, the literature review also undertook an in-depth discussion to justify such an environment. The Knowledge Transfer Partnerships were introduced to satisfy the research objective and provide a context favourable to explain SCA for the firm. Hence, the KTP was specifically linked to KBV assumptions and the causal ambiguity discussion of knowledge. Furthermore, each KBV-theme was also mapped against KTP to show the robustness and fitness for the research purpose of the chosen case study.

In doing so, the literature review highlighted that there is still a lack of empirical research of those issues mainly due to the challenge to understand how and why the knowledge elements interact with the primary knowledge processes to explain the achievement of an SCA of the firm. The thesis referred to this as the magician’s trick.

The third research question in this thesis is:

To develop a research construct most likely to overcome issues of causal ambiguity of knowledge

The typical approach for research, identified in the literature review, is to measure performance indirectly by using, e.g. indicators such as total speed of knowledge transfer or number of patents. Such measures do not unveil performance that can shed light on the nature of competitive advantage or the source of that advantage and would not methodologically overcome the causal ambiguity challenge of knowledge. However, the literature discussion illustrated how this study will overcome the causal ambiguity challenge by introducing a static context plus variable
KE equals outcome model. Furthermore, it linked KTPs as a favourable context environment and its achievement of SCA to the outcome before illustrating via a KBV value chain model how the KBV will be unveiled.

Hence, the last research objective is:

To understand, how and why, the identified knowledge elements (if at all) explain SCA and how they can be used to recommend a holistic KBV strategy

To satisfy the above research objective, this thesis needs a primary research approach. Therefore, the following Methodology chapter will be used to explain and satisfy research objective four.
Chapter 3: Methodology

3.1 - Introduction

So far, the Literature review elaborated on a theoretical link between a KBV of the firm and SCA. In particular, tacit knowledge is highlighted as increasing the complexity of knowledge and therefore, seen as the main cause for SCA. Furthermore, the literature review has also highlighted the ambiguous causal nature of knowledge linked to SCA of the firm, especially with increasing complexity of knowledge. This causal connection between action and result has challenged KBV researchers attempting to form any holistic knowledge-based strategy for the firm.

This thesis argues that the pre-requisite, to form any KBV strategy for the firm, is to gain a better understanding of how and why the KBV can explain an SCA of a firm. Furthermore, this explanation of how and why the SCA took place, needs to further appreciate the interdependence of all eleven identified KBV-themes to generate a holistic view.

The literature review investigated a unique environment with the ability to link a specific project (KTP) to an achieved SCA to overcome or minimise the challenges discussed in the literature review. Hence, the literature review revealed that by having a fixed context, which is the unique environment of a KTP and an already known outcome, which is a specific competitive advantage, the KBV-themes and subsequent assumptions can be used to satisfy the final research objective:

To understand, how and why, the identified knowledge elements (if at all) explain SCA and how they can be used to recommend a holistic KBV strategy

This methodology chapter will argue, that the chosen method for this thesis is an interpretative case study analysis as explanatory research. The purpose of this chapter is to identify the philosophical stance best suited to address the final research objective and subsequently contribute to the research question by considering some
of the methodological issues in this thesis and how they have been addressed. This is important to show a clear methodological path especially within a case study research method (Yin 2018). This chapter will first critically discuss the overall research stance before data collection methods, and ethical considerations will be given.

### 3.2 - Research Stance

Any enquirer will make certain assumptions. My own philosophical assumptions consist of a stance towards my chosen methodology, my language of research (rhetoric), my own values within the research process (axiology), how I know what I know (epistemology) and the nature of reality (ontology) (Creswell 2012). I will explain and choose a stance on each of these philosophical assumptions. The rhetorical assumption is concerned with the language of research. Qualitative researchers tend to embrace the rhetorical assumption that the writing has an informal style while using personal voice (Creswell 2012). As such, I may use metaphors or refer to myself in the first-person pronoun, ‘I’.

#### 3.2.1 - Ontology, Epistemology and Axiology

Ontology is the study of the nature of reality (Bryman and Bell 2015; Wilson 2014; Hudson and Ozanne 1988), and ontological assumptions are concerned with the very nature of the social phenomena being investigated (Cohen et al. 2007). Since the nature of my study is to understand how and why certain knowledge elements are used or dealt with by different knowledge actors within an organisational context, I will view reality as subjective and multiple; and embrace different realities within my research. My literature review identified three key knowledge actors most likely to be responsible in achieving the KTP outcome. When studying different knowledge actors within a set context, I intend to refer back to these multiple realities by making explicit, which knowledge actor’s point of view is interpreted. Creswell (2012) suggests that such research is best undertaken through qualitative studies in which
evidence of multiple realities can include the use of multiple quotes based on individual knowledge actors presenting different perspectives. Hence, my ontological implication of research practice is to give meaning to quotes and themes in words of my knowledge actors by also providing evidence of different perspective.

Epistemology refers to how we know and the relationship between the knower and the known (Soini et al. 2011). Hence, any epistemological debate is concerned with possibilities, sources and limitation of knowledge in any given field of study (Hallebone and Priest 2009). However, according to Soini et al. (2011) epistemology has been the subject of considerable controversy. Guba and Lincoln (1989; 1994) argue that the appropriate epistemological paradigm for qualitative research is constructivism, defending the position that our understanding of reality is not an objective truth, and that multiple realities exist, associated with different groups of people and perspectives which is in line with my ontological view. However, although this view is supported by researchers such as Greene (2007) who describes that constructivism is the only legitimate stance for qualitative research and referred to as ‘purist’ perspective, I will not make such strong claims. For example, Eisenhardt (1989) in her article ‘Building theories from case study research’ adopted a successful positivist view of qualitative research. Furthermore, Yin (2018) describes much of his case study research and application from a realist perspective but highlights that case study research can equally excel in accommodating a constructivist and interpretivist orientation. My view regarding what constitutes acceptable knowledge will very much be determined by my research philosophy discussed in subsection 3.2.2. Therefore, I will link back to further epistemological views when discussing my research philosophy in the next subsection.

Axiology focuses on what I value in my research. This is particularly important in qualitative research as such research will be value-bound by the researcher (Biddle and Schafft 2015). This means, my own values will influence the outcomes of this research study. The final choice of my philosophical stance is also a reflection of my axiology, as is my choice of data collection technique (discussed in subsequent
sections). For example, I have always valued personal interaction and rich communication over anonymous or less personal forms of communication. Hence, I would more likely lean towards interviews as a favourable data collection tool. It is important that I acknowledge the existence of biases as my research is value-bound. Hence, my axiological implication of research practice is to openly discuss values that could shape and influence my research, and as such, the subchapter ‘research positionality’ (see section 3.6) will further discuss my axiological assumptions.

### 3.2.2 - Research Philosophy

My discussions and findings in the literature review and my earlier epistemological and ontological assumptions navigate me towards a qualitative research study using an interpretivist philosophical stance, which this chapter will further defend. Therefore, considering my research question and research objective four, it is important to be transparent about my research philosophy. Thus, I will acknowledge strengths and weaknesses of other research philosophies to strengthen my methodological alignment. For example, the assumption of idealism supports that reality is subjective and mentally constructed. However, within my context of study, idealism would be more likely to try and answer questions about the nature of KBV in an ideal KTP however, I reject this legitimate approach in favour of an investigation into KTPs that actually occurred. My research question does not try to find an ideal KTP.

An alternative philosophical view could be the view of a positivist. A positivist stance generally believes that a position can be created in which a body of research can be replicated by fellow researchers achieving the same result. Hence, separating objective reality from the subjective knower (Angen 2000) is the foundation of all authentic knowledge. Therefore, any observation and experiments which are based on sense experience for all genuine knowledge need to be captured through direct data or information (Easterby-Smith et al. 2002). This stance is based on the natural science model and hence, more often associated with quantitative method of analysis.
(Baharein and Noor 2008). Trochim (2006) argues that science aims to find hypothesis, which is operated by cause and effect and indicates that science should be concerned to test assumed theories through, typically, deductive reasoning. If the theory does not fit the fact, then it should be revised. The positivist stance, therefore, assumes that the reality is ‘out there’ and that it can be tested (Creswell 2003).

However, the strict positivistic view on ontology and epistemology has been debated, amongst others, by social scientist and the post-positivism assumption emerged (Mayer 2015). Post-positivism is not just an adjustment to positivism, but its central tenants reject positivistic views. Although both views believe that reality is pre-existed, post-positivism also assumes that observations may contain errors and therefore, all theory is revisable (Trochim 2006). One of the most common forms of post-positivism is a philosophy called critical realism. One origin can be traced back as far as Galileo, who stated that “whatever cannot be measured and quantified is not scientific” (Capra 1989, p. 133). Knowledge must be deducted through an objective distance, and if this distance is not maintained, there is a risk of tainting reality with the researchers own subjective beliefs and biases (Heshusius 1994).

In terms of practical assumptions, a post-positivist researcher will likely write their qualitative studies in the form of scientific reports informed by a quantitative structure. Furthermore, a post-positivist researcher will view inquiry as a series of related steps, with multiple perspectives from participants rather than a single reality, with multiple levels of data analysis for rigour, while encouraging the use of validity approaches and more likely employ IT to assist analysis (Creswell 2012). Any Validity assumption in a more conventional experimental approach would rely on a strict method to ensure adequate distance between the object of the study and the researcher’s subjective biases. The aim is to achieve validity, reliability (its repeatability) and generalisability (Angen 2000; Kvale 1996). To address the validity problem in qualitative research, Hammersley (1995) adopted a position called ‘subtle realism’, and although Hammersley agrees with the realist ontological view, he also agrees with the interpretivist view that reality is only known from our own
perspective. Hence, Hammersley (1995) redefines validity as confidence instead of certainty and places a number of methodological criteria to judge confidence in interpretive study. An example is Creswell (1998), who refuses to adopt quantitative terminology but “attempts to find qualitative equivalents that parallel quantitative approaches to validity” (p. 197).

Creswell (1998) outlines eight techniques: triangulation, peer review (debriefing), prolonged engagement, negative case study analysis, clarification of researcher bias, thick description, member checks, and external audits. Creswell also believes that at least two should be employed in any valid study.

My study could have engaged in qualitative research from a post-positivist philosophy (which it has not) which would support the belief in fixed laws of causation and therefore, cause and effect oriented (Creswell 2012). Hence, one possibility to unveil the existence of an SCA explained by the knowledge elements would have been to investigate the mechanisms by which the KBV-themes may be used to achieve SCA. Merton (1967) states that: “(Middle–range theory)...involves abstraction, of course, but they are close enough to observed data to be incorporated in propositions that permit empirical testing” (p.438).

This kind of study would have typically generated hypothesis that could be tested. The Middle-Range theory could have been used to explain how the context influenced the mechanism. By using the Context + Mechanism = Output (CMO) model. However, any robust CMO model, in order to satisfy my research aim, would have been challenging. Hodgson and Cicmil (2008) argue, to view project environments as being more complex in its social context than simply creating instrumentalist and mechanistic, functional management processes. Although, a CMO approach would have been theoretically valid, finding cause and effect relationships with hard to identify mechanisms, especially if tacit knowledge is a main part of the study, is not only very difficult to overcome from a robust methodological view, but the outcome may also be too reductionistic for the aim of this study. Consequently, I would argue
my ontological, epistemological and axiological stance, as well as my research aim, does not support this study formulation.

Furthermore, since I view reality as subjective and multiple, I have some reservations on the earlier identified success criteria to confirm research validity. Although I agree with Hammersley (1995) and my earlier discussion to redefine validity as confidence rather than certainty and I recognise Creswell’s (1998) validity techniques, I do think that such success criteria needs to be further discussed. Furthermore, there are too few studies to produce a testable hypothesis from although, this thesis may generate such for subsequent positivist research.

Qualitative research is frequently criticised for lacking scientific rigour and demonstrating such rigour is challenging as there is no consensus about standards to judge qualitative research (Welch and Piekkari 2017; Noble and Smith 2015). One popular definition articulated by Van Maanen (1997) argues that qualitative study:

“seek to… come to terms with the meaning, not the frequency, of... phenomena”
(p. 520)

Although this definition is applicable for most qualitative methodologies, the nature of ‘meaning’ and how it should be captured will depend on the chosen methodologies, as different research paradigms and research philosophies live under the broad umbrella of qualitative research (Prasad 2005). Moreover, I believe that the right practices and standards are context dependent and not universally applicable (Maxwell 2012). This perspective helps to inform that my conclusions are based on my own research philosophy, the aim of my research, as well as my research setting.

Welch and Piekkari (2017) looked into quality in qualitative research and found that the discussion can be divided into three generations of evaluative criteria. The first generation formalised in the 1950s influenced by logical positivism on the social science (Cronbach and Meehl 1955; Whitley 1984) judged qualitative research against the same criteria and procedures as quantitative research while applying criteria
unappropriated to qualitative research. Welch and Piekkari (2017) describe the second generation as still viewing qualitative research with the same criteria as quantitative research but by developing different procedures. This view was popularised in management by Yin (1984) and his approach to validity in case studies from a qualitative positivist view. Eisenhardt (1989) further discusses Yin’s criteria and argues that the goal of research is to develop testable hypotheses and theory which are generalizable across settings. The third generation was concerned and acknowledged that there are multiple criteria and multiple procedures which will vary depending on the research philosophy being followed. Hence, a quality study results from following the right procedures, in line with the research goal. One of the most influential alternative standards were those by Lincoln and Guba (1985) who recognised the shift from positivist to interpretivist (they refer to naturalist) while demonstrating rigour within qualitative research by offering alternative criteria namely, truth value, consistency and neutrality, and applicability.

Nevertheless, the underlining assumption of, e.g. consistency is that an independent researcher should be able to arrive at a similar or comparable finding which would be hard to justify within my research stance and belief of multiple realities and my own effect on the research outcome.

However, Guba and Lincoln later renounced their own criteria by stating that “their parallelism to positivist criteria make them suspect” (Guba and Lincoln 1994, p.114). They then introduced a set of authenticity criteria clearly distinguishing a break from positivism. Others scholars then entered their own criteria with increasing numbers over time (Symon and Cassell 2012). Tracy (2010) recognised the debate around specific criteria and argued that it is possible to deduct some ‘big-tent’ criteria to help reach a consensus. The following table shows some of the big-tent criteria in relation to my research.
| Worthy topic | To satisfy this criteria, the research topic needs to be relevant, timely and significant. The topic worthiness was addressed in chapter two with particular focus on subchapter 2.4 |
| Meaningful coherence | This study achieves what it purports to be about as well as using methods and procedures that fit its stated goals. My methodology chapter is concerned to show that my methodology is in line with my method. |
| Rich rigour | The study uses appropriate theoretical constructs such as the KBV value chain construct and an appropriate context which is identified as a KTP in subchapter 2.5. Furthermore, the data collection method needs to be appropriate which is discussed in subchapter 3.3. |
| Sincerity | The study is characterised by self-reflexivity about subjective values and biases highlighted in the axiology discussion and further discussed in subchapter 3.6 (research positionality). Furthermore, the research method will be discussed, and transparency about the method is given in the methodology chapter |
| Criteria for quality | Based on the research stance of this thesis, any quality or ‘fit for purpose’ criteria is based on subjectivity. The literature review highlighted the ambiguous causal nature of this type of study and the research strategy subsection (3.2.4) will discuss further means and practices how a fit for purpose outcome will be achieved. |
| Credibility | In order to achieve credibility within qualitative research, any study should discuss the criteria to achieve the quality for credibility including, for instance, triangulation, member checking and |
reflexivity discussions which are further discussed within this subsection 3.2.

<table>
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<th>Significant contribution</th>
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<td>The thesis provides a significant contribution in the area of theoretical discussions and understanding of the KBV and its link to SCA. It further established a methodological contribution by formulising a KBV value chain construct which can be used and adapted by subsequent scholars. A further contribution is a contribution on practical implications and emerging KBV-principles. All contributions to knowledge are further discussed in subchapter 5.2.</td>
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Figure 7: Big-tent criteria based on Tracy (2010)

Others argue that big-tent criteria would be so broad that they risk being of limited use (Welch and Piekkari 2017). Furthermore, I have listed some means to achieve the criteria for quality which are mainly derived from the discussions of Angen (2000) but with a focus on my philosophical stance:

**Triangulation:** This technique confirms accuracy by using measurement from three different angles. The assumption is that multiple methods or data sources will result in convergent meaning of inquiry (Wilson 2014; Lincoln and Guba 1988). The principle of triangulation has been long understood (Denzin 1978) which discusses the use of multiple methods or data sources to justify a full understanding of phenomena in qualitative research (Turner et al. 2017; Carter et al. 2014). Denzin (1984) identified four types of triangulation: Data source triangulation; Investigator triangulation; Theory triangulation and Methodological triangulation. Yin (2013) argues that the first type (data source) and the last type (methodological) are more likely to strengthen the validity of a case study evaluation. I intend to use the first type of data source triangulation, as a means to ensure comprehensive results. Hence, it is envisaged to evaluate the knowledge recipient perspective (Associate), company perspective (Company Supervisor) and university perspective (Academic Leader) for
each case study. However, Mathison (1988) argues that triangulation may have the opposite effect of convergent findings and may be inconsistent and contradictory. Moreover, a robust triangulation process would assume an objective reality independent of my identified knowledge actors and myself and therefore, contradict my philosophical stance. The acceptance of multiple realities does offset this issue. Although, I deemed it to be useful to identify three key knowledge actors for each firm in line with Denzin (1994) who would argue that interpretive researcher may find it useful to have different views of a phenomenon. Therefore, my use of data triangulation is less so to validate my research but to achieve a better understanding of my research question even or because of different points of view.

**Peer review:** This technique assumes added value by the view of the peer. Morse (1994) states that peers will not have the same involvement with the information as the investigator and therefore, have less ability to judge whether the interpretations have been given enough consideration on perspectives. This is a valid point and supports my research stance discussion so far. However, I used the peer review as part of my PhD process. My interpretations and assumptions were constantly challenged by my supervisory team, including an experienced KTP manager, an associate professor and a professor of strategy. The discussion during peer review practice helped me to have a more critical view within the subject area.

**Member checking:** This technique which confirms accuracy by returning analysis to informants suggest a fixed truth or reality (Sandelowski 1993) which would contradict my philosophical stance so far. My KTP knowledge actors may change their minds as my interview process itself may have impacted on their original ideas over time, or the respondents may disagree with my interpretation resulting in questioning whose standpoint should be used. Morse (1994) supports these points and argues that this technique could lead to confusion rather than confirmation. My philosophical stance, so far, would assume that there is no static truth to which my KTP knowledge actors’ response may be compared to. Moreover, I would argue that my research looks for processes that come from a KBV of which the key subjects are neither aware nor interested in. It is my job as investigator to understand what the KBV is and how the
knowledge elements can be used to explain the SCA. Furthermore, it is important that I am interpreting in line with my knowledge-based value chain construct based on my literature review discussion and hence, member checking becomes relegated to checking what actors regard as the facts.

**Reflexivity:** This technique stresses the importance of objective distance between my work and myself which I already discussed above. However, from an interpretive perspective this may be a misguided attempt. Smith (1984) argues that, it is an illusion to suggest that objective distance would allow the truth to show itself. I do not argue that any form of reflexivity is redundant but agree with Gadamer (1994) that self-reflexivity is not carried out to achieve objectivity but to see the value of my own contribution to the KBV and trace how my sense of my research has changed (Bergum 1991). As I previously discussed, transparency is key to my research and highlighting my research positionality (section 3.6) is important to self-disclose my assumptions, believes and biases that might have shaped my inquiry (Creswell and Miller 2009).

Nevertheless, some interpretative researchers do engage in some or all of the mentioned practices (Blumenfeld-Jones 1995). However, Angen (2000) argues that assessing validity through strict and specific methodological criteria continues the positivist assumption of an external foundational reality. Emphasising on specific criteria as mentioned above has the danger of converting qualitative research into bad quantitative research (Nielson 1995).

It becomes more evident that the main research question of my study can be best explained by an interpretivist ontological view of my research which has a multiple and relative ‘reality’ view. Interpretivism does not view science as mechanistic and reductionist (Cohen et al. 2007). Hence, any research based on interpretivism would need to include notions of choice, freedom, individuality and moral responsibility and see the world as a living organism. Hence, there is no universal truth and understanding and interpretation comes from the researcher’s own frame of reference (Fitzgerald and Howcroft 1998). This study will use the responses of knowledge actors whereby interpretivism as a technique may be favourable and, to
some extent, archives. Subjective phenomena have an in-directive approach while understanding connections with overt behaviour, if at all (Diesing 1966). I do not accept all interpretations as being equal or ‘true’. However, considering my research questions, it is not possible nor desirable to distinguish a clear-cut view between a subjectivists and objectivist approach as some elements such as the analysis of the archive may have some objective content whereas testimony would support a subjective approach.

A qualitative versus quantitative research discussion is subject to the next ‘Research Approach’ section (3.2.3). However, qualitative research can be informed by different epistemological views, and not all researchers share the same epistemological assumptions when it comes to qualitative research (Denzin and Lincoln 2000). Still, Denzin and Lincoln (2000) assume that qualitative research is divided into distinct research philosophies, e.g. post-positivist or constructivist. Lincoln and Guba (2000) modified their philosophy assumption that allows combining different paradigms as long as there is no major contradiction to the axioms of the two paradigms. I have already highlighted a somewhat mixed view of objective and subjective assumptions within my particular study which need further defending. My research study deals with many assumptions which could be argued to have a more cause and effect related to nature and therefore, may be seen to stance with a higher degree of positivism. Such contradictory or mutually exclusive paradigms could be seen as problematic and need further transparency.

Soini (2011) argues that qualitative research can, not only be conducted from a number of different ontological and epistemological perspectives but opens significant advantages to conceptualisation and practice of qualitative research. Greene (2007) further argues:

“Important paradigm differences should be respectfully and intentionally used together to engage meaningfully with difference [...] to achieve dialectical discovery of enhanced, reframed, or new underpinnings” (Greene 2007, p.69)
I do not intend to process my research outputs through the use of contradicting paradigms as discussed above. However, I like to be transparent about the research construct I created and discussed in the literature review. I have chosen KTP as a favourable context which, through archived information, I believe to have generated an SCA of the firm. This may be seen to have some degree of a cause and effect relationship assuming an objective reality separated from the subjective knower. However, my knowledge-based value chain construct is based and related to Grant’s (1997) assumptions and views. I do not try to generate, prove or disprove hypothesis. I merely represent a construct to be able to focus on the knowledge elements and holistic knowledge processes/perspectives to overcome research limitations discussed in my literature review. My philosophical stance to unveil and understand how and why the knowledge elements inform SCA will be by using an interpretative research philosophy.

3.2.3 - Research Approach

So far, my research stance discussed my ontological, epistemological and axiological point of view as well as my research philosophy. My research approach will recognise the overall research question and research stance discussed thus far.

Many researchers refer to two broad methods of reasoning when it comes to the research approach, namely, inductive and deductive approaches (Bryman and Bell 2015; Soiferman 2010; Trochim 2006). Trochim (2006) broadly defines deduction as moving from the general to specific, while induction begins with the specific and ends with the general. Bryman and Bell (2015) stress the importance to deduce hypotheses within any deductive approach that is subject to empirical scrutiny. Saunders et al. (2016) follow, by adding that deduction is the dominant research approach in the natural sciences, where laws present the source of explanation enabling concepts to be operationalised in a way that enables facts to be measured. Many researchers (Bryman and Bell 2015; Saunders et al. 2016; Soiferman 2010; Trochim 2006) therefore, highlight that a deductive approach is likely to be quantitative although
qualitative measures are also possible. A quantitative study is widely used by researchers to collect large samples of data using mathematical or statistical techniques to make a hypothesis about association in statistics. A complex phenomenon which may involve explicit and tacit aspects (Brandbury and Lichtenstein 2000) including, the use of predominantly what or how questions (Lee et al. 1999). As already discussed in my previous subchapter, such a study would have a higher degree of objectivism. However, my research question is predominantly trying to understand how and why question which would suggest that in-depth analysis is necessary to provide meaningful results. Hence, considering my philosophy discussion so far, a quantitative approach may not be favourable and harder to defend.

However, deductive and inductive approaches are not mutually exclusive and often address the same question, using different methods (Soiferman 2010). Although the choice of reasoning is important to satisfy research questions, this study shows that one size does not fit all. Deductive reasoning is a basic form of valid reasoning and will, therefore, test theory (Pheby 2015). This research uses, in part deductive reasoning to show that KTPs are a strategic research fit environment while working its way down to a conclusion, based on evidence, to satisfy my research objective two. However, following the rest of the research questions and objectives it becomes evident that producing falsifiable hypothesis may be very challenging and therefore, an ‘Inductive’ approach may be appropriate to build on the KBV. A tendency to construct a rigid methodology while using a deductive approach may hinder alternative explanations of what is going on (Saunders et al. 2016; Diesing 1966) which in turn could provide a risk for my study when considering the context and knowledge elements discussed earlier.

Arguments based on experience or observation are best expressed inductively, and Creswell and Plano Clark (2007) argue that the inductive bottom-up approach, can use participants’ views to build broader themes or understand them and generate a theory or view to interconnect themes. This research study is particularly interested in gaining insights into KBV-themes within a specific context and by interconnecting
the themes into knowledge elements and three broad primary knowledge-based processes (knowledge production; knowledge coordination; and organisational structure for decision-making). Such qualitative research approach will share insight into how and why interconnections of themes exist rather than a quantity of them. Qualitative research is an extrapolation of meanings and themes from data gathered which does not infer from a given form of knowledge.

Qualitative studies are usually classified as exploratory in nature and data is often collected through case studies, interviews, focus groups or observations (Sekaran 2003). The exploratory link of qualitative research comes from the misconception that according to Yin (2018) some social scientists implicitly believe that case studies are only suitable for the exploratory phase, while the descriptive phase is dominated by surveys and histories, and that the only way of pursuing explanatory or causal inquiries is through experiments. However, Yin (2018) points out that some of the most famous case studies have been explanatory. Yin also states that the more appropriate view of case studies may be an inclusive and pluralistic one, whereby a case study could be exploratory, descriptive and explanatory (2018).

3.2.4 - Research Strategy

As stated at the beginning of this methodology chapter, the chosen method for my fourth research objective is a multiple interpretative case study analysis as an explanatory research study.

The first three research objectives implied using secondary research, whereas my fourth research objective needs to undertake primary research. It is a key understanding to point out that no research strategy is inherently superior or inferior to another. It is, however, important to achieve a sensible level of coherence throughout my research design (Bryman and Bell 2015) and consider further suitability with my research philosophy and approach. Therefore, to defend my choice
of case study research as a research strategy, alternative options of research strategy will be discussed before an in-depth discussion of case study research will take place.

Ethnography: This research strategy is best described as a scientific approach which undertakes research by systematically observing and participating in the social construct of the people they study (Madden 2017). Here, the researcher observes the social world being researched and, in particular, look for the phenomenon within the context in which it occurs (Hammersley 2016). This strategy would be in line with my research aim. Such observations involve the use of our sensory systems (including eyes and ears) to record behaviour. This method would require me to make judgments about the occurrence of the behaviour, its frequency, its duration, or its latency (Gill et al. 2008, Patton 1987). Even by neglecting the time pressure and accessibility issues for such research, this approach does not seem feasible for practical reasons. Trying to observe the right moment in which the knowledge (which is invisible) to produce an SCA has taken place and considering the literature review discussion around knowledge and SCA, makes this approach somewhat impossible. There is also a very high probability that a given KTP may not achieve SCA at all which would waste immense time and effort.

Grounded Theory: The aim of Grounded Theory is to create theory through continuous comparison in an iterative manner (Bryman and Bell 2015). According to Goulding (2002), any research which will predict and explain behaviour could use a grounded theory approach with the emphasis on developing and building theory. Charmaz’s (2000) argues that grounded theory associated with Glaser, Strauss, and Corbin is objectivist in that it aims to uncover a reality that exists and is external to social actors. This notion may be problematic with my philosophical stance discussed earlier. Even by considering alternative, constructivist views, grounded theory is most appropriate when there is little knowledge about the phenomenon being studied or a new perspective of phenomena is required (Corbin and Strauss 2008; Strauss and Corbin 1998). However, my research question is less concerned with the creation of a new theory but understanding an existing view within a specific context. Hence, this research strategy will not be further discussed.
Although both approaches could possibly work within this research context, they are subject to the identified risks and may not satisfy my research aim in its entirety. Especially, as my literature review already identified KTPs as a most favourable context to explain how knowledge elements explain an SCA. In other words, by using the KTP as a case study, it fixes the context while being informed about the outcome through ex-post analysis which allows the research design to undertake in-depth research into KBV knowledge elements.

My research question and objectives are more concerned with ‘how’ and ‘why’ knowledge elements are affected by the context and how they can be explained to have achieved an SCA from a holistic perspective. Therefore, another possible research strategy is archival research. Hsu et al. (2015) point out the tremendous number of digital archives created through information technologies. Adegbuyi et al. (2015) conducted an archival review of the influence of organisational strategy on organisational performance by using various empirical data on business strategies and their effects on organisational performance. Hence, I investigated the possibility of archival records within KTPs as there is an archival record for all KTPs in the form of an end project report.

The KTP end project report includes firm sensitive data, and some companies could reject my request to gain access. A preliminary request for the KTP end project report strengthened this risk. Furthermore, the company would have had some control over my research and potentially asked for parts to be taken out from the thesis before publication, and although this is still an acceptable route, it would have also increased the burden for administration on the company part. However, archival research strategy would allow me to potentially gather data from a larger sample size. Nevertheless, it is apparent from my research paradigm and philosophy, that I am less concerned about having a big sample size but more interested in showing transparency, rich description and detailed understanding of the phenomenon. However, since those archival records were not created with my research purpose in mind, the use of archival records in the form of end project reports would not satisfy
my research objective and research question. Even if further access to, e.g., emails, calendars, minutes and reports was possible, the chances to discover and explain SCA seems unlikely. Thus, a survey or an examination of archival records may be too simplistic and reductionistic for my research focus which may include questions such as: how and why knowledge transferability may impact knowledge actors and the dynamics of decision-making within a highly innovative firm. However, I did use archival records to identify if a KTP achieved some form of SCA and if the projects were likely to have achieved a higher degree of innovation, but this was based on a case study selection exercise and not a full archival research strategy.

Yin (2018) argues that how and why questions of an explanatory nature are also likely to lead to the use of experiments or case studies as the preferred research strategy as they give more insight as mere frequencies or incidence.

Experiments for my research study seem to be very difficult to undertake, and I could not find any evidence, in my secondary research, to suggest that there is a research stream trying to unveil the achievement of an SCA from a knowledge-based perspective by using any form of experiments. My research aim is less about causal links between the change of one independent variable and the resulting effect on the other dependent variable (Saunders et al. 2018; Hakim 2000) as experiments may suggest. Considering my philosophical stance discussed before, I do not believe that I can separate the existence of an SCA from its social actors to even attempt to explain it through experiments. In any case, there is a need for a control group for experimental research to succeed (Pithon 2013). The establishment of a control group is not possible for my research which eliminates this research design altogether.

Considering my ontological, epistemological and axiological discussion as well as my philosophical stance and research approach thus far, I will defend my research strategy as a multiple case study research. Hence the following chapter will discuss case studies further.
3.2.4.1 - Case Study Level

The case study is differing to the experimental strategy discussed above which incorporates a highly controlled environment. This lack of control is also identified by Yin (2014) who argues that the boundaries between the phenomenon being studied and the context are not as clear-cut. Case study research is an ideal methodology when a holistic, in-depth investigation is needed (Feagin, Orum, and Sjoberg 1991) which would include a number of informants each providing their case as to how the knowledge production, coordination and decision-making took place.

However, case study research has been criticised by some researchers because of the difficulties to produce generalisable, reliable and theoretical contributions to knowledge. I have already discussed reliability and validity from an interpretivist perspective within my research philosophy section. Moreover, such criticism is largely based on a positivist philosophy (Riddler et al. 2014) assumption who would criticise small samples especially on interpretative, qualitative research which has been countered by scholars such as Buchanan (2012) or Flyberg (2011).

Flyvbjerg (2006) warned researchers to be mindful of the five greatest misunderstandings of case study research:

(1) theoretical knowledge is more valuable than practical knowledge;

(2) one cannot generalize from a single case; therefore, the single-case study cannot contribute to scientific development;

(3) the case study is most useful for generating hypotheses, whereas other methods are more suitable for hypotheses testing and theory building;

(4) the case study contains a bias toward verification; and

(5) it is often difficult to summarize specific case studies.

Another critique in the literature is that case study research is not widely applicable in real life. A strong response to that criticism was made by Yin (2018) who
differentiates between statistical generalisation and analytic generalisation, the latter being very powerful when previously developed theories or views are used as a baseline against which the empirical result of the case study can be compared to. My thesis aims to draw analytic generalisations by using the KBV as the baseline for my study.

Flyvbjerg’s earlier mentioned second issue, of generalisation from a single case, has been widely discussed (Yin 2013, Tellis 1997). However, single case studies may be used to strengthen or challenge a particular theory or view (Yin 1994). The incorrect terminology such as ‘small sample’ is usually misleading as it does not recognise eventual data source triangulation whereby a single case study does not necessarily mean a single respondent. My case study design uses a shorter KTP case study as a legacy from my PhD transfer report which also constitutes as my pilot, as well as a further three classic KTP case studies. I also use data source triangulation where possible with a total of 11 in-depth respondents. This case study approach follows a replication logic, which is different from a traditional sampling logic argued to be improper for case study research (Tellis 1997). However, I only intend to use this data source triangulation, as discussed in the previous research philosophy subchapters, in line with Denzin (1994) who would argue that an interpretive researcher may find it useful to have different views of a phenomenon. A robust triangulation process would assume that my knowledge actors and I, have an objective reality independent of the context which would contradict my philosophical stance and was already discussed in the previous subchapter. Hence my case study approach and use of data source triangulation are to strengthen my research by achieving a better understanding of my research question even or because of different points of view.

Each of my KTP case studies represents a whole study in which an in-depth understanding of the phenomenon is gathered from the various KTP stakeholders. Each case study will normally include perceptions of the Associate, Academic Leader and Company Supervisor. All three key KTP stakeholders will be analysed within a context and identified KBV-themes will be discussed. After this phase of analysis, each
KTP will be compared with one and another to be able to make more general observations and comments.

Poulis et al. (2012) highlights qualitative research as context-sensitive and suggests that current research perspectives within business are biased towards an explicit treatment of context by mainly employing quantitative tools. Welch et al. (2011) strengthen this view by observing that studies miss out on qualitative case study research and therefore, the rich context. A quantitative method would suggest being specific and using a hypothesis to be tested which would not allow me to consider the uncertain nature of this study, exempli gratia, causal ambiguity has been discussed earlier. Furthermore, such an approach would not unveil the multi-faceted knowledge elements that lead to an SCA from a KBV theme point of view. Yin (2018) recognises that explanatory case studies using a deductive approach are likely to build and verify an explanation, by using theoretical propositions to test their applicability in a case study. I do not intend to verify or test applicability but to understand how the KBV can explain a given SCA. A case study strategy enables researchers to gain an in-depth understanding of the context and process of the research and explains the ‘why’ question as well as the ‘what’ and ‘how’ (Yin 2018; Morrison and Wood 1991). Therefore, I will inductively analyse the data by understanding how and why possible patterns emerge while comparing to the existing literature to refine or extend the KBV of the firm. Moreover, since qualitative research is context sensitive, and since my context in each case study is a KTP, this research study will utilise on this context bias as it focuses on the primary knowledge processes and supporting knowledge elements.

3.2.4.2 - Case study selection

As discussed above, this research includes testimony as a primary source of data gathered. Ambiguity in case study selection hinders the positive dissemination of research (Ghouri and Firth 2009). Hence, this section will be transparent about the case study selection process.
The literature review discussed the suitability of KTPs as a case study at lengths and mentioned KTP reports which are written as a proposal to win the government substitute for a project. Once, the KTP project has finished an end project report is produced. Analysis of administrative documents and records are part of the archival strategy. Hence, there was an opportunity to use not only testimony but also archives. However, the earlier research strategy discussion identified that a full archival strategy does not satisfy my research goals.

Nonetheless, the KTP end project report information was used for the purpose of case study selection. Due to accessibility issues of KTP end project reports, I worked with two KTP managers who had access to a large sample of KTP projects.

The transfer report anticipated identifying two classic KTPs in addition to the pilot shorter KTP. The optimal criteria of the two KTP are identified as:

- **Very high knowledge complexity and very innovative in approach**
- **Low knowledge complexity and not particularly innovative in approach**

However, this study investigated three KTPs in addition to the sKTP which was placed in between the initial two criteria and is identified as:

- **High knowledge complexity and innovative in approach**

The following diagram (Figure 8) illustrates how the KTPs are placed regarding the two axes of knowledge complexity versus innovative approach criteria. The approach to innovation is usually part of the KTP end project report. The report judges if the achieved KTP output is unique in the respected business environment or if the output already exists but is unique to the firm. The knowledge complexity axis is an important selection criteria based on the second KBV main assumption, identified in the literature review (subsection 2.4.1.1). Assumption two differentiates between explicit and tacit knowledge and argues that tacit knowledge is essential to achieve SCA. Since
the knowledge complexity could only be selected through subjective interpretation of the end project report, the two KTP managers, with access to and specific knowledge of the KTP were instrumental to the selection success.

Figure 8: KTP Criteria Matrix

The initial assumption for KTP (1) was to have a very innovative approach with a potential for a very high complexity of knowledge. However, this KTP did not follow the standard KTP process. The literature review inferred from secondary data that since the associate is the individual who produces new specialised knowledge, the tacit knowledge leading to the SCA should be with the associate. Therefore, the assumption was made that a successful KTP project is one, where the associate remains within the company, especially, if the degree of complexity of knowledge is high. Hence, this KTP should have failed but it has not, and the reasons why it has not failed are of particular interest. The second KTP was assumed to have less knowledge complexity, identified as relatively low in the diagram and a relatively low innovative approach. The additional KTP (3) was assumed to have a high knowledge complexity and high innovative approach whereas the sKTP was classified as having achieved relatively low complexities of knowledge with a relatively low innovative approach.

The identified classic KTPs within this study achieved at least a CA and were judged as being successful by the KTP scheme owner. All three classic KTPs come from a different industry and only the sKTP overlaps industries with one of the classic KTPs.
3.2.4.3 - Pilot Study

Pilot studies are important as they try out the research instrument and can act as a small-scale version in preparation for the major study (Polit et al 2001; Baker 1994). George and Benett (2005) refers to ‘plausibility probes’ which help identify population boundaries. It also presents the advantage of giving advance warning about where this thesis could fail, where research protocols may be flawed, or whether proposed methods or instruments are too complicated, misunderstood or just inappropriate (Baker 1994).

I used a shorter version of the KTP (sKTP) as a pilot and incorporated the results in my PhD transfer report. Shorter KTPs are usually between 6-12 month in length and tackle more operational issues while still linked to generating a competitive advantage for the firm. Although, the pilot study did not identify any potential practical problems in my research procedure, it did give confidence that the KTP case study has indeed potential to fill the KBV-themes with data that could be analysed to satisfy my research question.

However, it also became apparent that the access to KTP end project reports are a potential risk, especially if the KTP is undertaken by another university but my own. This realisation helped me to pay attention on identifying KTP managers who have a robust KTP portfolio and are able and willing to help me in two ways. First of all, to identify suitable KTPs by accessing sensitive KTP end project report data. Second of all, by introducing me to the identified companies and allowing me to have access to the three key stakeholders. The data collection method and participant selection will be discussed in the following subchapters.
3.3 - Data Collection Method and Ethical Considerations

Yin (2009) states that case studies benefit from having multiple sources of evidence to increase robustness of a study and the importance and selection of triangulation has been discussed multiple times within the methodology chapter so far. The data collection method usually refers to the appropriate usage of data collection and analysis (Prasad 2005). The previous ‘research strategy’ subchapter also identified, that interviews of the KTP social actors will take place and defended an interpretative case study analysis as an explanatory research study as best suited to answer my research question.

In general, interviews are conversations between the interviewer and interviewee, in which the interviewer asks questions and the interviewee responds accordingly (Esterberg 2002). I use the interview technique which Robson (2002) defines as explanatory interviewing. There are two main persuasive reason for using this technique: Firstly, my concern is to find out what is happening and seek insight in order to understand how and why the KBV can explain the outcome which is linked to the SCA. Secondly, interview analysis gives more in-depth details compared to questionnaires or surveys. The aim is to make the interview conversational by minimising leading questions which would limit the pursuit of explanatory interviewing and hence, special attention needs to be placed to achieve more open-ended questions throughout the interviews. It is hoped that open-ended questions encourage participants to respond freely and openly to queries (Creswell and Poth 2017, Esterberg 2002). Hence, open-ended questions would allow for a more in-depth understanding of a phenomena (Snow and Thoma 1994).

Considering the number of questions identified in the ‘Pilot Interview Design’ section (18 questions in total), interviews are estimated to take between 1.5-2 hours, which should give some insight into the key KTP stakeholder views, and unveil how the KBV can explain the achievement of an SCA.
Any methodology design should consider an individual versus a group focus. A group focus approach may generate an insightful discussion by inviting all key KTP stakeholders into a focus group (Bryman and Bell 2015). However, the reason why an individual interview approach was selected, was due to the danger of finding the right time and place when all KTP knowledge actors could come together and the danger of peer pressure during the focus group. This peer pressure may be increased due to the organisational hierarchy between associate and company supervisor and academic supervisor as an external member. However, limited sampling is somewhat compensated as in-depth interviews, without peer pressure bias, will produce more valid results (Webb 1992). Hence, I conducted individual interviews rather than a group focus.

The next question that needs to be answered is the type of interview which best suit my research question and is in line with my earlier discussed research stance. I already mentioned the need for open-ended questions. A structured interview asks each respondent a series of close ended questions. Thus, all respondents experienced the same set of questions following the same order (Fontana and Frey 1994). This will provide very limited flexibility and Bryman and Bell (2015) argue that structured interviews are best suited for a quantitative approach as they aim to collect quantifiable data. Furthermore, I have discussed my philosophical assumption of multiple realities and the need to embrace different points of views. Hence, a rigid interview structure would hinder rich communication with knowledge actors and would limit my acknowledgement of their individual mind-set and experience. On the other hand, unstructured interviews are widely discussed and are divided into diverse types, such as, Oral History (Abrams 2016; Bryman 2015; Starr 1984), Creative Interviewing (Holstein and Gubrium 2004; Douglas 1985) and Framing (Montogomerie 2017; DeShazo 2002; Kahn and Cannell 1957). The unstructured interview will provide the interviewee with a greater breadth than other types (Fontana and Prokos 2016; Fontana and Frey 1994) and are informal and sometimes called non-directive (Bryman and Bell 2015). There is no predetermined list of ‘risky’ questions as my research aim is linked to the KBV which is predefined from my
literature review. Furthermore, the use of semi-structured interviews is also largely defined as a qualitative interview technique which would support my research stance. The semi-structured interview technique will enable flexibility in the depth and breadth of the questions asked, using subjective judgement on the situation in time. However, it is important to follow the KBV-themes identified in the literature review to have some consistency for the analyses of my findings. To encourage participants to elaborate or clarify certain points, probing and follow-up questions may be used when necessary, to encourage participants to elaborate on, or clarify a response (Denzin and Lincoln 2003). Overall, the chosen semi-structures interview technique is mutually supportive for my research aim and philosophy.

Considering the discussion above and my research question at hand, which is focused on making meaning, I would defend that my primary data is best suited to use a semi-structured interview technique.

3.3.1 - Participants Selection

Since qualitative research has generally a smaller sample size, it becomes very important for any researcher to identify who the ‘gatekeepers’ of the knowledge base relevant to the research study are. Patton (2002) refers to ‘key informants’, who are individuals particularly knowledgeable in assisting the analysis to unveil the research aim. The in-depth KTP discussion in the literature review identified three key stakeholders as key informants to ensure a rich data sample. A total of 11 participants over three classic and one shorter KTP were interviewed.

This study used purposeful sampling (Patton 2002, Eisenhardt 1989) rather than random sampling of KTP actors for personal interviews. Maxwell (2005) defines purposeful sampling as:
“a selection strategy in which particular settings, persons or activities are selected deliberately in order to provide information that can’t be gotten as well from other choices” (Maxwell 2005, p. 88)

One of the possibilities was to only interview the ‘associate’ as my literature review identified the associate as the key knowledge actor who has most likely created the new tacit knowledge needed to achieve an SCA for the firm. However, having multiple point of views within the same context of a particular organisation gives further insights and will be less of a risky research strategy if the literature review assumption is false.

Furthermore, there is also the risk of inaccuracy in performance reports, which are well known in measuring individual competences (Kruger and Dunning 1999). Hubert and Power (1985) identified three main sources of error: Deliberate misreporting, perceptual and cognitive distortion, and lack of information (Hubert and Power 1985) which could lead to method bias. The first two errors can be decreased, in probability, if more than one individual is questioned. Grant and Verona (2015) argue that the lack of information with respondents’ is a much more fundamental source of error since some managers could lack comprehension of their companies’ levels of capability. Denrall et al. (2004) provide evidence of such challenges where informants were doubted to have had the direct involvement that is necessary for reliable assessment.

Although there is always a risk that my research participants lack the right degree of involvement, this risk is less concerning to my study because of two main factors. First, my literature review identified the key stakeholders with direct involvement in the KTP. By KTP definition, the identified three key KTP stakeholders are the key knowledge actors responsible for achieving an actual competitive advantage. This again, strengthens the KTP as a research context and overcomes issues in current research streams. Second, even if one or two of my three identified knowledge actors lack the degree of involvement needed to make judgement, the use of my in-depth research approach is more likely to identify this and take it into consideration when
making meaning of the data. Multiple points of view also add to a fuller understanding, which I have already discussed earlier. I decided to interview all three KTP stakeholders which have pre-identified roles and responsibilities in every KTP project. Hence, a secondary advantage would be that I could compare perceptions within KTPs as well as between.

Another advantage, to include all three key KTP stakeholders, is to achieve a thick, rich understanding of the case (Esterberg, 2002; Merriam, 2002), as all three stakeholders are also involved in the knowledge production, coordination and decision-making process. Hence, I argue that the participant selection for this study is purposeful.

### 3.3.2 - Research Ethics

Any PhD at my university requires ethical clearance before research projects can commence and human participants can be approached (Solent 2018). Hence, the principle of consent and therefore, fully informed voluntary consent is of particular important.

Any ethical consideration for my research study is important, especially, as I need access to data from an external researcher’s point of view. Discussions about ethical research principles have been broken down by Diener and Crandall (1978) and informed more recent business research discussions such as Bryman and Bell (2015). The four principal areas by Diener and Crandall (1978) are:

- *Whether there is harm to participants*
- *Whether there is lack of informed consent*
- *Whether there is an invasion of privacy, and*
- *Whether deception is involved*
My research topic and data collection requirement as discussed in the previous subchapter is relatively straightforward. There was no risk to harm participants through any experiments or through other means, e.g. mentally, by creating some stressful interview scenarios. There was also no lack of informed consent as each knowledge actor was asked for interview permission, nor did any observation through the working day take place where such consent may have been important. Furthermore, none of the case studies will mention explicit names and will only be referred to as associate, academic leader or company supervisor. The company name is also completely private. The research aim and objectives were completely transparent and communicated through the KTP manager to all knowledge actors, prior to the interviews. I also filled in the standard university online application form to apply to the general ethics standing panel which was eligible for self-certification under the university regulations and my form response.

3.4 - Research Instrument: Interview Protocol

Consistent with the discussion so far, an appropriate interview protocol was used to guide the discussion. Audio recording was used during the interview to ensure a more accurate transcription (Merriam 2002). There have been two exceptions where audio recording was not possible (a telephone interview and one company supervisor who refused to be recorded). However, during each interview handwritten notes were taken which enabled me to track key points. Handwritten notes were also used during the interview to help identify and clarify key points.

In line with Patton (1988), to build rapport, my protocol included the introduction of myself, my research and the confirmation if participants had any questions. Participants received an introduction and the aim and objectives of the research study from the KTP manager before the actual study was undertaken.

Overall, the questions used in this study can be placed into two categories. The first category: ‘General Questions’ are asked to gain a general ‘feeling’ for the KTP project,
exempli gratia, how successful this KTP was in their opinion and how they would describe the outcome of the KTP. The following table shows the first five general KTP questions:

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Justification</th>
<th>Source Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>How successful would you rate this KTP project to achieve some sort of competitive advantage (CA)/ superior performance (SP)? (Very Low-Very High)</td>
<td>To find out the general view about the achievement of a CA/SP – If the tendency would be more of a negative nature the semi structured interview style would allow the interviewer to understand the reasons why this is the case.</td>
<td>N/A – General Interview Question</td>
</tr>
<tr>
<td>2)</td>
<td>Could you describe this CA/SP?</td>
<td>This question is important in order to place the CA/SP into a generic strategy or context e.g. strategic strengths or scope</td>
<td>N/A – General Interview Question</td>
</tr>
</tbody>
</table>
| 3)  | What is the absorptive capacity for knowledge of the Company Individual/Company structure (including technology etc.)/Associate/Academic? Why? | This question is important to judge if the analysis has to consider a more negative result because of a weak link.                                                                                              | Question links to:  
- Capacity of Aggregation (Section 2.4.4.2)  
- Specialisation in Knowledge Acquisition (Section 2.4.4.4) which incorporate the idea of individual absorptive capacity. |
| 4)  | What are the 3 key outputs of the KTP project?                           | This will identify any of the projects specialised products (Tangible or Intangible)                                                                                                                         | N/A – General Interview Question   |
| 5)  | What are the outcomes? identify 3-5 major outcomes which you feel was substantial/important for this project | This question will show the result of the change derived from using the output. The outcomes will form the major                                                                                               | N/A – General Interview Question   |
The second category: ‘Specific KBV Questions’ were designed to allow in-depth understanding of the outcome(s) and the knowledge stakeholders believed to be key to the achievement of SCA. Throughout the specific KBV questions, the identified output/outcomes were used as a baseline against any following KBV question. In particular, each identified outcome was used to guide through the identified KBV-themes.

This will enable me to compare different KBV-themes findings with a specific outcome and aid my understanding of how and why different themes link together and which knowledge elements (if any) were key to explain a phenomenon as well as understanding assumptions without losing the specific outcome it relates to. Furthermore, the outcome can be linked to importance of the SCA which will enable the researcher to analyse research findings through prioritisation of importance. The following table shows the following specific KBV questions:

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Justification</th>
<th>Source Literature (linked to sections in the literature review)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6)</td>
<td>Could you explain the complexity in terms of knowledge used for each outcome identified?</td>
<td>This question gives an insight if the outcomes are based on or have a more explicit or tacit knowledge nature?</td>
<td>Question provides insight into: - Transferability (Section 2.4.4.1)</td>
</tr>
<tr>
<td>7)</td>
<td>How would you rate the transferability to share the knowledge for each</td>
<td>This question highlights if and how the ‘Transferability’</td>
<td>Question links to previous question (6):</td>
</tr>
<tr>
<td>Question</td>
<td>Description</td>
<td>Insight into</td>
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<tr>
<td><strong>8)</strong> Where is the knowledge for the outcome stored or shared into? (individual; system; statistic; group of individuals; specialisation in knowledge acquisition)</td>
<td>This question is designed to understand the general KBV assumption three, by linking questions 6, 7 and 8 together. Furthermore, it will give some insight to two more knowledge specific themes.</td>
<td>- Transferability (Section 2.4.4.1)</td>
<td></td>
</tr>
<tr>
<td><strong>9)</strong> How was the specialised knowledge for each outcome integrated?</td>
<td>This question allowed in-depth understanding on how the mode of coordination was deployed? Particular focus was given to the following KBV modes identified in the literature review: (1) rules and directives, (2) sequencing, (3) routines, (4) group problem solving and decision-making</td>
<td>- KBV Assumptions (Section 2.4.1) - Capacity of aggregation (Section 2.4.4.2) - Specialization in Knowledge Acquisition (Section 2.4.4.4)</td>
<td></td>
</tr>
<tr>
<td><strong>10)</strong> How important would you rate each outcome against the overall achievement of CP/SP?</td>
<td>This question is designed to allow an insight into the second general KBV assumption by linking this question to the analysis of question 6 and 7.</td>
<td>- KBV Assumptions (Section 2.4.1.1)</td>
<td></td>
</tr>
<tr>
<td><strong>11)</strong> How strategically important is the particular outcome?</td>
<td>KBV assumption one is already covered by using a KTP whereby acquiring new knowledge is the goal of the programme. However, tacit knowledge should link to SCA and therefore should also be strategically more important</td>
<td>- KBV Assumptions (Section 2.4.1.1)</td>
<td></td>
</tr>
<tr>
<td><strong>12)</strong> How many people worked on the particular outcome for the knowledge to be</td>
<td>This question is designed to analyse the scope of knowledge integrated to achieve competitive</td>
<td>- KBV Assumptions (Section 2.4.1.1)</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Description</td>
<td>Insights into</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>13) How important would you rate the aspect of common knowledge within the knowledge integration process?</td>
<td>This question is designed to give insight into the KBV theme within the discussion of coordination of the firm. Particular focus was given to the following KBV types of common knowledge identified in the literature review: (1) Language, (2) other forms of symbolic communication, (3) commonality of specialised knowledge, (4) shared meaning, (5) recognition of individual knowledge domains</td>
<td>Question provides insight into: - The role of common knowledge (Section 2.4.4.7)</td>
<td></td>
</tr>
<tr>
<td>14) How would you describe the hierarchy of decision-making for each outcome? + Did the KTP project change the usual hierarchy of decision-making? [explanation for each outcome]</td>
<td>This question will analyse the assumptions made by the KBV within the coordination process while focusing on organisational structure and design. This question is linked to question 6 and 7 to give further insights into the theme.</td>
<td>Question provides insight into: - Organisational structure and design (Section 2.4.4.9) - Role of Hierarchy in Decision-making (Section 2.4.4.10)</td>
<td></td>
</tr>
<tr>
<td>15) Where would you describe the location for decision-making power? (Central structure; KTP structure, academic; Associate or company)</td>
<td>This question will analyse the organisational structure and design while understanding how and why the decision location is used for certain outputs.</td>
<td>Question provides insight into: - Location of decision-making (Section 2.4.4.11)</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Details</td>
<td>Justification</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>16) <strong>How effective would you rate the location of decision-making?</strong></td>
<td>This is a supporting question for question 15 to enable more understanding in terms of effectiveness and decision making linked to knowledge complexities.</td>
<td>Question provides insight into: - Location of decision-making (Section 2.4.4.11)</td>
<td></td>
</tr>
<tr>
<td>17) <strong>What is the measurable improvement from using the outcome that is perceived as an advantage?</strong></td>
<td>This question will give in-depth understanding on how the firm overcomes inappropriability of knowledge when it comes to the market value of knowledge. Furthermore, the question should provide some insight into the benefits for each outcome.</td>
<td>Question provides insight into: - Appropriability (Section 2.4.4.3)</td>
<td></td>
</tr>
<tr>
<td>18) <strong>In your opinion, which outcome has the biggest benefit? [Explanation for each outcome]</strong></td>
<td>This question will identify the single most important outcome and should therefore, shed light into the assumption that tacit knowledge is essential to achieve SCA.</td>
<td>Question provides insight into: - KBV Assumptions (Section 2.4.1.1)</td>
<td></td>
</tr>
</tbody>
</table>

*Table 4. Specific Interview Question Justification*
3.5 - Analysis Method

The data collection section highlighted that semi structured interviews are a preferred method to be used for the identified case studies. Tesch (2002) argues that researchers should vary about prescriptions and standardised processes. One hallmark of qualitative research is the researcher’s creative involvement which is also in line with my philosophical stance.

“It is possible to analyse any phenomenon in more than one way” (Spradley 1997, p.9)

The chosen procedure is neither scientific nor mechanic, as Mills (1959) argues, that qualitative analysis is ‘intellectual craftsmanship’. It is a creative study (Denzin and Lincoln 2003) capitalising on making sense (Stake 2000).

My literature review created a knowledge-based value chain construct including a more specific KBV value chain as seen in figure 9 below and already discussed in the literature review:

Figure 9: Knowledge-based value chain construct and KBV value chain

To be in-line with my research stance, there is a special emphasis in the design of the construct to not be too specific. Although, the KBV value chain is argued to be generic, the knowledge-based value chain construct is bound by the pre-requisite to achieve a fixed context and for that context to inform the outcome which is linked to an SCA.
of the firm. However, once the pre-requisite assumptions on the construct are in place, the KBV value chain emphasises on the knowledge elements based on the KBV-themes and the broad primary knowledge processes, which will increase flexibility from an interpretivist point of view to unveil how and why the KBV can explain an SCA.

Any analysis method needs to be fit for purpose for the research study at hand. Hence, there is a debate on how to access ‘quality’ in qualitative research. This debate also includes issues around concepts of validity and reliability and how they are applicable to qualitative research (Friese 2010, Gobo 2008). However, my research philosophy subchapter already highlighted the danger of data validity when using techniques which may be contradictory to my interpretive research philosophy therefore, the following discussions will have my research stance in mind. One decision, that needs to be made when analysing data, is to use either paper and pencil or a computer-assisted qualitative data analysis software (CAQDAS). There is some concern in the literature (Bringer et al. 2004) that CAQDAS mediate between researcher and the qualitative data. The implicit assumption is that pen and pencil is somewhat more ‘Natural’ (Rodik and Primorac 2015). However, software can make searches on words and structures more quickly compared to traditional methods who are argued to be more time consuming. Nowadays, software is an unavoidable part of interaction with data (Rodik and Primorac 2015) the sheer fact that this thesis is created using a word processor would strengthen this assumption.

My research analysis will use CAQDAS and in particular the Nvivo software which is argued to be particularly useful to systematise and order data to gain more thorough and reliable analysis (Ghauri and Filth 2009). The software capacity of sorting, matching and linking the data set to the KBV-themes was used to answer the research questions without losing the contexts from which the data had come. There is a common perception that software can assist to ensure rigour in the analysis process, by allowing the researcher to find every recorded use of a term or every coded
instance of a concept, which in turn ensures a more complete set of data for interpretation than might occur when working manually (Bazeley and Jackson 2013).

Esterberg (2002) suggests that open coding is a process where “you work intensively with your data, line by line, identifying themes and categories that seem of interest” (p. 158). However, Creswell (2009) describes a thematic analysis procedure to provide structure to the analysis and enhance reliability and validity. I used a mixed approach, in which lines of responses were coded into the identified KBV-themes. However, open coding was also used to include realities outside the KBV-themes. Furthermore, I used a mixed approach to examine my data which also includes some of the traditional approaches (Creswell 2009) for open coding. At this point, I would like to clarify that this thesis defends an interpretivist view, although the word ‘coding’ is mostly used in quantitative research terminology. I still defend that I accept my place within the research; understand the world through my interaction with others; and acknowledge my dynamic relationship with data (Greenbank 2003). Hence, I would like to stress the concept of interpretation and subjectivity and do not pretend to be objective. I merely use the coding to structure different answers, exempli gratia, into my KBV themes to be able to have a better interpretive perspective.

My first step was to transcribe the interviews to allow the data to be organized and structured to have a clear and easy to use format (Seale et al. 2007). Stake (2000) argues there is no right moment when data analysis begins or ends. With this in mind, I already made notes on the word document in forms of comments before I even started coding as such.

My second step was to read through the data again to be familiar and get to know my data, which is also in line with the suggestions made by Esterberg (2002).

My third step, having used Creswekk’s (2009) thematic procedure, was to go through the transcript line by line and use Nvivo to link the selected data to the KBV-themes. I highlighted and labelled actual language used to match against the language used in
the literature. I placed particular importance to highlight which testimony was used by which knowledge actor as this was important for my interpretivist view of this data.

My fourth step, was to highlight seemingly important data and my thoughts within them which were not relatable to any of the identified KBV-themes. I then familiarised myself with the specific meaning of the data to hand and made sense of the information and build overall principles that those would fall under.

My fifth step, was to interpret the meaning of the data, considering the context of the KTP, as well as the participant’s position within the KTP. Each KTP would therefore, present analysis on each KBV theme from different viewpoints. I would then analyse overlaps within themes and between case studies, before I would draw conclusions of a theme considering all case studies together.

3.6 – Researcher’s Positionality

Compared to quantitative methods, qualitative methods play importance to the researcher’s role and background in the process. At the beginning of this methodology chapter, I highlighted the importance of my own biases, which are expected (Merriam 1998), when it comes to conducting my research. I started to link my own biases in the axiology assumption and this subchapter will give further insight into myself as the primary instrument for data collection and interpretation.

For audiences to appreciate the conclusion made, any researcher should be open about potential biases by stating them (Denzin and Lincoln 2003). As previously discussed, my chosen data collection methods are interviews and although, I defended this choice through the literature discussion and research aim in previous subchapters, I have always valued personal interaction and rich communication over anonymous or less personal forms of communication. Hence, I will generally be more
likely to lean towards interviews as a favourable data collection tool. However, I have carefully structured and defended my research choices around my research stance.

My personal experience, which may positively or negatively impact this study, is that I used to work as a KTP manager for two different higher education institutions. This has allowed me to understand the unique nature in which a KTP operates and gave me access and networks to other KTP managers. However, I did not use any of the KTPs which I personally managed in my research sample.

Since acting as a KTP manager, I moved to a role as a senior lecturer for the past seven years. After lecturing in several business subjects, I specialised in project management. Currently, I am the lead trainer for professional accreditations such as PRINCE2 and AgilePM within the university. I have personally designed and introduced the MSc in Project Management and also act as the course leader for it. My own research interest has moved from operational project management methodologies to a more strategic view of project management and its role within the achievement of an SCA for the firm. I have presented on a KBV on project management as an act of strategy in one of the leading project management conferences (supported by PMI) in the world. Furthermore, I gave a key note speak at a conference from the chartered body for the project management profession in the UK (APMG) about a KBV on project management. I also consulted multiple companies on a KBV of project management. I have also worked with the international project management consortium in designing a short course (foundation accreditation) for a KBV of project management called AgileFramePM. This course has also received CPD credits from the association for project management.
Chapter 4: Data Findings and Analysis

4.1 - Introduction

The previous chapter outlined and justified the research methodology. The research methodology design is built around the literature findings of eleven KBV-themes and assumptions, as well as four general and one subsequent KBV assumptions. The aim of the analysis is to satisfy my research objective four:

To understand, how and why, the identified knowledge elements (if at all) explain SCA and how they can be used to recommend a holistic KBV strategy

The key KTP Stakeholders interviewed in this study are:

- Academic Leader (AL)
- Associate (AC)
- Company Supervisor (CS)

NVivo10 was used to assist with the analysis process by using the software tools to structure the KTP qualitative data. NVivo10 was mainly used to increase the efficiency of learning from the dataset and to manage such data. It allowed for an increased focus on the meaning of the recorded data set. The software capacity of sorting, matching and linking the data set to the KBV-themes was used to answer the research question without losing the contexts from which the data had come.

There is a common perception that software can assist to ensure rigour in the analysis process by allowing the researcher to find every recorded use of a term or every coded instance of a concept which in turn ensures a more complete set of data for interpretation than might occur when working manually (Bazeley and Jackson 2013). The following table is an overview of some of the NVIVO Nodes used in this study.
4.1.1 - Assumptions

The following Table 3 is an indication of how well the KBV-Assumptions could be supported by my selected case studies.

<table>
<thead>
<tr>
<th>#</th>
<th>Main Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knowledge is considered to be the most strategically important resource of the firm</td>
</tr>
<tr>
<td>2</td>
<td>Differentiation between explicit and tacit knowledge, with tacit knowledge being essential to achieve sustainable competitive advantage</td>
</tr>
<tr>
<td>3</td>
<td>Tacit knowledge is acquired and stored in a ‘highly specialised form’ within individuals</td>
</tr>
<tr>
<td>4</td>
<td>Production needs a wide range of knowledge</td>
</tr>
<tr>
<td>#</td>
<td>Subsequent Assumption</td>
</tr>
<tr>
<td>1</td>
<td>Economies of scale for knowledge: All knowledge has higher creation costs than subsequent replication.</td>
</tr>
</tbody>
</table>

Table 5: KBV Assumptions
4.1.2 - Case Study Overview

The following sections will introduce each KTP case study to inform the context in which it was operating. The name of the company is coded with a specific case name to strengthen transferability and comparability within different sections of the analysis. All three case studies discussed in this section are between 2-3 years in duration and aim to fill a knowledge gap of the firm. The identified knowledge gap is of strategic importance to the company and seen as instrumental to increase competitive positioning by the company, the university, and the funding provider. Furthermore, there may be some reference within the analysis to an additional case study. The shorter-KTP, which was six months in duration, undertook a more operational perspective which did not lead to an SCA as such but was used to survive and compete and may be classified as a strategic catch-up. The shorter-KTP was used as a pilot study to see if the individual KBV-themes and the chosen methodology would bring ‘usable’ qualitative data. The shorter-KTP pilot case study is attached in Appendix C for completion purposes.

4.1.2.1 - Case Study - Crystal

This two-year KTP was set up between a University in the South of the UK, as the knowledge-base, and an SME called Crystal as the company. Crystal is a spinout company from the University with intellectual property (IP) that was generated from the University. Crystal was set up in 2009, and the KTP was running from 2012-2014.

The project was set up to transfer manufacturing knowledge from the university into the company with the view towards getting Crystal into the laser projection market. The university patent covered the ability to use a crystal that is used for a cheap invisible laser and convert it into a green laser. Green lasers are rare and cannot be readily brought and are much more expensive. Crystal manufactures a crystal for converting the colour of lasers. The main challenge for the KTP was to convert a lab-based technique into a mainstream process for commercial purposes (Crystal Academic Leader).
This KTP is unusual as the academic leader (AL) was also undertaking the role of a company supervisor (CS). This is partly due to the fact that the company is a spin-off of the university and the leading academic was responsible for the lab success in the first place. The KTP was also classified as very knowledge-intensive and the associate, only staying for 1.5 years and then headhunted into another firm, was already a post doc at the time.

Based on the literature review, this case study should have struggled as the main tacit knowledge generator left the company. However, this KTP is an exception in the sense that the AL at this point also acted as the associate for the KTP to finish the delivery since the original, lab-based success was already led by the AL.

This case study company can convert a cheaper crystal, producing an invisible laser, into a green laser which is considerably harder to achieve. There are only a handful of companies in the world that can produce a similar crystal and out of those only two delivering to the scientific market. There is Crystal in the UK and a company in Taiwan. Crystal operates in a niche market and supplies to 100s of research institutes, universities and companies worldwide. Out of the 5 companies in the world who could convert the crystal, two of them serve the scientific market (including Crystal) the others mainly use it internally or for small batches for development contracts.

“We just wanted to know how to make the crystals. The technology was a bit of a black art to start with... the process wasn’t really refined. It was a lab based process. Whereas now, it’s a standardized, turn the handle and generate crystals kind of process” (Crystal AL 2016)

From the outset, it seems that the KTP gave Crystal the time and focus to turn a very tacit, lab-based approach of manufacturing into a more standardised explicit manufacturing process that gave Crystal the quality and quantity needed to make it commercial (Crystal CS Transcript 2016). However, the knowledge transfer process will be discussed in more detail below.
4.1.2.2 - Case Study - Simulation

This two-year case study developed a dental implant simulation to overcome particular shortcomings in dental implants, specifically, the metal component that fits into a jawbone on which a standard crown is mounted. However, the screw is not an accurate representation of anatomy that is replaced, which has several problems including the danger of infection.

The statistical development, understanding sizing, suitable shapes, and the biomechanical influences, were all part of this KTP. The simulation was developed specifically for the company to come up with a new innovative solution in dental implants. Rather than single patient analysis, this company build models from the whole population of patient scan or patient anatomy to build a series of bell curves to analyse designs across populations. This will help the surgery not to have so many gaps to fill, and the surgeon could potentially start right away, but the technical details are still confidential.

A very complex workflow was created, from scratch, to create a simulation that also uses fairly abstract mathematical techniques to give physical meaning. This also shows an anatomy variation of size in ways not previously represented (analysis of shape anatomy). The end goal was to have a minimal number of different shapes which can be used of the shelf. The common practice is to tailor every single implant, mostly, from scratch. A limited size range will reduce the inventory of standard implant systems and make the whole process much more efficient.

Before the KTP, the company concentrated only on hips and knee implants where most of the expertise was channelled. This KTP has allowed the company to develop expertise for application into a new and lucrative market segment which is the dental implantology. The tool/simulation is ground-breaking in the field and can also be used to come up with other innovations:
“And to analyse those implants, so that’s where you using the statistical understanding of the bone of the implant, it will be implanted into. I think it’s hard to say for sure, but I’m not aware of any other companies that doing that level of research, and it’s tremendously important as well because, if you are analysing new design you want to demonstrate its safety prior to clinical use or trial” (Simulation Academic Leader Transcript)

4.1.2.3 - Case Study- E-PLATFORM

E-PLATFORM is a private training organisation who delivers courses such as PRINCE2 or ITEL. The aim of the KTP was to establish a new eLearning capability, which was not previously existent. This particular KTP already started in 2003, and hence some of the technology discussions are not cutting edge anymore but were certainly innovative at the time.

The KTP proved to be of critical importance for the company and the associate stayed within the company to become the Head of eLearning and is now one of the directors. In this case study, at the time, the CEO was newly appointed and took over from his father who was still partly involved in the company and suspicious about the eLearning idea.

Implementing an eLearning system was the new CEO’s idea who took on the role of Academic Supervisor. Compared to the previous two KTPs where the Academic Leader (AL) engaged in knowledge transfer throughout the project, this KTP seems to be slightly different in terms of the AL being more hands off. The AL wrote the first version of the software for the associate to have a platform to start from. It took the KTP 6 months between KTP approval and start to find an associate with the right skillset. The associate used the platform from the AL as a base but changed the original software considerably. Furthermore, the scope of the eLearning solution shifted and included online payment gateways etc. but such add-ons were bought
into the platform rather than coded from scratch. One of the reasons why this three-year KTP was a success is described as having commitment, other ideas in the past started as a good idea and then got lost in the day to day work.

“We are very good with having ideas but to see them through is another thing” (E-PLATFORM Company Supervisor Transcript)

Before the KTP the company had neither an online learning platform nor online payment etc. The establishment of an eLearning platform gave the company a competitive advantage at the time.

“I think it put us ahead of the market by a few years from our closest competitor, who was ahead before we start the project. In terms of revenue itself, I think it near enough doubled …” (E-PLATFORM Associate Transcript)

The KTP proved to be of critical importance to the company and gave them the means to survive during the financial crises. The online sales quickly became their main source of income with traditional training declining rapidly at that time. E-PLATFORM is a relatively small company compared to some of the leading training organisations.

“I feel if we hadn’t had the KTP we would have followed the crowd. Whereas the difference now is, that we are pioneering a lot of different technologies, just in online learning, never mind within our own industry. I think in the wider learning industry we are very much sort of front end” (E-PLATFORM Company Supervisor Transcript)

Between, 2003-2006, the company accredited the world’s first online-only Practitioner qualification for PRINCE2.

“It had never been done before and a lot of the accrediting bodies felt that practitioner levels could not be delivered online” (E-PLATFORM Company Supervisor Transcript)
The number of eLearning candidates, have since the KTP, amounted to over 400,000 people and was described as significant.

“And also from a numbers point of view there are so many more people coming through online learning rather than classroom. Probably around 80/20, so much of the work is through the online learning which is a legacy of the KTP” (E-PLATFORM Company Supervisor Transcript)
4.2 - KBV value chain – analysis of supporting knowledge themes

The previous section gave an introduction to the KTP case studies. This section will give an in-depth discussion based on the case studies and the previously identified KBV-themes. Table 6 below, is a quick overview indicating, how strong the KBV-theme discussions and subsequent assumptions within the literature review, are in line with my case study findings.

<table>
<thead>
<tr>
<th>Transferability</th>
<th>Coordination within the firm</th>
<th>Organisational Structure/Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity of Aggregation</td>
<td>Integration of specialised knowledge</td>
<td>Role of hierarchy in decision-making</td>
</tr>
<tr>
<td>Appropriability</td>
<td>The role of common knowledge</td>
<td>Location of Decision-making</td>
</tr>
<tr>
<td>Specialisation in knowledge acquisition</td>
<td>Organisational Capability</td>
<td></td>
</tr>
</tbody>
</table>

**Table 6: Theme Overview**

To understand, how and why, the identified knowledge elements explain SCA, the earlier discussed knowledge elements value chain will be used.

**Figure 11: KBV value chain model (Serkan Ceylan)**
The following subsections will analyse the supporting KBV themes. Each KBV-theme will be analysed separately and will have its own subsection. To do so, the specific KBV-theme will be analysed by providing the findings of each case study separately and therefore, will not be compared with one and another. After all case studies are analysed within the specific theme, a conclusion of the theme will follow. This theme conclusion will sum up the theme specific assumption by taking the previous case studies discussion into account.

The previously created KBV value chain (Figure 11 above) links the analysed themes and assumptions towards the three primary processes. Hence, an overall conclusion of the findings and analysis will revisit the general KBV assumption before a holistic view with focus on each primary knowledge process will be given in order to complete the KBV value chain analysis and to satisfy my research objective four.

**4.2.1 - Transferability**

The ‘Transferability’ Theme is one of four ‘knowledge specific’ themes identified in the Literature review. The identified KBV assumption in the Literature Review is that:

- Explicit knowledge has high transferability whereas tacit knowledge shows low transferability

It will be of particular interest to investigate if this assumption is indeed true and how it is linked to the complexity of knowledge. Furthermore, the transferability discussion will help in building the foundations to analyse how transferability issues affected the company’s knowledge elements of coordination and decision-making.
4.2.1.1 - Crystal Case Study

The main determinant for success in this particular case study is the transformation of a highly lab-based, tacit knowledge-driven process, into a process that is more explicit for technicians to follow to convert crystals. Hence, the challenge for this KTP case study was, to deal with challenges of knowledge transferability and who to involve in the knowledge integration activities. At the beginning of the investigation, the feeling was that this KTP had achieved to transfer the ALs tacit knowledge to the overall company and therefore, achieving externalisation of knowledge (Explicit to tacit). If this was true, the question in my mind was how the company could have sustained their competitive advantage as the literature review discussion pointed to the tacit elements of knowledge as the source for SCA. The following quote illustrates my externalisation of knowledge assumption at this point:

“... to know when to turn the handle or when to use which temperature and bake rates to use. All of that is now written down (explicit knowledge) so the company can do it, so if I get hit by a bus it’s all documented.” (Crystal Academic Leader Transcript)

The quote above suggests, that within a fairly long timescale (three years) the KTP succeeded in taking highly individualised tacit knowledge and turn it into an explicit knowledge base in the form of a ‘recipe’. This is in line with the literature review discussion that would suggest that tacit knowledge could be transferred but it would be very time-consuming and costly when compared to explicit knowledge transfer.

However, further analysis of the case study suggests that full documentation of the tacit knowledge has not taken place. In fact, the case study is very clear about explicit knowledge stored within the company as a ‘recipe’ for technicians to follow, compared to the tacit knowledge stored within a selected number of individual engineers.
Yet, to assume that the KTP achieved transfer of the tacit knowledge from the AL into a fully explicit recipe would be wrong. Further analysis revealed that changing parts of the process to adapt to eventualities within the manufacturing process of crystals are not as clear-cut as the following extract suggests:

“If you want to change the process you need the background expertise but to follow the receipt a technician can do it.” (Crystal Academic Leader Transcript)

It is interesting that Crystal did not attempt to get the technician to gain the tacit knowledge. This could be explained by the lack of commonality of specialist knowledge which was discussed in the literature review under the coordination aspect within the firm and the role of common knowledge. Also, the absorptive capacity of technicians may have been believed to be insufficient as the AL often described part of the process as “very complex”. Over three years the KTP succeeded in translating some highly complex lab-based results into a process that was made explicit and could be used for manufacturing. Hence, I was also interested in how much externalisation of knowledge actually took place. The challenge of the cognitive knowledge dimension when it comes to problem solving could not be made accessible, within the knowledge integration aspect, to the rest of the company. The following quote highlights the challenge with the tacit knowledge expertise:

“The other aspect is of course the knowledge aspect of how you do these things, and that’s where the people come into place and the experience. We have a process where technicians can follow the recipe and make the crystals but if one of the systems breaks or if there is a problem with the raw material than it still requires a background level of expertise to fix it” (Crystal Academic Leader Transcript)

This quote above is in line with one of the arguments made by Polanyi (1966) in the literature review which describes tacit knowledge as ‘knowing more than we can tell’. The transformation of the crystal has been made explicit to some extent. However, this is only true if there are no complications. This also links to the later discussed
theme of ‘Capacity of Aggregation’ where the explicit knowledge seems to be successfully aggregated into organisational level in the form of a receipt but the highly tacit knowledge stayed and was only partially shared within three individuals (see quote below).

The very nature of a crystal means, that sometimes the answer in the recipe does not work and the technicians cannot follow the recipe. If the reason was based on very complex problems, the AL himself would have the knowledge to overcome the problem. Furthermore, one or two other engineers, although not the same level as the AL, who would have enough tacit knowledge to solve some of the problems the technicians could not, as suggested in the following quote:

“Recipe is stored within the company and problem solving skills is individual based. There are only one or two other people in the company with that or part of the skills set.” (Crystal Academic Leader Transcript)

Hence, the firm would need to identify tacit knowledge domains to overcome potential challenges that could not be identified from the outset as there are too many different variables to consider. Writing them all down may take a lifetime but solving any one of those problems may only take a few minutes or hours. Henceforth, this is interesting in two aspects.

Firstly, in light of problem solving (which is individual based) the tacit knowledge holder seems to be far more efficient to solve the problem even or especially if the problem is one which did not occur before.

Secondly, Crystal didn’t make any effort to increase the scope of tacit knowledge holders as it was not seen as an effective strategy due to the transferability issues of tacit knowledge, which I will be discussing further in the knowledge integration discussion.
During the case study interview it was evident that outcomes perceived as explicit knowledge were described as being transferable without major challenges whereas outcomes which were described as having a somewhat tacit nature seem to be more difficult and complex to transfer. Hence, this case study supports the ‘Transferability’ assumption of the KBV Theme.

4.2.1.2 - Simulation Case Study

The associate is using the word ‘embedment’ to describe which elements of the KTP were transferred:

“I like to use the word embedment a lot in these sorts of projects, and then what I say is that at top level we have been able to embed concepts and the theory and the methods but in an actual practical capacity running these tools it’s fairly Associate dependent” (Simulation Associate Transcript)

Considering the overall context, it appears that the overall understanding of the concepts, methods and the theory behind was transferred, so the top level can make strategic decisions. However, the knowledge of how to actually run or develop the tools itself seems to be within the Associate in relatively tacit form:

“… just to reiterate on how I understand the how to use it side of things it’s a very, very complicated tool, hence two years to develop” (Simulation Associate Transcript)

A high degree of tacit knowledge for the creation of this tool can be assumed as it is described as very complicated. The Company Supervisor (CS) also reiterates how important the Associate was for the KTP outcome:

“The Associate is very important. In our previous KTP we didn’t have the best possible Associate which effected the success of the KTP in a negative way” (Simulation Company Supervisor Transcript)
The AL identifies that the high dependency of the knowledge holder (Associate) is also a risk to lose the knowledge base. The majority of the specialised knowledge is embedded within the Associate himself and the AL also acknowledges that the transfer process would be hard:

“We communicate as much as we can to the team but we are such a small team and it is so high tech that it is hard to, if the Associate was positively head hunted by KPMG or negatively killed by a bus, it would be very hard to drop somebody else into his position and have them pick up...and this is a challenge, perhaps a weakness and a risk... to round that off, I suppose is by reporting as much as we can of it in the design history file so that you can see the heritage of the decisions that we made in that development process…” (Simulation Academic Leader Transcript)

Decisions and to some extent the process, which is more of an explicit nature is documented in the design history file to have some sort of backup. However, the design history file is not an externalisation of complex knowledge but merely represents a report to see the heritage of the decision. Design history files are also mandatory for clinical trials etc. Considering my complexity of knowledge scale (Figure 2), I believe that the idiosyncratic knowledge achieved by the AC is between relatively tacit to highly personal. Moreover, the AL also described that the design elements of the shape anatomy are less complicated than other aspects of the tool and hence, the project tried to capture it in an explicit way and also used it for journal papers:

“How to exploit that statistical model. Knowing what’s important, and that’s knowledge that we have being generating as we gone along. We tried to capture it at an explicit way so we can write it up and take it to conferences and put it in journal papers but there are aspects of it which are still quite tacit” (Simulation Academic Leader Transcript)
Less complicated aspects of the tool with a higher transferability have been used by the company to transfer not only within the company but even through the means of journal papers. Hence, more explicit knowledge-based elements have been shared openly which also indicates that the company did not value them as important to sustain the competitive advantage. The company also managed to transfer the explicit knowledge of an overall understanding of the concepts, theory and methods so the top level could make strategic decisions based on the outcomes the Associate generated.

“The development side of the tool is much more Associate driven and maybe the AL. I will leave them to sort out the bits and bobs. I’m also quite involved to an extend to be able to see opportunities once the results are out. Understanding results needs some insight into the subject area, I would say” (Simulation Company Supervisor Transcript)

The CS within the KTP is also the director of the company who therefore, represents the higher-level management team. Being part of the KTP team has allowed the CS to understand results and build some complex knowledge capacity for himself. This seems to be through common knowledge generated over the years within the KTP. However, the knowledge of how to actually run or develop and configure the tools have not been transferred and are embedded within the Associate in relatively tacit form:

“I would say from the company side and knowledge embedment side, there knowledge is how to use the results of it how to actually farm the data out of it for their own benefits. It’s less so how to pull the levers and run through the entire workflow from scratch it’s much more a conceptual use of these things, how we have got a tool now that can show an anatomy variation in size, in ways not previously represented and how that can feed into a design. The development side of this tool is much more isolated, that’s kind of me, and then the developed design
and exploitation of this tool is much more understood by the company now”
(Simulation Associate Transcript)

The quote above, also suggests, that the AL is happy to integrate the knowledge for wider use in the company. There does not seem to be the issue of ‘knowledge protection’ to keep the knowledge for self-centred reasons. However, the actual knowledge around modification and extension of the simulation tool is not transferred, and at this point, it is not really clear how the company deals with the knowledge gap of other company actors. In short, challenges remain for the rest of the company to understand the tacit knowledge requirement of the simulation for other users to modify it on their own, for their particular use. However, none of the key KTP stakeholders suggest that the lack of knowledge Socialisation (tacit to tacit), when it comes to replication the Associate tacit knowledge, was because of cooperation issues.

“So overall these techniques and methods that have been originally been imported through the KTP and the seed have been implanted its now coming onto the company from different angles so it’s becoming more as part of their repertoire but in terms of operational use of them it’s still quite isolated” (Simulation Associate Transcript)

The Associate is very much involved in any aspect to do with the simulation tool in the company. This also becomes very apparent in the patent process in which the first application was redirected and hence, the Associate was used to gather more knowledge around patent applications. Although some of the patent knowledge is highly tacit, that knowledge stayed with the attorney and the Associate tried to gain more explicit knowledge around options. Hence, the knowledge transfer or exchange between Associate and Attorney was kept minimal, and efficiency of knowledge integration was fostered by using ‘Coordination within the firm’ theme which will be discussed in the relevant theme.
“We made the (transferability) easier by having a clear communication link between the company and the attorney, so we set the Associate to work with the attorneys for a few days, to sit with one of their patent writers. Great experience for the Associate as he could see how it was written and that was something that we brought back so I think we can do that more efficiently next time” (Simulation Academic Leader Transcript)

The explicit knowledge the Associate received through transfer was:

“more of a knowledge what the patenting process is and what an attorney is looking for and what a patent reviewer is looking for” (Simulation Academic Leader Transcript)

The Associate made sure that the attorney could tease out the novel and patentable aspects, however, the academic leader also claims that the:

“tacit knowledge there is potentially really in the patent attorney” (Simulation Academic Leader Transcript)

For the Associate to gain specialised tacit knowledge around the ins and outs of patents would have not been necessary nor effective.

The transferability issue is also strongly linked to “The role of common knowledge” and “Location of decision-making” themes which will be discussed further in the specific themes:

“There are inherent issues most just with handing over these tools to be used by, but even explaining what they actually doing. It uses fairly abstract mathematical techniques to give physical meaning to stuff; so people look at the result and say what does this mean and that’s kind of the first big question, even just communicating the significance of various results. Let alone the really complex
work flow there is to get to that results. I would describe that as very tacit”
(Simulation Associate Transcript)

This quote above shows a particular challenge of very complex ‘highly personal’ tacit knowledge. The question arises of how much transfer of knowledge is needed, considering that this type of transfer is very time-consuming and that time spent means a cost factor for the company that needs to be accounted for. The team strategy here is to not tap into the ‘really complex work-flow’. Knowledge Transfer is limited to other team members and only concerned what kind of data to put where within the sequence. Other team members may not necessarily understand why it is entered the way it is entered.

Even this attempt is very time consuming and the question remains if a company could afford this if the project was not part funded by the government:

“Making about some of the tacit knowledge explicit took more than a year ... So that’s again stripping it down to the minimum what do you need just to run it, not understand it, not understand how and why it works but just so you get results”
(Simulation Associate Transcript)

Again, in this case study as well as in the Crystal case study, the tacit knowledge holder seems to be far more efficient to solve the problem even or especially if the problem is one which did not occur before. The scope of tacit knowledge holders has been kept to a minimum as it was not seen as an effective strategy due to the transferability issues of tacit knowledge. However, it is interesting that the KTP has used some externalisation of knowledge and invested the time, ‘more than a year’, to achieve this. However, this externalisation activity was just enough for other divisions to get results rather than a full understanding of the simulation.
4.2.1.3 - E-PLATFORM

Compared to the previous two KTP’s, overall, this KTP seems to have achieved a lower degree of knowledge complexity. The Associate calls tacit knowledge as

“Slightly more evolved…. So there was evolution of some of that tacit knowledge if you like” (E-PLATFORM Associate Transcript)

Whereas explicit knowledge was easier accessible in the Associates mind. The Academic Supervisor differentiated between two areas:

“The programming was the explicit knowledge, but the tacit knowledge was to do with the pedagogic stuff, understanding people’s motivation” (E-PLATFORM Academic Supervisor Transcript)

Interestingly, none of the KTP team members had any particular deep knowledge to start with, so the KTP was primarily done by trial and error.

Another interesting comparison the Associate makes is to describe tacit knowledge as not fixed, ergo, dynamic and explicit knowledge as more static. None of the other KTP stakeholders differentiated between a more fixed nature versus a more dynamic nature when knowledge was discussed. However, if the market is changing and the individual knowledge holder and the business wants to sustain the advantage gained through tacit knowledge then the individual has to evolve his or her tacit knowledge base which ultimately links to the ‘Capacity of aggregation’ theme.

“it just doesn’t come automatically, you can’t study a market and then say you know everything about it. You have got to live it. You have to go through the business cycles, that’s what it is, I think. It sets the ground but its evolutionary, tacit knowledge is not fixed, it’s the sum total of your abstraction, the connections you have made your experiences and that just doesn’t stay the same, next year you
think, shit, my understanding something else comes in and changes the whole market” (E-PLATFORM Associate Transcript)

Furthermore, the issue around knowledge transfer is also highlighted:

“Because you are talking about tacit knowledge it doesn’t translate into physical knots and turning bits you know” (E-PLATFORM Associate Transcript)

On the other hand, the Associate highlights that explicit knowledge is potentially a lot easier to transfer but even then, this may be challenged by the context in which the explicit knowledge is trying to be used. Whereas the knowledge transferred in itself may show lower complexity, it could be that the environment or the context it will be used in is more complex and therefore, need some additional specialist knowledge:

“while you could pass on the knowledge that you understood in that moment in time and articulate that in that context but applying that into a different context required a little bit more evolution from the person receiving it as well as a business” (E-PLATFORM Associate Transcript)
4.2.1.4 - Conclusion

The identified KBV assumption in the Literature Review is that:

Explicit knowledge has high transferability whereas tacit knowledge shows low transferability.

During all case study interviews, it is evident that outcomes perceived as explicit knowledge were described as being transferable without major challenges whereas outcomes which were described as having a somewhat tacit nature seem to be more difficult and complex to transfer. Hence, this case study supports the ‘Transferability’ assumption of the KBV Theme.

The biggest indication of the lack of tacit knowledge transferability is shown in the challenges to disseminate the tacit knowledge which was aggregated to the key person. From a KTP point of view and considering the discussions in the literature review, this key person should be the Associate. In the Simulation Case Study the Associate was kept and got full time employment with the company as his knowledge has become key to move the company forward in that specific knowledge area. The same is true for the E-PLATFORM Associate who went on to become one of the directors after the financial crisis as his eLearning system knowledge became key to the companies survival.

“One of the ways the board had dealt with that at the time was, rather than let that knowledge walk out, - well some elements weren’t absorbed, they found a gap... One of the ways they chose to retain the knowledge is to retain the resource” (E-PLATFORM Associate Transcript)

A high degree of tacit knowledge for the creation of this tool can be assumed as it is described as very complicated. Furthermore, the creation of this competency and hence, the knowledge production process took two years which is significant. It is clear from the quote above that the companies either struggled to transfer complex
idiosyncratic knowledge or chose deliberately not to transfer within a very knowledge-centric context. The weakness identified by the Simulation case study earlier was communicated as the dependence on the associate altogether. It seems like the KTPs use the associate as a knowledge source by minimising knowledge transfer but integrating the complex knowledge through other means which the following themes will discuss further.

Kang, Rhee and Kang (2010) argue that knowledge by itself does not create value and competitive advantage until it can be shared and transferred within the firm. They further argue, to externalise and integrate tacit knowledge for firms’ SCA. However, this seems too simplistic. For example, the Crystal case study managed to sustain its SCA without transferring the highly personal tacit knowledge to the wider organisation. Although, it is evident that achieving ‘common knowledge’ which is the expert level within my complexity of knowledge diagram supports efficiency in the pursuit of SCA.

The KTPs managed to transfer knowledge of concepts, theory and methods to the top level, which I would classify as knowledge with lower complexities. Furthermore, there is no evidence that the lack of transfer of highly complex knowledge was due to cooperation issues as such and this will be discussed further in subsequent themes. Furthermore, there seems to be a higher appetite to link to knowledge transfer attempts for capabilities needing relatively low complexity of knowledge where I could identify that most of the knowledge transfer was taking place. Some of the tool-specific knowledge within the Simulation case study mentioned that a particular capability transfer involving higher degrees of tacit knowledge took over a year. This means that for high complexities of knowledge, externalisation, needs to be carefully considered by managers and such time investment accounted for.

I realised that any discussion of transferability of knowledge tends to give input to other themes and it is very hard to gather any more meaning within the discussion without involving other themes. It will also come apparent that the case studies
considered the ‘Capacity of Aggregation’ of the type of knowledge (explicit VS tacit) ‘Specialisation in Knowledge Acquisition’ (individual absorptive capacity) and even ‘Appropriability’ in the background of transferability. Hence, from a KTP perspective it seems appropriate to view transferability as an enabler or at least symbiotic, for those three. Furthermore, the degree of knowledge identified in the literature review and the transferability discussion will be important in the coordination within the firm when it comes to an integration strategy and organisational structure and design for the purpose of decision-making.

Hence, within the KBV of transferability, understanding the degree of knowledge complexity as shown in figure 2, seems to be a key determinant for firm managers to explore and build strategies.

The emerging KBV-principle that managers would need to consider when considering transferability of knowledge, is to ‘communicate effectively and clearly’ with other knowledge actors inside and outside the KTP team. Here, transferability of knowledge seems to play a crucial role within the achievement of this KBV-principle. In the patent discussion, the Associate concentrated on explicit parts of the patent, and the attorney used that explicit language. This gave very quick and easy results for selective communication while recognising individual’s knowledge domains. Following discussions on the’ role of common knowledge’ will further investigate this point.
4.2.2 - Capacity of Aggregation

The ‘capacity of aggregation’ Theme is one of four ‘knowledge specific’ themes identified in the Literature review. The identified KBV assumption in the Literature Review is that:

- Explicit knowledge can be more effectively aggregated to a single location than tacit knowledge

The organisational absorptive capacity is linked to technical (company technology) knowledge management aspects which are not part of the research aims and objectives. The literature review highlighted that the focus in this thesis is in the individuals’ level of knowledge absorption, which in turn depends on the capacity of aggregation (ability to add new knowledge to existing knowledge).

As discussed in the literature review, one focus of this thesis concludes in the ability to make the right decision. Hence, the capacity of aggregation also influences the firms’ coordination and structure/design theme. This theme can be viewed from an individual or organisational level.

4.2.2.1 - Crystal Case Study

The Crystal case study has only limited impact for this particular theme. The most profound example is linked to the decision to move the project from a crystal manufacturing process to manufacturing a laser. Knowledge about the project progress was transferred to the CEO who decided to change the scope. The literature review argued that knowledge receipt is linked to the absorptive capacity, in this case, the CEO. The CEO’s ability to add new knowledge to his existing knowledge which the KBV describes as capacity of aggregation was low due to the CEO’s lack of specialised knowledge and deficiency of common knowledge. The AL described the CEO’s move from a crystal to a laser as follows:
“This product was a tougher kind of product then it could have been. E.g. you write the project to come up with an engine, then it gets quickly decided to make the whole car, and that’s obviously a completely different outcome to make. But by the end of the project, we went back to making the engine again. So from trying to make a crystal, to try and make a laser to try and make a crystal again” (Crystal Academic Leader Transcript)

We already identified that the Crystal project is very tacit knowledge-driven and hence, it is not surprising, that major decisions taken by somebody other than the knowledge specialist would increase the probability of an incorrect decision. The CEO did not really understand the implications of de-scoping the project and misjudged the capabilities and resources available to achieve his ambition.

It becomes apparent that the ability to transfer and aggregate knowledge is a key determinant for the optimal location of decision-making. The literature review highlighted that organisational hierarchy is an efficient firm solution to two main problems of coordination (technical problem) and cooperation (divergent goals of individuals). However, the KBV assumption is that:

Hierarchical coordination fails if a major part of knowledge integration is tacit which can only be exercised by those who possess it

The capacity to aggregate the required knowledge into a single location, in this case for the CEO to access, was hindered due to the level of tacit knowledge involved. This in turn, links to the challenge of tacit knowledge transferability in the context of time-bound decision-making. The literature review discussed this and suggested that tacit knowledge, especially with shorter time frames, needs a very strong shared meaning level and even then, a conversation between the knowledge owner and in this case, the CEO would involve substantial knowledge loss (Grant 1996). Furthermore, absorptive capacity is key to knowledge transfer which will be further discussed in the following sections. The CEO struggled to understand the challenges of this scope
move because of the tacit nature of the knowledge to be transferred which in turn made the hierarchy or location in decision-making unfavourable.

However, some might argue that a big scope change in a project like this should only be made by the CEO. The CEO was motivated by further profit gains and his decision to change the strategic positioning of this project was based on an explicit perspective.

However, making decisions that require a complex understanding of crystals and lasers without the tacit knowledge owner resulted in a major hiccup, in which the decision-making structure failed. This is indeed in line with the literature review assumptions and therefore not overly surprising.

However, some of the points included in this discussion are viewed and further discussed in other themes as a primary outcome of decisions and activity and hence, the aggregation theme for this case study provides only limited value.

### 4.2.2.2 - Simulation Case Study

The efficiency of the knowledge transfer activities is very much dependent on the knowledge potential for aggregation. It seems that the Associate together with the Academic Leader is key to successful operation. The Associate would predominantly decide if it is even worth to try and run a simulation for a specific goal. To the question of what position the company would be in if the Associate leaves an explicit manual and is not part of the operation anymore, the response is:

“Yeah it would be of limited use, yeah it wouldn’t be much use. There would be to run the same simulation again but they wouldn’t be able to manipulate things and make fundamental changes as that would be quite difficult and I think that’s probably again something specific to our KTP” (Simulation AS Transcript)
Hence, the Capacity of aggregation outside the individual knowledge domain is very weak. It was already mentioned that the Associate seems to be involved in all important decisions around the simulation tool.

The efficiency of knowledge transfer and production is to do with the knowledge potential for aggregation which in this case study is very individual-centric. Henceforth, efficiency must be linked to the absorptive capacity of the individual. The academic leader describes the absorptive capacity of the Associate as follows:

“The absorptive capacity of the Associate was very high, he has got a good balance of a business head of his shoulder and understanding the value of the science. He is quite self-critical so he will always strive to improve the rigour of the science behind the technology we are trying to develop. Perhaps with a little of our guidance he has learned how to marry those two together...” (Simulation Academic Leader Transcript)

The complexity of knowledge seems to be between ‘relatively tacit’ to ‘highly personal’. The transferability discussion for this case study already highlighted the tacit nature and the challenges to transfer the highly tacit elements of this KTP. The Associate states that:

“So overall these techniques and methods that have been originally been imported through the KTP and the seed have been implanted its now coming onto the company from different angles so it’s becoming more as part of their repertoire but in terms of operational use of them it’s still quite isolated” (Simulation Associate Transcript)

Other individuals in the company are now at a stage where they can understand statistical outcomes after using the model. Although they are not able to set the simulation up they can, however, interpret the results which were already classified as more explicit knowledge driven:
“how to exploit that statistical model. Knowing what’s important, and that’s knowledge that we have being generating as we gone along. We tried to capture it an explicit way” (Simulation Academic Leader Transcript)

Since this knowledge was easier transferred and could be aggregated within the company rather than being solely associate based, it is not surprising that the senior management team uses the analysis and statistical outcomes to make strategic company decisions. So far ‘Transferability’ and ‘Specialisation in knowledge acquisition’ play a major role for the capacity of aggregation for tacit knowledge, which also seems to have a big impact on the Location of decision-making which will be discussed later.

The Transferability discussion highlighted that the operational use and modification aspects of the simulation is very complex and although the simulation has wide usage within the company, the knowledge aggregation process of the simulation configuration to different projects is very limited. Instead, the Associate is used in other projects to set the simulation and tailor it to the need of that particular project, which is increasing his time pressure overall. This, in turn, could affect the Associate’s ability to make significant advancements in the simulation and may hinder further innovation as some of his time is allocated in the operational use of the simulation for different areas and projects within the organisation. There is no evidence from the interview analysis that the capacity of aggregation is potentially not there, but it seems that time and effort are not released for others to specialise enough to transfer the associate’s knowledge to other actors. The above points and further implications will be discussed in depth within the ‘specialisation in knowledge acquisition’ and ‘coordination within the firm’ themes.

As mentioned earlier, the configuration is still very much dependent on mainly the Associate and in parts the Academic Leader. The Associate gained the knowledge from scratch as the creator of that model and by aggregating other people’s
knowledge to his own knowledge base. An example of this could be the design expertise linked to the simulation tool:

“One of the design engineers was also involved in sharing their design expertise with the Associate and how you physically take that design idea and sort of formalise it, so that was a bit of Knowledge Transfer, employing knowledge already in the company” (Simulation Academic Leader Transcript)

This shows that the Associate is the main receiver of knowledge not only from the Academic Leader and Company Supervisor but also from different actors such as the design engineers and is henceforth able to build new explicit and tacit knowledge from the knowledge transfer (KT) of the other actors. Hence, the ‘capacity of aggregation’ in this case study is very much linked to the Associates absorptive capacity who uses his specialisation in knowledge to increase the efficiency of KT as the main knowledge benefiter.

Since the Associate is the tacit knowledge holder, the KBV would suggest that the location of decision-making needs to be with the Associate himself. Hence, decisions around the simulation should not be centralised and in it very least involve the knowledge holder. The organisation adopts this view and is, therefore, in line with the KBV.

“One the tool itself is driven by very specialist knowledge. There is no need for me to try and understand all of it. That’s why we have the Associate who is specialising in this area” (Simulation Company Supervisor Transcript)

The crystal case study as well, as the simulation case study, link the ability of knowledge aggregation and KT to the ‘optimal location of decision-making’ which will be discussed in detail under the respective theme.
4.2.2.3 - E-PLATFORM

In the first two KTP case studies, the efficiency of the knowledge transfer activities is very much depended on the knowledge potential for aggregation. It seems that the Associate together with the Academic Leader is key to successful operation. However, this KTP has a slightly different picture as the Academic Leader involvement was not as intense compared to the other case studies. The main reason for this was probably the lack of specialised knowledge for the Academic Leader to make further contributions other than his initial construct of the eLearning platform. The absorptive capacity of the Company Supervisor and the Associate are fit for purpose and the capacity for aggregation from that point of view worked well.

“Because the Associate has some business background and CEO has some technical background as well” (E-PLATFORM Academic Supervisor Transcript)

The ability to aggregate and transfer the knowledge from Associate to Company Supervisor meant that the Company Supervisor could make more decisions himself as compared to the previous two KTPs:

“[Company Supervisor] represented the management had a really good feel for the strategic knowledge of what the product did and what it could do for them. It wasn’t the questions of it is the Associate’s baby, and I just talked to him, [Company Supervisor] had an idea where the product was going to go, where it’s going to be sold, how it’s going to be sold” (E-PLATFORM Academic Leader Transcript)

However, the academic Supervisor made clear that this was a team effort.

“The Associate was given a really wide authority we are not the sort of company who micromanages people. We believe in letting people do their own thing” (E-PLATFORM Company Supervisor Transcript)
The Associate and Company Supervisor established common knowledge to discuss the eLearning platform and hence, there was some knowledge transfer to the Company Supervisor allowing him to make decisions. This could be an indicator that the degree of knowledge was more explicit driven and hence, the efficiency of transfer was increased. This is different from the previous two KTPs as they seem to struggle more with the knowledge transfer process and especially the higher-level decision in the Crystal case study went wrong.

In this case study, both parties trusted each other and had intense communication. Clearly, the Associate had the absorptive capacity to not only understand the technical aspects but the business aspects too.

“We were very lucky to get the right individual as well, because what you want from a KTP Associate is not just to deliver a product but if you can get someone with business acumen as well, then that’s where the magic takes place” (E-PLATFORM Company Supervisor Transcript)

The Transferability theme already discussed that in changing markets, the firm needs to change as well in order to survive and compete. My case studies will show that in order to sustain the advantage gained through tacit knowledge, the individual has to evolve his or her tacit knowledge base which ultimately links to the ‘Capacity of aggregation’ theme.

“It just doesn’t come automatically, you can’t study a market and then say you know everything about it. You have got to live it. You have to go through the business cycles, that’s what it is I think. It sets the ground but its evolutionary, tacit knowledge is not fixed, it’s the sum total of your abstraction…” (E-PLATFORM Associate Transcript)

The Associate hints to the evolutionary nature to stay competitive. Hence, this case study suggests to link ‘Capacity of aggregation’ not just to the efficiency of knowledge
transfer and view it as the ability to aggregate and transfer knowledge to the optimal place for decision-making, but also use the ability to aggregate to strengthen the tacit knowledge domain in an evolutionary manner.

### 4.2.2.4- Conclusion

Linking the discussion back to the KBV assumption that:

Explicit knowledge can be easier aggregated to a single location than tacit knowledge.

It is fair to say, that the above discussion would strengthen this assumption and hence the case study behaves within the earlier identified KBV assumption.

The case studies suggest that the ‘capacity of aggregation’ theme is linked to the absorptive capacity of the individual and the degree of knowledge complexity. The case study which was strongest for the Academic Supervisor to aggregate project specific knowledge was the E-PLATFORM case study. This case study was also identified from the outset as being more explicit knowledge driven than the other two case studies. Therefore, the overall dominant aspect seems to be the Transferability aspect of the knowledge and the differentiation between tacit and explicit knowledge as an act of KBV strategy.

The nature of the KTP is that the Associate (or the main receiver of the knowledge gap, e.g. Academic Leader in the Crystal case study) receives and produces the main part of the tacit knowledge.

“The ‘tacit’ knowledge is going to sit where you put it all together” *(E-PLATFORM Associate Transcript)*
Since the Associate’s primary purpose is to close the knowledge gap identified for the KTP by having rich communication from a knowledge perspective (Academic Leader) and Company perspective (Company Supervisor) the Associate specialises in the acquisition of knowledge. Once the Associate creates a tacit knowledge base and such knowledge was used to achieve some form of competitive advantage, the KTPs struggled to disseminate that knowledge further into the wider company, hinting that the capacity of aggregation is reduced with increasing knowledge complexity. The investment of time, communication and resources the company made to close that knowledge gap was not replicated, probably because each additional individual would need to go through a similar experience curve as the Associate which can take as long as three years within a KTP. However, the specialisation in knowledge acquisition’ theme will discuss this further.

It becomes apparent that extracting ‘capacity of aggregation’ as the main KBV theme from an individual level provides only limited value to my thesis aims or objectives to justify this as a standalone theme for a firm to consider when using the KBV as an act of strategy. It does not seem to have a profound impact on organisation strategy as it is already absorbed within the transferability, specialisation in knowledge acquisition and organisational structure/design discussion.

There could be grounds to view capacity of aggregation in isolation from a technical aspect concerning low complexities of knowledge or information. My thesis is more concerned with knowledge that is linked to the achievement of a CA that may be sustained and my literature review discussion and research question already descoped technical aspects which could be analysed holistically from other academics.

The analysis highlighted a company dilemma. All case studies show a dependability aspect of certain individuals who have the specialised knowledge. The desire to drive the specialist knowledge to other individuals is challenged by the time, effort and investment it takes to achieve knowledge production in the first place. The following
coordination of specialist knowledge theme will analyse possible integration activities as a substitute for transfer.

KTPs are ‘Knowledge Transfer Partnership’ projects, whereby the major transfer happens between Academic Leader, Company Supervisor and Associate. A second objective for KTPs is the dissemination of such knowledge. Interestingly, knowledge transfer does not seem to be the mechanism of choice to create the outcomes which can be linked to SCA. The case study KTPs are relatively small companies where company actors have their own specific knowledge areas. The KTP was used because the company lacked a specific knowledge, to begin with. However, all case studies were reluctant to undertake major tacit knowledge transfer activities. So far, this could be explained by the increased ability of the Associate and their achievement of high complexities of knowledge (see Figure 2) that seems to be highly personal in the Crystal and Simulation case studies and Expert level in the ePLATFORM case study.

The need for knowledge replication to achieve SCA of the firm was discussed in the literature review. However, there is a clear lack of knowledge replication throughout the KTPs. This is contradictory to the literature review discussion that knowledge is subject to economies of scale. Grant claims that:

“A characteristic of all knowledge is that its initial creation is more costly than its subsequent replication” (Grant 2002, p 136)

However, considering the initial investment to create the knowledge in order to close the knowledge gap, the case studies only made very limited use of possible economies of scale of knowledge. Winter (1995) recognises that tacit knowledge is not only costly to produce but also costly to replicate, but lower than the cost incurred in its original creation. Nevertheless, knowledge transfer of the Associate’s production of new tacit knowledge was not transferred. Even the E-PLATFORM case study which arguably showed a more explicit knowledge degree in the complexity of
knowledge missed to use additional knowledge transfer to disseminate knowledge during the KTP or shortly after. The Company Supervisor commented:

“I think that would have helped the transition from the technical development into the business. Again, this is classic thing as well, we teach this stuff so it’s crazy that we didn’t do it” (E-PLATFORM Company Supervisor Transcript)

This case study eventually managed to integrate some common knowledge, routines and directives into the company by hiring people with the commonality of specialised knowledge and by subsequently transforming eLearning into ‘business as usual’ which the coordination themes will further investigate.

However, I argue the lack of replication, especially with the Crystal and Simulation case studies which showed a high complexity of knowledge, is due to the cognitive limitation of actors and their absorptive capacity when one individual who is already a specialist in one area may struggle to be an expert in another area as well. Since the tacit knowledge recites in individuals, and since, it is necessary for another individual to replicate the tacit knowledge, especially in the mode of socialisation (tacit to tacit), it becomes difficult to sustain a general assumption that knowledge is subject to economies of scale. Any claim that tacit knowledge replication is cheaper than its original creation would assume that the second person has the same absorptive capacity (if not better) than the original tacit knowledge holder. Furthermore, there could be unwillingness and lack of motivation from the knowledge receiver, to step outside their individual specialisation, to specialise in another area as well.

The Capacity of Aggregation highlighted some interesting analysis, but I already argued that such discussions are primarily linked to other themes. From an individual aspect, considering that our main assumption is that tacit knowledge which leads to superior performance mainly lies within the tacit ability of individuals, the ‘capacity of aggregation’ can simply be viewed under the individual’s absorptive capacity which will be further discussed under ‘specialisation in knowledge acquisition’ theme.
Therefore, the key enabler for the ‘capacity of aggregation’ theme when it comes to knowledge most likely linked to SCA, is the individual’s absorptive capacity. Individual’s absorptive capacity is strengthened by the specialisation in knowledge acquisition. This means that complex knowledge is most efficiently aggregated to the knowledge actor with the highest degree of complexity within that knowledge domain. However, the strategic risk for managers to consider is the increasing dependability of the key knowledge actor.

Hence, ‘Capacity of aggregation’ should be considered within knowledge production and knowledge transfer in the pursuit of strategy formulation. Since efficiency of knowledge transfer and production is also linked to the absorptive capacity, ‘capacity of aggregation’ will influence the holistic view as an enabler with focus on knowledge coordination and organisational structure and design.
4.2.3 - Appropriability

Some of the earlier discussions in the literature review highlights that the KBV links knowledge to market value and unless the market is protected by patent or copyright it will generally be inappropriate by means of market transaction. Therefore, the KBV assumption is that:

Tacit knowledge cannot be directly transferred which makes it in turn not directly appropriable

The literature review identified patents and copyrights as the main determinant to sustain knowledge, especially when it comes to explicit knowledge. As identified earlier, it is the tacit knowledge stickiness, causal ambiguous nature and complexity of knowledge, which boosts superior performance. The risk with patents is, that once the knowledge is out in the open, it will allow competitors to get an insight of the knowledge and give opportunities for competitors to copy elements which may weaken the competitive advantage for the company with the original patent.

4.2.3.1 - Crystal Case Study

The transferability analysis of the Crystals case already highlighted the high degree of tacitness in the KTP project. Hence, a possibility was to convert the tacit knowledge embedded within the knowledge holder into explicit knowledge. However, there was no knowledge conversion to suggest ‘externalisation’ from tacit to explicit knowledge. Unlike the literature review suggestion, the patent was achieved without fully codifying the tacit knowledge. The case study understood, that the knowledge leading to the CA is so far embedded into the key knowledge holder, that there was no need of a patent to protect the CA. However, the patent was used to have a ‘card to play’ if somebody was to challenge their process. Their actual patent is based on how to apply the voltage routine without explicitly defining the knowledge that goes with it:
“E.g. how do you apply that photo sensitive material, what temperatures you use, what bake rates you use. These are the kind of things that could take years to identify. There is a very small window where this works, ... and know and understand what the limitations are. There is a certain art for writing patents. For somebody to understand the re-usability of it you need our special know how. To achieve the quality. If you just follow the patent you get a mess out of it the other end.” (Crystal Academic Leader)

The strategy for Crystal was to write the patent to be protected without knowledge externalisation (tacit to explicit), so the re-usability of the information in the patent is hindered without the tacit knowledge domain.

4.2.3.2 - Simulation Case Study

Similar to the Crystal case study, it is hard to find a direct link to appropriability as a KBV theme.

“It is very hard to put a market value on the simulation. It has helped us to innovate and develop new markets. It is also to do with confidence. Trials are very costly and it helps us to judge the suitability of different options” (Simulation Company Supervisor Transcript)

The quote suggests that the market value of knowledge is very hard to specify. Furthermore, the case study was not overly concerned with valuing the tacit knowledge as such. The appropriability of tacit knowledge was valued as the knowledge application of productive activity.

Similar to the Crystal KTP, the Simulation KTP also used the patent mainly to have a ‘card to play’:

“That was a strategic decision to make it complicated, there is a lot of them out there” (Simulation Associate Transcript)
The strategy to make the patent as complicated as possible, on purpose, is an interesting aspect, as the main aim is not to show the world the actual knowledge gained in the KTP through explicit descriptions, but to have a strategic card to play against their competitors. The actual aim is to make sure that competitors can not infringe on their innovation:

“We are not trying to explicitly protect what we are doing that nobody else can do it. It’s so that in industry it’s important to have a card to play you have to have something protected in your development otherwise you can’t really sell if they are interested in your concept and other people can much more easily infringe on it” (Simulation Associate Transcript)

The idea is to mainly follow a strategy that would make infringements by competitors’ very costly, time-consuming and probably not feasible if the patent was done correctly:

Basically, if we can both say we got patent literature around this IP it will have to be settle by the courts. Very often things will just defuse because nobody want to go to court” (Simulation Associate Transcript)

The interview suggest that the major strategic decision was taken to protect the knowledge from infringement of competitors rather than a strategy to achieve some form of market value of a specific knowledge domain.

4.2.3.3 - E-PLATFORM

Similar to the previous KTPs, it is hard to find a direct link to appropriability as a KBV theme. This case study was inconclusive towards this theme and similar to the Simulation case study, the appropriability of knowledge was valued as the knowledge application of productive activity.
The knowledge transfer theme discussion already identified that the complexity of knowledge within the E-Platform case study has a lower complexity of knowledge. This, in turn, could also explain the lack of any mentioning of patent protection of the intellectual copyrights within the organisation.

### 4.2.3.4 - Conclusion

Appropriability, as already discussed in the literature review section, links to the market value of knowledge. The KBV assumption is that:

- Tacit knowledge cannot be directly transferred which makes it in turn not directly appropriable

The ambiguous causal nature of tacit knowledge which is mainly linked to the company’s CA cannot be directly appropriated. In tacit knowledge heavy projects, such as the Crystal case study, the machinery to produce the crystals will have some value but the ‘bake rates’ to achieve crystal conversion may be useless as it would need the individual with the accumulated knowledge to solve problems in the manufacturing process. Hence, the market value really shifts from a company perspective of appropriability to an individual base if the tacit knowledge domain is indeed the primary factor for competitive advantage. Furthermore, the identified risk of patents for rivals to use the codified knowledge without violating the patent identified by Coff (2003), did not happen. The Case studies did not attempt to externalise their tacit knowledge for conversion and used patent primarily as a card to play to protect themselves for possible infringements claims of competitors.

My view of the KBV is slightly different to the original view of Grant in the sense that; I do not agree with the notion that unless the knowledge is protected by patents and copyrights, it will generally be in-appropriable by means of market transaction. I do not think that such view is helpful nor necessary within a KBV context when linked to
strategy formulation, which I will explain further. I come to the conclusion mainly due to my literature review discussion to focus Appropriability on discussions around sustaining a competitive advantage rather than ‘rent-appropriability’. First of all, it is not the knowledge itself which generates market transaction but its capability to create goods or service by using that knowledge. Secondly, the two case studies which used patents did not use it to put a price tag on the knowledge:

“or we could sell it without a patent by using the design know how we have” (Simulation Academic Leader Transcript)

Such discussion would only be appropriate in the strategy for company sell-out, whereas I focus on the use of knowledge within decision-making, production, transfer and integration to achieve an SCA.

The true market value lies in the tacitness of the knowledge and hence, the barriers to have it easily replicated by competitors. This strategy of tacit knowledge protection is also highlighted in the patents themselves which are more concerned with patenting the process rather than the mechanics of their operation.

Within a knowledge based view, it is not the machinery as a resource who achieves considerable market value but the knowledge that goes with it. Since the knowledge that needs protection and is leading to a CA, is highly complex with highly personal tacit knowledge, it is questionable if Appropriability needs to be considered as an act of KBV Strategy.

I argue that, if the knowledge that leads to CA is embedded within individuals and if individuals are classified as voluntary actors within a firm, then the only appropriation discussion important for a KBV as company strategy is its capability to create goods or service by using that knowledge and therefore, any other ‘appropriability’ discussions are of secondary importance if not obsolete.
4.2.4 - Specialisation in Knowledge Acquisition

The 'specialisation in knowledge acquisition' theme is one of four 'knowledge specific' themes identified in the Literature review. The identified KBV assumption in the Literature Review is that:

KBV requires for individuals to specialise in particular areas of knowledge while considering their absorptive capacity to increase success of knowledge integration

So far, the analysis and literature review suggested that individuals are the means to acquire and store existing knowledge (particularly tacit knowledge) and create new knowledge.

4.2.4.1 - Crystal Case study

The Crystal case study indicates that there was a clear differentiation between the engineers which understood how crystals are structured and how they behave (all of which are post doctorate) and engineers which have some knowledge but have not specialised enough or simply lack the absorptive capacity, referred to as technicians. The Academic Leader highlights that:

“If you want to change the process you need the background expertise but to follow the recipe a technician can do it.” (Crystal Academic Leader Transcript)

The underlining assumption here is that the technicians have not got the background expertise. The specialist knowledge on how to change the process in this case study is linked to problem solving activities which seems to be the most important skill for this particular project. The case study suggests that for effective knowledge production the individuals’ absorptive capacity is crucial:
“The supervisor and the Associate and the company needs to be able to absorb it and have common knowledge. In a previous KTP I had to run through the story over and over again because the company (and Associate) couldn’t really absorbed it. If the other end can’t absorb it then it’s not going to work” (Crystal Academic Leader Transcript)

This quote suggest that absorptive capacity can pretty much determine success or failure for the knowledge production and integrating activities within the company and hence places a focus on the individual.

Considering the very complex nature of this project it is not surprising that there are only a very limited number of people with the necessary absorptive capacity and skillset:

“Recipe is stored within the company and problem solving skills is individual based. There are only one or two other people in the company with that or part of the skills set.” (Crystal Academic Leader Transcript)

This suggests that attempting to transfer knowledge may not be the most efficient way to integrate knowledge as the implication is that the complexity of knowledge is very high. Also, the absorptive capacity of some individuals could make it impossible or would slow down the knowledge transfer process so dramatically, that it would be strategically inadvisable to attempt knowledge transfer. Hence, this theme is very closely linked to the following theme discussion of the ‘coordination within the firm’ activities.

The Crystal case study illustrates that they have achieved, within a three year KTP, to convert a highly tacit based lab approach into a standardised commercial receipt which a technician can follow. This part externalisation of a lab based approach to use crystal conversion as a commercial approach means a higher scale manufacturing process. However, what becomes also apparent is, that the main competitive
advantage is the ability of problem solving within this commercial approach as batches of crystals have slightly different attributes:

“If you have a batch of crystals that didn’t work, you need to assess why that may be the case there is a certain experience level. I worked with 1000 plus wafers and material from multiple batches so if something is not working right I can normally change the system to get something out the other end. Whereas the technician would follow the recipe and if it doesn’t work there would still follow the recipe. So the technicians are not the problem solvers” (Crystal Academic Leader Transcript)

This suggest that the Academic Leader (AL), who is the main knowledge benefiter in this case study, can process the new information from a dis-functioning batch of crystal and add this information to his current knowledge of crystal batches to generate new knowledge to be able to solve that problem. The intensity of this approach, favours Bower and Hilgard (1981) original discussion in the literature review, that the knowledge holder will acquire new knowledge as making sense of prior difficulties. The ability to link past problems to future problems will increase capability and therefore, the speed of effectivity of solving future problems.

The technicians cannot solve challenges of failing batches, which suggests that the knowledge to solve such problems is relatively tacit and has therefore, a high complexity of knowledge. The assumption is that a technician can probably solve problems which are technical, machine related, but is stuck, even with years of experience in production, if the problem itself needs crystal related specialist knowledge. Hence, ‘specialisation in knowledge acquisition’ seems to be a critical success factor for a firm to consider when in highly tacit knowledge environments. The AL experience of the lab based approach prior to the project seems to be immensely important where the AL specialised in this type of problem solving.

As already mentioned, this ‘specialisation in knowledge acquisition’ theme is very much linked to the ‘coordination within the firm’ theme which is to follow.
If the knowledge to be produced and integrated is highly tacit then the literature review and case study, so far, suggest that the transferability will be slowed down or not be achievable within project time constraints compared to challenges which use a higher degree of explicit knowledge. It also suggests that the absorptive capacity of individuals need to be higher for tacit knowledge which in turn suggests that specialisation in knowledge acquisition is key to achieve high complexity of knowledge.

4.2.4.2 - Simulation Case Study

The Simulation case study also links absorptive capacity of individuals to the ‘Specialisation in knowledge acquisition’ theme discussion. Interestingly, the Associate is linking this theme with the limited amount of people within the project:

“I would say that the absorptive capacity of the company is very limited and I say it’s primarily to do with size, although all of the company boys come from an academic and research background, that’s about as far as it goes. When it comes about the specific methods, and because it’s a small company, everybody has their own line of expertise so there is not a lot of crossover” (Simulation Associate Transcript)

The Associate highlights that the team comes from an academic and research background which would normally suggest that there is ‘common knowledge’ which we already identified as important for knowledge integration and/or transfer.

The reference to the lack of ‘crossover’ is related to their individual area of expertise in e.g. particular methods. There does not seem to be an expectation for individuals to understand other individual’s specific expertise areas. However, we know from the transferability discussion, that part of the simulation knowledge was disseminated to the team. It was argued that the disseminated knowledge had a more explicit based complexity of knowledge which could be argued with the efficiency aspect within knowledge transfer and integration.
This efficiency is particularly important when the company’s main strategy is to innovate quickly. In fact, the academic leader described that the company had been bought by another company who got rid of most of their previous functions such as the sales team but kept their R&D team as they are very innovative and flexible to adapt to new challenges.

“they were keen on our research and development expertise, something we could do faster and slightly more manuvarable” (Simulation Academic Leader Transcript)

The Associate in the case study has been given enough time to specialise in the new expertise area and rather than spending time to disseminate that knowledge, he was expected to achieve more complex and more efficient configurations of the Simulation. Hence, there seems to be an interesting trade-off between specialisation and dissemination that needs to be considered for this theme and other themes e.g. decision-making.

The R&D team (Simulation) is free to operate as a separate function and the academic leader describes that the key to their innovation success is actually having the right people working together and each getting better in their respective fields:

“the technical specialised knowledge is a key important because that’s how we are able to innovate as a micro SME” (Simulation Academic Leader Transcript)

Hence, linking the ability to continually innovate very clearly to the specialisation of knowledge of key individuals. The importance of allowing specialisation of knowledge is also supported by the senior management team. The CS very much believes in the ability of his team and trust in the individual’s knowledge is also mentioned:

“I would say the team complexity is unusually high, with that I mean we have very good and smart people who know what they are doing. They have specialised in
their own knowledge domain. That’s why a KTP works for us as it is a project structure which is what we implement as a company anyway. Low hierarchy, trust and freedom is important. I wouldn’t second guess the knowledge of the others. They are good that’s why they are part of the team” (Simulation Company Supervisor Transcript)

This quote also touches on the project structure element which I will discuss more intensely under the organisation structure and design theme. Nevertheless, having the right knowledge actors and allowing knowledge specialisation clearly improves the element of trust and freedom within the team. Furthermore, not ‘second guessing’ the knowledge of others shows the importance of trusting decisions based on individuals achieving a specialisation in a particular knowledge domain.

The creation of this competency and hence, the knowledge specialisation took two years, which is significant. When the Academic Leader was asked how hard it would be to replace the Associate the following answer was given:

“this is perhaps a weakness that we rely communicate a bit on this individuals [Associate] knowledge, we are embedded in the company to some extent but it’s embedded because the Associate is embedded in the company. ” (Simulation Academic Leader Transcript)

The academic leader, in the quote above, also highlights the dependency danger that comes with individual specialisation in knowledge acquisition, by illustrating that the AC is the key knowledge holder for the outcomes of the KTP. To lose the knowledge holder and therefore, to lose the ability to run the simulation to the same extent as current operation is further highlighted:

“if you wanted to have the tool that I got right now, with as much freedom for use and manipulation as its currently got in my hands, you would struggle to achieve that with anybody else” (Simulation Associate Transcript)
The team realised that transferring tacit knowledge to understand specific methods would be very time consuming in the knowledge integration context and hence, it was limited and the new tacit knowledge production mainly happened between AS and AL:

“I would find it hard to imagine a situation where, say if tomorrow I were to leave and (AL) were to leave, so basically remove the Associate and the academic, I don’t believe that the company could continue working the next day with the same method” (Simulation Associate Transcript)

The above quote further highlights the dependency threat of individuals who achieved specialisation in knowledge for an outcome that might be strategically relevant to the firm. One of the earlier assumptions, in the literature review, was that the Associate will gain new knowledge from the company and the academic leader and hence, be in a position to have achieved highly personalised knowledge which is linked to the overall KTP objective to achieve and better competitive position. The efficiency in knowledge production is linked to the individual’s ability to store existing knowledge and create new knowledge which makes the individual absorptive capacity very important. The Academic Leader himself worked for the company throughout his final year at university and did a summer internship before he was officially recruited. The current Associate did his MSc Project under the Academic Leader’s supervision:

“We like recruiting... based on a 6-9 month job interview rather than 20 minutes... The absorptive capacity of the Associate was very high” (Simulation Academic Leader Transcript)

Hence, it is important from a KBV perspective to get the right individual involved which starts with the recruitment process.
The assumption, that the Associate will achieve a high complexity of knowledge that is idiosyncratic seems to be relevant for this case study. Referring back to the ‘complexity of knowledge’ discussion in the literature review, running the tools seem to have a ‘highly personal’ tacit knowledge degree and therefore achieves great complexities of knowledge:

“There are inherent issues most just with handing over these tools to be used by, but even explaining what they actually doing. It uses fairly abstract mathematical techniques to give physical meaning to stuff; so people look at the result and say what does this mean and that’s kind of the first big question, even just communicating the significance of various results. Let alone the really complex work flow there is to get to that results. I would describe that as very tacit” (Simulation Associate Transcript)

This particular point, will also be discussed later in the context of ‘Location of decision-making’. The AS also describes aspects of the project which are based on a lower complexity of knowledge and are more explicit knowledge based, such as standard mechanical testing, physical mocking up prototypes using novel materials:

“That’s something that multiple people in the company where able to understand to transfer that knowledge and techniques in, I guess an explicit way” (Simulation Associate Transcript)

4.2.4.3 - E-PLATFORM

Just like the previous two KTPs different individuals have their specialisation. The aim of the KTP was to establish an eLearning platform and structure which did not exist before. Hence, the Associate was the only person during this KTP who specialised in the knowledge acquisition around eLearning with the Academic Leader to transfer some of that knowledge.
The company was dependent on the AC knowledge production when it came to eLearning and making the offline material suitable for online-use without face to face contact of trainers. The company had an idea of direction but did not even know the requirements to get there:

“in terms of scope it wasn’t a known game of here is your requirement list and deliver it. What was given was a mandate. We want an online payment system, how you do it how you implemented is your business” (E-PLATFORM Associate Transcript)

The Associate also describes this as a ‘green playing field’ where he was just allowed to get on. This was true especially for the first 3 month of the KTP. The AL quoted earlier that he believes that the programming was more explicit-knowledge based. There was a higher degree of tacit knowledge involved when it came to the pedagogy and people’s motivation for one eLearning package against another. I already identified that the overall knowledge complexity, compared to the previous two KTPs, seems to be lower. Although it could be classified to have reached expert level it has not achieved the ‘highly personal’ level within my complexity of knowledge diagram (Figure 2). Nevertheless, the Associate was given some authority within the eLearning domain and the time and support for him to specialise in this particular knowledge domain.

“The Associate was given a really wide authority we are not the sort of company who micromanages people. We believe in letting people do their own thing, and grow in their own way, put recommendation, self-manage but we are always there to support them” (E-PLATFORM Company Supervisor Transcript)

Through having a strategic outlook for the creation of new knowledge, specifically to close a knowledge gap that was previously identified as strategically important, the company receives an expert in that field through the specialisation in that particular field. This also strengthens the view to see the individuals’ skills and knowledge as
the main output of organisational activity. This realisation was done by the CEO who realised the importance of strategic specialisation in knowledge acquisition of individual members:

“We did get an ever better output if you like, which was a fully developed expert resource if we see [Name], the Associate as an output but ultimately that’s what we got as well because he learned as he went as well and that was a great training ground for him” (E-PLATFORM Company Supervisor Transcript)

The Literature Review mentioned that the efficiency in knowledge production is linked to the individuals’ absorptive capacity. In fact, the Academic Leader mentioned other unsuccessful KTP project where the Associate had not enough absorptive capacity:

“One of the things which could have easily failed, was the Associate could have not understand the software and what the software was trying to do and not have the technical capability to take it on, it would have died very quickly. I have been involved in a KTP where the Associate couldn’t understand the software and it died” (E-PLATFORM Academic Leader Transcript)

However, the Associates absorptive capacity for this KTP seems to be high:

“I think the Associate first degree was in business as well as computing, and its family was in business and he was a very bright lad, so that all helped” (E-PLATFORM Academic Leader Transcript)

“The team was very strong and the Associate was very good, there was a lot of confidence in him. He definitely communicated confidence, justifiable confidence” (E-PLATFORM Academic Leader Transcript)
So the question remains, why the degree of knowledge complexity is comparatively low. The Academic Leader himself mentioned that his main work was undertaken before the KTP actually started:

“I did the prototyping ahead of time, I did it in the time between the KTP being authorized and the Associate starting which was about 6-8 month. By the time he started there was a kind of working prototype. He had to learn how to do it and develop it further” (E-PLATFORM Academic Leader Transcript)

The Academic Leader also mentions that the KTP team did not need him towards the end at all and that during the KTP his involvement was limited to the LMC meetings which are scheduled as part of the KTP program.

Towards the end they didn’t even need me anymore” (E-PLATFORM Academic Leader Transcript)

The Academic Leader also mentioned that his work, at the beginning, was the first base which was important to give the Associate a good start. However, the overall construct had to be changed as the emphasis changed and at that point the Associate was deeper in the material and the knowledge of the Academic Leader was needed less.

“it became his job to tidy it up and rewrite a lot of it because it was put together very quickly and not particularly well. So he had to understand what it did and basically reconstruct it... So he had to do an awful lot of learning. He had no browser based programing experience to start off with” (E-PLATFORM Academic Leader Transcript)

The CS was earlier identified as making more decisions than in the other two cases studies. He was very much integral to the KTP project with intensive communication lines to the Associate. However, the CS did not want to know every little detail about
the technology itself. This is not surprising as his main focus is on the strategic impact of the technology rather than the details of it.

“He couldn’t understand all that technology and wasn’t interesting in understanding the technology, that doesn’t mean he was disinterested but it was not his role” (E-PLATFORM Academic Leader Transcript)

Therefore, another KBV-principle emerges to ‘Create a Diverse Team with Clear Roles and Responsibilities’. This is especially true in an environment which is taken out of the normal ‘business as usual’ organisational design.

So overall, the Associate had to do a lot of learning in isolation without much knowledge transfer from the Academic Leader. Hence, the Associate had to specialise in an area with limited experience to start with. This explains why overall the complexity of knowledge produced is comparably lower than the other two case studies. Furthermore, the ‘Organisational Capability’ theme will discuss that the Academic Leader did not really see the value to have a strong link to the company as he argued that everything would be channelled through the Associate. Although the Associate keeps a central role for a good reason, the feedback loop from a company point to the academic was missing which in turn was evidently stronger in the other two KTPs.

**4.2.4.4 - Conclusion**

The literature review assumption for this theme is:

KBV requires for individuals to specialise in particular areas of knowledge while considering their absorptive capacity to increase success of knowledge integration
It is evident that the central point for each KTP is the Associate. This is not surprising as the Associates’ role is to close the knowledge gap the company has identified over a period of time. The two main stakeholders sharing their knowledge to achieve the objectives are the Academic Leader and the Company Supervisor. In this context the Academic Leader from the E-PLATFORM Case Study mentions.

“There is a lot of pressure for the Associate, you need to be a strong minded person but willing to listen but also you got to be very intelligent” (E-PLATFORM Academic Leader Transcript)

Therefore, and not surprisingly, the absorptive capacity of the Associate was discussed the most. If the knowledge to be produced and integrated is highly tacit driven, then the literature review and case study suggest that the transferability will be either slowed down or not achievable within project time constraints compared to challenges which use a higher degree of explicit knowledge.

It also suggests that the absorptive capacity of individuals need to be higher for tacit knowledge, which in turn suggests that specialisation in knowledge acquisition will become key. The first two case studies were described with an unusually high knowledge complexity. In the Simulation case study, for example, further knowledge specialisation was put above knowledge dissemination within the company. Hence, an interesting discussion in the analysis section emerged between knowledge transfer versus knowledge specialisation.

Furthermore, providing individuals “Trust and Freedom” to use their absorptive capacity for a specific field seems to be a valuable strategy proposition. Trust in the knowledge capabilities are important: “I wouldn’t second guess the knowledge of the others” (Simulation Company Supervisor Transcript) which means that having the right individuals becomes even more important as there are not much alternative individuals who receive the intensity needed for knowledge production. This links to the freedom aspect, that there needs to be an understanding that specialisation takes
time, which has also been discussed in the case study analysis. The combination of ‘trust and freedom’ has allowed, especially in the Simulation case study, to create a culture of high innovation and flexibility which was the predominant reason why the company was taken over.

The literature review challenged, quite fundamentally, whether sustained competitive advantage is even possible in dynamic environments and focus on the ability to change as a driver to achieve temporary advantage leading to superior performance, rather than the possession and use of knowledge (Eisenhardt and Martin 2000, D'Aveni 1994, Eisenhardt 1989). The case study analysis highlights that any strategic view needs to consider a trade-off between dissemination and specialisation of knowledge. There seems to be a general belief, that knowledge replication would take too much time and effort and that the company would be better off to specialise the key knowledge holder further. The first two (highly complex) case studies traded-off major integration initiatives against further specialising the Associate’s knowledge. The complexity of knowledge gained by the Associate was seen too great to replicate the knowledge to other company actors. Especially the Simulation case study further innovated the tool and sustained the competitive advantage.

The third case study also chose specialisation over integration. However, the analysis showed that this case study was based on lower complexity of knowledge which would have assumed easier knowledge integration than the previous two case studies. Furthermore, the eLearning platform affected the rest of the company’s operation and the lack of dissemination resulted in the dependency of the knowledge holder (Associate) to be dragged into many operational matters and operational problem solving. This in turn, hindered the Associate to reach further intensity levels, which was discussed in the literature review to enable the deepening of the knowledge. In contrast to the previous two case studies, the same trade off actually resulted into a lack of innovative capabilities and the inability to sustain that knowledge. There was also a sense of risk in the Simulation case study as the degree
of innovation of the tool slowed down since the operationalisation of the tool was widened within the company. This resulted in the Associate being dragged into more operationalisation which takes time out of knowledge specialisation.

The complexity of knowledge seems to play a very important role in that matter, as well as the understanding how much of this knowledge is needed in operational matters, which are time consuming and where an investment into knowledge integration could play major dividends. Although, the Associate in the Simulation case study is still able to innovate further, he mentioned that projects who uses his simulation increases which in turn increases the time to be setting up ‘black boxes’ for other projects. This means that increasing demands of a specific knowledge within the firm may hinder subsequent future innovation if the knowledge is not integrated to the level needed, thus a strategic view needs to consider that requirements may well change over time.

I argue, that choosing continued specialisation of individuals will enable short-term innovation but the lack of knowledge integration combined with the possibility that the knowledge output is increasingly used by other company functions, will increase the time for operationalisation of the knowledge holder which in turn would hinder future innovation and specialisation of the knowledge holder.

4.2.5 - Coordination within the firm

The ‘coordination within the firm’ theme is one of two main ‘organisation specific’ themes identified in the Literature review. The identified KBV assumption in the Literature Review is that:

Minimising knowledge transfer but emphasising on absorptive capacity and henceforth coordination of people’s specialised knowledge will increase efficiency and success.
4.2.5.1 - Integration of specialist knowledge

The secondary assumption to the Coordination within the firm assumption is that:

Problem solving and decision-making in groups is reduced to unusual, complex and important tasks as the firm is maximising efficiency through the other formal integration mechanisms.

The literature review has already highlighted the limited progress with the concern that; if the tacit knowledge level for overall knowledge production is high then knowledge transfer between individuals becomes difficult.

So far, analysis concludes that attempts to transfer tacit knowledge is not the most efficient approach for knowledge integration as it is timely and therefore, costly to the firm. Furthermore, specialisation in knowledge acquisition is needed and linked to the absorptive capacity within individuals.

4.2.5.1.1 - Crystal Case study

In the Crystal case study no attempt is made to even try and get the technician to gain the tacit knowledge of crystals. The company requires the technicians to focus on replicating and following the ‘recipe’. This is in line with the literature review discussion which stated that knowledge transfer should be minimised and emphasis should be given on the importance of effective integration of many people’s knowledge. The same is true for the computer system side of the project:

“ One (engineer) was looking into the computer elements of it. So I would give him part of the recipe and tell him how I wanted to work and he would build the infrastructure so again working very closely and group problem solving. Between us we documented. I wrote down this is how all works, he wrote down this is how the computer system should work based on that” (Crystal Academic Leader Transcript).
As the quote above suggest, the knowledge integration process was limited to ‘group problem solving and decision-making’ which is pointed out in the literature review as a subsequent theme and will be discussed in this section.

The technicians and engineers worked closely together to translate the lab based manufacturing method into a commercial method by discovering some routines that tend to work as the quote below suggests:

“allowed me to work there for the amount of time and get the technology from here out there working to a point now where technicians can manufacture the material basically. It’s now moved into a Routine” (Crystal Academic Leader Transcript)

There was no mention of ‘rules and directives’ or ‘sequencing’, as suggested as part of the 4 main integration models identified by the original KBV of the firm discussion.

Another unique situation in the Crystal case study is that the knowledge transfer was not limited for the Associate, who should have gained new tacit knowledge and should be the most important link in the knowledge production process, according to my literature review discussion. In this case however, the most important link is the Academic Leader who seems to have the most crucial tacit knowledge base. The following quotes highlights this discussion and reiterates the importance of group problem solving:

“Ironically the crystal knowledge didn’t go into the Associate as he was doing parts of the sideway project. I wrote the processes down. We had two other engineers who I trained over the years about the process and manufacturing through group problem solving. One was looking into the computer elements of it. So I would give him part of the recipe and tell him how I wanted to work and he would build the infrastructure so again working very closely and group problem solving.” (Crystal Academic Leader Transcript)
In this case, the Associate was side tracked to another output which did not lead to a CA. I already discussed the CEO decision based on lower complexity of knowledge for a decision that needed a high complexity of knowledge understanding.

The quote above also talks about ‘working very closely’, highlighted a couple of times in my analysis, so far. Hence, another principle emerges which I named ‘Outperform through Collaboration’ where problems which occur in production are solved with the technicians and engineers working together and each one contributing to their knowledge domain keeping actual knowledge transfer to a minimum. This is also strengthened by the mechanisms of group problem solving and decision-making which was already mentioned and further discussed in the integration of specialist knowledge theme. Another enabler for the ‘outperform through collaboration’ principle seems to be the ‘shared location’ aspect:

“The technology needs the person who knows how to make these things on side to actually turn it into something Viable” (Crystal Academic Leader Transcript)

4.2.5.1.2 - Simulation Case study

The Simulation case study has quite a strong relationship to the university where the academic leader is coming from. Over the years there has been considerable knowledge exchange:

“The company and the university has a 15 year relationship. The principle R&D engineer did their PhD with the university, the Managing director is a visiting reader and now a visiting Associate professor because of the research focus at the university he is working there for one day a week since 2003” (Simulation Academic Leader Transcript)

Hence, the Academic Leader didn’t struggle to fit within the company at all. It seems that there is a lot of communication within the team further strengthening the earlier mentioned ‘outperform through collaboration’ principle:
“As I mentioned before it’s all about teamwork. We use project structures who have the ability of rich communication which is mainly face to face. We are very good with that” (Simulation Company Supervisor Transcript)

In the Simulation case study, no attempt is made to try and get other staff to fully understand the simulation and the Associate seems to be accepted as the specialist in the area:

“it’s a small company, everybody has their own line of expertise so there is not a lot of crossover” (Simulation Associate Transcript)

Some could argue, that this is typical for small companies on the contrary, there may be views that small companies have a higher degree of knowledge sharing. For example, the bone modelling simulation which simulate the effect of an implant to a bone over a period of time to see if the bone is getting stronger or weaker is highly tacit knowledge driven and the Associate states:

“….highly specialised skills that aren’t shared by many people”

“…we are all kind of interested in everything but everybody has their specific skill, there is some overlap but not a lot” (Simulation Associate Transcript)

This suggests that the cost pressure of communication overturns knowledge replication of highly tacit driven knowledge. This was already discussed in the transferability theme but shows that the firm was willing to spend considerable time and cost in the Associate gaining new tacit knowledge while playing less emphasis on replicating that tacit knowledge.

“Absorptive capacity of the company is good although it would be good to share some of the simulation knowledge to the wider team. The challenge here is time and company size. Other areas don’t need to understand the whole simulation to
use it but without understanding it all it is very hard to even try and use it. There is a dilemma here. Hence, we make sure its teamwork and the Associate gets involved as well” (Simulation Company Supervisor Transcript)

It seems that for relatively high tacit knowledge exchange the Associate and Academic Leader implemented rules to guarantee that the time and intensity needed for KT from AL to Associate was sufficient:

“me and [Academic Leader] sit down regularly and formally where we have regular meetings like weekly once” (Simulation Associate Transcript)

On top of that the AL and Associate also had ad-hoc meetings when needed. Furthermore, this ad-hoc approach, whereby rules and directives played a less important role, where used to form a much more agile way of handling knowledge integration:

“when it comes to interfacing with the rest of the company we do things in a much more informal manner” (Simulation Associate Transcript)

In fact, this case study is very strong on their overall flexibility and ad-hoc arrangements. Rather than having particular sequences or routines which found its way quite strongly in the KBV literature to achieve efficiency, there seems to be a lack of integrating mechanisms in favour of flexibility. The CS states within this context:

“This helps us immensely with overcoming problems as a team. Usually we have somebody who knows about a particular area to overcome a challenge. If not we come together and talk about it” (Simulation Company Supervisor Transcript)

Hence there seems to be a lot of emphasis on group problem solving when needed. The identified KBV-principle to ‘outperform through collaborations’ seems to create
a flexible and ad-hoc structure which can be used in a more formal way (routine dates to meet between AL and Associate) but also very flexibly on an ad-hoc basis:

“part of our success is that we don’t seem to struggle, if there is a problem you can get it across to someone, if there is a solution you can get it across to someone” (Simulation Associate Transcript)

This idea that you can talk to anybody at any-time in a flexible environment seems to be linked to the idea of using project teams and project environments:

“As I mentioned before it’s all about teamwork. We use project structures who have the ability of rich communication which is mainly face to face. We are very good with that” (Simulation Company Supervisor Transcript)

Hence, the identified KBV-principles (outperform through collaboration) enables a company culture where this type of flexibility together with the idea of group problem solving and decision-making finds a place.

One of the KTP objectives is also to disseminate the use of the simulation to other projects. It would be highly inefficient, to even try and transfer all of the knowledge the Associate has to other individuals, who only need to use parts of the simulation. Hence, a more efficient means of integrating the Associates knowledge into the dissemination process is by establishing a set of procedures ad rules and black boxing other parts of the simulation:

“various project students or interns we had in the company who have used this tool as well, who can use it to a slightly less extend so, are you familiar with a term a black box? We say a black box is at the bottom they have parts of it which are black boxed and other parts which they know how to manipulate (Simulation Associate Transcript)
This ‘black-box’ approach enables the associate to dis-function parts of the simulation and only give access to parts needed by a project. Rules and directives are then formed for the new user who only needs a more general lower complexity of knowledge base to make the simulation work for their process. Hence, increasing effectiveness within the knowledge integration process for the simulation.

However, if there is a problem which needs more input then the team seems to be very flexible to invest their time in an ad-hoc manner as already discussed above. Nevertheless, any problem solving to do with the simulation is down to the Associate who will be part within discussions concerning the simulation:

“Actually, while [Academic Leader] was talking to you earlier, we gathered around for 1.5 hours just discussing potential ways of solving a problem and I think that, if you have a specific problem that’s kind of how things work” (Simulation Associate Transcript)

There were similar remarks in the earlier discussed Crystal case study. Another example was given by the Academic Leader who talked about the patenting process. It was already discussed that the first patent application had to be re-visitted as the company did not really understand the patent process. Rather than trying to understand the patent process and its pitfalls, the company decided to get the Associate involved with a patent attorney who had to be externally hired in order to tab into the knowledge domain. The Associate communicated several days with the patent attorney to achieve enough common knowledge between the attorney and the Associate to be able to work together by achieving a relatively explicit knowledge base. The knowledge integration process was by group problem solving between the Associate and the attorney. The Associate produced some new explicit driven knowledge around basic patent processes and demands of different patent stakeholders by establishing some primitive common language. However, since the attorney was the main tacit knowledge holder, his aim was to make sure the patent would be accepted:
“[Associate] helped the patent attorney to tease out what was the novel and patentable aspect of what we done” (Simulation Academic Leader Transcript)

However, since the Associate spent a few days with the attorney discussing patent issues and trying to make it work for their project, there was a chance for the Associate to tap into some degree of the attorney’s knowledge especially because it was done for the Associate’s simulation in which some of the patent challenges could be contextualised within the Associate’s knowledge domain. I would describe the achievement based on my complexity of knowledge diagram (Figure 2) as relatively explicit which seems to be fit for purpose. The Academic leader describes this as:

“Great experience for the Associate as he could see how it was written and that was something that we brought back so I think we can do that more efficiently next time” (Simulation Academic Leader Transcript)

Hence, ‘Group problem solving’ seems to be the preferred integration mode when it comes to projects with a highly tacit nature even if the degree of knowledge exchange is kept at the lower complexity of knowledge level. This is surprising in some ways, as the KBV literature established group problem solving as the most expensive way to integrate knowledge. On the other hand it is also the least surprising as the intensity of knowledge communication is at its highest within a face to face, group environment.

The academic leader highlights that:

“You can’t develop a medical device by yourself as a single person” (Simulation Academic Leader Transcript)

The knowledge production process, although in this case study mainly aggregated within the Associate as an individual, needs different individuals to aid the knowledge production and integration process. Even when it comes to identifying potential risk
of some of the applications (for further development of the simulation tool) other individuals need to be consulted:

“We have individuals to brain storms of what we think risk are across the whole lifecycle. So all the way from the factory, to the surgery, to the patient using the device. We try and keep it individually to assess the risks and then we come together to compare what the individuals came up with” (Simulation Academic Leader Transcript)

4.2.5.1.3 - E-PLATFORM

From the outset, this particular KTP seems to have less struggle with the integration of some of the specialised knowledge. However, there was still a dependency noted by the Academic Supervisor when it comes to even more explicit knowledge domains such as user accessibility on the eLearning platform.

“If I could go back again, perhaps bring the resource staff in a little earlier in terms of the training in terms of the system before it actually goes life. Where we fall short, even in the first 4-5 years, that long after delivery, everything still goes back to the Associate. We got a user here who can’t access their learning. It went back to him, what we could have done better there was made that transition to the support team a lot better” (E-PLATFORM Academic Supervisor Transcript)

Another danger, which becomes apparent in the delay or failure of knowledge integration, is the bottleneck of knowledge and the dependency of the knowledge holder when it comes to more mundane tasks. The lack of common capability, in this case for even explicit driven knowledge might hinder the company moving forward in their development as the knowledge was not integrated enough. Clearly, the Associate who received freedom to specialise in the eLearning domain boosted the company’ bottom line with the new online market segment. However, as soon as the product went live, the Associate was sucked into the operational day to day running rather than widening the eLearning strategy. The Company supervisor realised this by
looking back into the project but at the time it was just the way the company was running:

“Because everything was going back to [Associate], of course [Associate] was becoming a support role which restricted his development time of the products. This is the problem, it becomes almost like a vicious circle. The more he did in terms of support the more people brushed it off to him and it leaves very little time to step back and to look at the whole system and thinking where do we need to go. We went through that way too long, we are talking years really. Its only for the last year or two hits that he step back and be able to rethink about a larger scale” (E-PLATFORM Academic Supervisor Transcript)

The result of losing the knowledge holder’s time capacity to further specialise in knowledge acquisition meant that the ePlatform became underdeveloped and the CA was short lived as competitors caught up with their own ePlatforms.

Therefore, there may be need for remembering a strategic approach to common capability within the team so that the burden for operational tasks to run a specific innovation can be taken by support staff who are not the knowledge specialists but should gain enough of the explicit knowledge to run the operation. An example for this is the Crystal case study who differentiated between engineers and technicians. There is a need for a KBV-principle to ‘create a diverse team with clear roles and responsibilities’ which will be further discussed in subsequent sections. Furthermore, this example strengthens the ‘Role of common knowledge’ and especially the commonality of specialist knowledge types.

As already discussed earlier, the Academic Leader had less involvement than the other two KTPs and therefore, no real analysis could be made for the process to integrate specialised knowledge as an act of coordination within the firm.
“The Associate had to understand what was going on with the coding, but he did mostly self-study for that part. He may have rewritten it and that’s why he didn’t ask me very much what was going on” (E-PLATFORM Academic Leader Transcript)

The whole KTP was done from one office base which means there was a shared location. Similar to the other KTPs this KTP also mentioned the relatively flat structure of the project.

“there were conversations happening in terms of a) understanding what the requirement is from different perspectives not just operational, but the business environment, competitive forces, who else is doing what and what are the technologies available for instance, why should be put one against the other. So there was evolution of some of that tacit knowledge if you like, both from that individual e.g. the KTP perspective as well as within the business so when you have that conversation you are creating some knowledge. Because someone brings an argument, you bring another one and someone else brings a perspective from the environment” (E-PLATFORM Associate Transcript)

This again strengthens the perspective identified by the previous two KTPs, that the ability to discuss things as a team through structured and unstructured meetings or informal discussions really helps the integration process. The emerging principle here is the emphasis to ‘communicate effectively and clearly’. This principle either fosters knowledge integrations or hinders it. The Associate also mentions the recognition of individual knowledge domains as an enabler for the integration process which seems to also be a common view from a KTP perspective and enables clear and effective communication.

As already mentioned, this particular KTP achieved a lesser degree of knowledge complexity. The company eventually established a workflow to communicate some of this knowledge:
“there was an element of training incorporated of how do we hand this feature or system on to the business as usual. Some of it involved some element of documentation but we never worked with 100s of pages of manuals. It was more workflow, here is two pages of high level information so we could evolve really” (E-PLATFORM Associate Transcript)

However, another challenge for the company was to do with communicating the importance and the need for a more online driven business:

“There would have been a lot of that conversations because you know any change leads to fear so there is a lot of stakeholder management from the outset I think” (E-PLATFORM Associate Transcript)

Most of the staff was with the company for many years and used to the traditional training approach. The new technology drive did not sit well and staff did not want to change and saw the online platform as a threat to their own work. So the knowledge integration process was hindered by the cooperation aspect which is discussed in the decision-making of the KBV rather than in the integration process. Nevertheless, the cooperation issue is vital in the integration process itself. Whereas the previous two case studies had a culture of innovation, this case study, was more traditional in its approach. Half of the staff have been with the company for 10-15 years so there is very little staff turnaround.

“Just over the last 2-3 years we started to bring additional people in to the company. As they come in, we tell them these are our products this is what you need to understand, so they learned very quickly” (E-PLATFORM Academic Supervisor Transcript)

The reason why they learn it relatively quickly is, as we discussed, due to the more explicit nature of the knowledge domain. Since, the ‘new blood’ came in, there was a shift in the support of the old staff too.
“which means that the people that been here for 15 years who were a little resistant to embrace these things, suddenly said I need to do this as well... I’m not just talking about admin staff I’m talking about trainers as well. Trainers writing those support material for the online learning and coming up with new content for online learning. Whereas not even 5 years ago they said I don’t agree with this online learning because they see it as a threat” (E-PLATFORM Academic Supervisor Transcript)

4.2.5.1.4 - Conclusion

The literature review assumption for this theme is:

Problem solving and decision-making in groups is reduced to unusual, complex and important tasks as the firm is maximising efficiency through the other formal integration mechanisms.

This assumption does not entirely reflect the analysis of the KTPs and is unaware of advanced team based structures such as intensive project environments in which the KTP is argued to take place.

The general issue is to find ‘the best’ or a ‘mix’ of mechanism for integrating specialist knowledge from individual knowledge domains. The first three mechanism identified in the literature review (Rules and directives, sequencing, and routines) are mechanism that needs less communication once in place. Rules and directives was apparent in e.g. the Crystal project on how the technicians had to bake the crystals which had plans, rules and procedures to achieve more efficiency in the manufacturing process by also achieving less communication. The same is true for the black box usage in the Simulation case study. Hence, more tacit knowledge driven tasks were limited to elements in which the other actors could use the product by only referring to more explicit driven knowledge.
Interestingly, the Simulation case studies also used some form of rules and directives between Associate and Academic Leader to strengthen communication intensity which is contradictory to the literature review discussion who would argue that such mechanisms are there to decrease communication.

None of the case studies focused attention on sequencing for any outputs linked to SCA. However, sequencing was used by, for instance, the Simulation case study to use the software for projects outside the KTP. The integration of specialised knowledge theme was mainly determined by group problem solving supported by having a shared location in all of the case study examples. The shared location, as an enabler, was not discussed within the literature review but played a crucial enabling role for those ad-hoc and unstructured meetings which were formed based on a particular problem.

The literature review argued that rules and directives, sequencing, and routines minimise the need for communication, whereas group problem solving is very rich in communication. Therefore, the literature review concluded group problem solving and decision-making to be generally less efficient and costly. However, for the KTP, group problem solving was fundamental to transfer and generate the new knowledge in order to fill the companies’ knowledge gap. The Associate is receiving academic knowledge from the Academic leader and company knowledge from the company supervisor to fill the KTP knowledge gap. Interestingly, group problem solving is used strongly at the beginning of the KTP to establish the needed knowledge base for the Associate and then should have decreased as other forms of integration mechanisms should have taken over to satisfy the assumption of this theme. However, the KTP has used group problem solving and a team approach as the main mechanism that achieved SCA throughout the project instead. Hence, the KBV-principle emerged to ‘outperform through collaboration’ and ‘communicate effectively and clearly’.

The case studies tackled troubleshooting by involving the knowledge holder through group problem solving in an ad-hoc manner and less emphasis was given to increase
integration efficacy over the three year KTP periods. The exception to this is the operationalisation of the technicians in the Crystal cases study and the black-boxing in the Simulation case study. However, both case studies still traded off efficiency against innovation. Those two KTPs were also classified as showing a very complex degree of knowledge. On the other hand, the ePLATFORM KTP which is classified as having a lower degree of knowledge complexity still used those ad-hoc meetings. There was not any evidence within the analysis that would suggest the use of formal routines in the KTPs and any routines that were built were formed through mutual adjustment because of their informal nature.

The analysis has shown, that group problem solving was the most important mechanisms out of Grant’s (1996) ‘four’ mechanisms mentioned in the literature review. The only other mechanism which was mentioned just as much to enable the integration of specialist knowledge was to do with the Collaboration aspect. The recognition that the knowledge holder received trust and freedom was mentioned several times in this theme and linking to other themes. This trust and freedom also replicated itself as ‘care’ to the overall team and its objective. The KTP Teams achieved better collaboration with the ability to communicate effectively. The analysis has even talked about social communication in terms of the ability to make jokes or see each other socially outside the firm setting. The Socialisation enabler has proven to increase the collaboration and as well as increasing the communication. The simulation case study in particular has highlighted this point several times.

The enabler such as ‘socialisation’ were discussed in the literature review as members feeling part of the firm. It was highlighted that the level of relationships of trust, degree of common value and the level of commitment to the task of the organisation are crucial. Due to the lack of management to control the socialising of members, its relevance was perceived in company activities promoting an awareness of the firm’s values by for instance, training programmes. However, no such link or any other link discussed in the literature review could be found. Although, the crystal study was inconclusive, both, the simulation and ePlatform case studies established
socialisation which followed naturally. However, the KTP context enabled an environment where there was a shared goal (filling the knowledge gap) which is discussed in the literature review to have a positive effect (Moreno-Luzon and Lloria 2008). Autonomy, trust and care seemed to be also linked positively in this context. The fact that the KTP has limited knowledge agents all working towards a common goal within a ‘project’ setting has also become an enabler in this context.

4.2.5.2 - The Role of Common Knowledge

The discussion in the literature review identifies five different types of common knowledge fulfilling different roles in knowledge integration. Therefore, the KBV assumption is that:

There is increased organisational gain in knowledge production if integration mechanisms involve common knowledge between individuals

The KBV literature highlighted that for knowledge integration to work there needs to be a degree of common knowledge. Therefore, the KTP case studies will be used to shed light into how and which types of common knowledge are leading to the integration mechanisms with the biggest impact on SCA.

4.2.5.2.1 - Crystal Case Study

For the Crystal case study, Language, Commonality of specialised knowledge and Recognition of individual knowledge domains were identified as being enablers to make this KTP a success. Other forms of symbolic communication were not mentioned within this context.

I already identified that the Crystal case study did not attempt to replicate the specialist knowledge from the engineer to the technician. This could be explained by
the lack of communality of specialist knowledge which I already discussed within Transferability and the ‘Integration of specialist knowledge theme.

“Different people have different skills. You need someone who will develop things. That person would always change stuff, so if you ask them to do 5 times the same kind of things and it doesn’t come out the same - they want to understand what’s going on. Then you need the technician who hasn’t got the knowledge but at least they deliver the same result again. You need the engineer and technician for this kind of work. You don’t want an engineer to do production and play with it and then get bored.” (Crystal Academic Leader Transcript)

The above quote strengthens the earlier identified KBV-principle ‘create a diverse team with clear roles and responsibilities’. This allows efficiency gains as there is no unnecessary build-up of common knowledge. Furthermore, a KTP environment is not under the business as usual company structure hence, the project structure of roles and responsibilities needs to be defined. Furthermore, the above mentioned recognition of individual knowledge domain which seem to be a challenge for organisations are somewhat minimised in a project environment. The Crystal case study already mentioned that there was a lot of team work which enabled the team to know each other’s skills in the context of the knowledge production process hence, there seem to be a strong ‘recognition of individual knowledge domains’ link within this case study. This is then also linked to the ‘Communality of specialised knowledge’:

“Communality of specialised knowledge is important. You need to know where everybody fits to make it happen.” (Crystal Academic Leader Transcript)

Furthermore, it seems to be that the major success factor was a certain degree of specialised knowledge. I mentioned that the key people involved were post doctorate who, all, had a common specialised knowledge base which increased their efficiency in communication:
“We were quite lucky on this one. [Associate] was my previous PhD student so he had background knowledge” (Crystal Academic Leader Transcript)

The importance of having a ‘shared meaning’ was also highlighted in the KTP context. The engineers and technician seem to have their own shared meaning and then enough ‘communality in specialised knowledge’ to work together. I also highlighted the importance of language which was mentioned several times within the interview e.g.:

“That made life a lot easier and he could speak the language” (Crystal Academic Leader Transcript)

“The Associate he had experience in lasers and he could speak the language” (Crystal Academic Leader Transcript)

I already mentioned that Crystal is a spin off company which further helped with the ‘Communality of specialised knowledge’:

“As this is a spin out company we recruited from people we knew eventually” (Crystal Academic Leader Transcript)

Although, not a lot of specific examples could be extracted to link back to the different types of common knowledge, the case study does illustrates that they understood the importance of the role of common knowledge when identifying a strategy to achieve the required knowledge production within this project environment.

4.2.5.2.2 - Simulation Case Study

For the Simulation case study, Language, Commonality of specialised knowledge and Recognition of individual knowledge domains were identified as being enablers to
make this KTP a success. To start with the Associate highlighted that although there is some overlap of knowledge, the specific skills are more important and isolated within individuals:

“we are all kind of interested in everything but everybody has their specific skill, there is some overlap but not a lot” (Simulation Associate Transcript)

The ‘Recognition of individual knowledge domain’ as a type of common knowledge was highlighted by the Associate. One obvious enabler, is the fact that the company as a whole is not very big. Furthermore, the CS also recognised that face to face communication enables rich communication:

“We have a particular good idea of who knows what as we have a lot of rich communication in project teams which overlap. We have a team culture. Also, I would say we are a fairly small team so that probably helps as well” (Simulation Company Supervisor Transcript)

Moreover, the company operates very project driven and members are sometimes interlinked in different projects with different teams, which aids understanding of individual knowledge domains:

“members of the company having to become more familiar through parallel projects” (Simulation Associate Transcript)

As this KTP originated from a collaborative research project with the university, the recognition of individual knowledge domains goes in this case beyond the company itself and is highlighted as a network of knowledge domains:

“Importance of understanding each other’s knowledge domains, is absolutely, it’s one of the real, one thing that we are blessed with is the network we got, not just with the company but with the university as well is that very often 3 or 4 of us can
sit down and say, we can see where the problem is going to occur what we don’t know enough about that area of whether it is an issue or whether we can avoid it” (Simulation Associate Transcript)

The already emerging KBV-principle introduced earlier is to ‘create a diverse team with clear defined roles and responsibilities’ which are linked to the individual’s specialised knowledge. This is highlighted by the AL who further strengthens this point:

“Recognition of individual knowledge, I think we have quite clearly defined team roles, we know how our team fits together” (Simulation Associate Transcript)

Furthermore, the idea that the KTP has a project structure with limited size and that it is over a considerable amount of time (2-3years) enabled the recognition of individual knowledge domains further. Also using a core group of individuals seem to be important:

“…that’s something we acknowledged in our reports and why we think its successful because it is an established relationship” (Simulation Associate Transcript)

As well as recognising individual knowledge domains it is also important to have some ‘Commonality of specialised knowledge’ to fulfil a role in the knowledge integration process:

“The common knowledge doesn’t have to be too closely related to the specific knowledge domain but having, so all of the company comes from an academic technical engineering background, so having that as a reference. To have communality of specialised knowledge to a certain extend and then the specifics if you break it down even further to the specifics of everyone’s knowledge aren’t the same but we have got that overarching communality” (Simulation Associate Transcript)
Hence, to have good communication it is not necessary to have the same specific knowledge but enough overlap of the knowledge domain to increase efficiency and clarity of communication. The relating KBV-principle was already discussed and the Company Supervisor adds further:

“*I would argue that if you don’t have communality in specialist knowledge you can’t really communicate or the communication process would take much longer and probably be less productive*” (*Simulation Academic Supervisor Transcript*)

Group problem solving was mentioned as the main mechanism for the integration of specialist knowledge process (previous theme). Since group problem solving needs to have effective communication it is not surprising then to see the commonality of specialist knowledge as a vehicle for effective communication.

Communality in knowledge helps to overcome barriers to transfer knowledge within the team. The case study achieves this by making sure that the whole team has a related scientific background. The academic leader also point to the importance to have some commonality of specialised knowledge:

“*several of the people have higher degrees especially in biomechanics which is what we focus around*” (*Simulation Academic Leader Transcript*)

Employing people with a degree in their fields seems straightforward and is most likely practised within most companies. However, the main enabler of such activity here is the enhanced communication ability between individuals which was already highlighted several times. This is enabled in parts because of the communality in specialised knowledge and the understanding of other individual’s knowledge domain:
“I think what is important is that we have that established relationship were we know a little bit about each other’s expertise, works, and I know a bit what the company is looking for” (Simulation Academic Leader Transcript)

It is interesting that the Academic Leader, who comes from the university, still feels like he understands the capabilities of different individuals within the firm and the company needs. This statement is very much linked to cartographic knowledge management were knowledgeable people in the organisation are accessible to others for advice and knowledge exchange. Hence it is not so much a knowledge repository but a gateway to knowledge instead. The knowledge is likely to be tacit and therefore, the key to identify who might be a source of knowledge is established through conversation and contact rather than repositories of knowledge which may contain inadequate knowledge (Earl 2001).

“I know perhaps slightly better than some academics when to stop going off on a very exciting academic exercise and when to actually draw it together into something the company can use, and that’s thanks to the KTP and to the fact that I was allowed to work with this company for a longer time” (Simulation Academic Leader Transcript)

One possible reason why the KTP is helping to achieve common knowledge and, in fact, the integration of specialist knowledge is due to the project structure with having individuals put together to achieve a common goal. Sharing some time together and having the freedom to work on solving a problem and achieving a goal is not often mentioned in the KBV literature but seems to be a common phenomenon of success in the KTP analysis so far.

A lesser degree of common knowledge could make the knowledge transfer process more challenging and more time intensive which has probably also some relation to the degree of tacitness involved. The company differentiated between knowledge domains and knowledge areas. Knowledge domains are very tacit knowledge driven
and need a high degree of specialisation whereas knowledge areas are more explicit and easier transferable. Emphasis was put to achieve commonality of specialised knowledge which had a lower degree of tacitness which the following quote highlights. It is important, to not see explicit and tacit knowledge as a fix entity but to use the complexity of knowledge (Figure 2) diagram created in the literature review.

“the knowledge on how to do them and I still say that there are fairly highly tacit but the conveying of the result and the conveying of the meaning of that result is much easier as the company has knowledge on what to expect” (Simulation Associate Transcript)

The strategy adopted in this KTP is to have the commonality of specialised knowledge in mind. A further enabler was a common understanding of statistical models from individuals which helped them to understand the black-box version. The development of the actual tool has already been highlighted as very tacit and highly personal to the Associate. Hence, it is argued that commonality of this specialised knowledge is extremely low. However, part of the KTP objective was to disseminate the tool within the company. To overcome some of the knowledge integration challenges the Associate ‘black boxed’ the tool tailored for each project used by others. Depending on the ‘black box’ configuration different individuals have different parts they have access to and learn how to manipulate:

“The tool that I’m writing today for this MA student, who is not particularly familiar with any of those concepts, that’s almost entirely black boxed with very little user input and that’s the strategy we not necessarily have chosen but found through necessity we had to adopted as we have various different versions of this methods of analysis that could be used depending on the level of user skill and at the top level is me, I have written it from the ground up and I know where everything comes from and everything else is kind of slightly evolved from that” (Simulation Associate Transcript)
The literature review already highlighted that with a high degree of separate knowledge bases the integration cannot occur beyond primitive levels and hence, knowledge integration may be counterproductive or very time consuming:

“\textit{The development side of this tool is much more isolated, that's kind of me and then the developed design and exploitation of this tool is much more understood by the company now}” (Simulation Associate Transcript)

For commonality of specialist knowledge to be effective, another type of common knowledge needs to be considered which is the ‘Language’ aspect. There is undoubtedly a link between those two, which is critical to make coordination within the firm a success.

“I think the reason why we made this a success of it is because we know how to communicate. As engineers goes we are relatively fluent people” (Simulation Academic Leader Transcript)

Interestingly, the company supervisor highlights the importance of language as an articulation tool to get a point across which again will enable effective communication:

“I would say it is equally as important to be able to articulate yourself and get your point across as it is to have some of the specialist knowledge needed to discuss” (Simulation Company Supervisor Transcript)

The Associate links the role of common knowledge mainly with the communication aspect as well. Within this context, he also mentioned the language aspect:

“I think the answer could more or less apply to all of them which is in instances where there is more of a common language, just the technical language not the national language or anything, yeah it massively, massively improves things it’s
very important attribute of communication is that people speak the same language and that’s a lot what we discovered when it comes to some of the more complicated methods that we use” (Simulation Associate Transcript)

The degree of common knowledge usually means that there is a degree of technical language overlap which is used by that particular field in general. This in turn strengthens communication efficiency and reduces error based on misunderstanding. The Associate highlighted barriers of communication with none experts in the field:

“Our main issue is that having the language to communicate it with none experts in the field. That’s even within the company” (Simulation Associate Transcript)

However, I will look into this in more detail when it comes to the discussion around decision-making and organisation structure and design. The Academic Leader describes language as crucial for exploitation:

“I say this is very important as it is about understanding how to put our science into language that is useful for exploitation in the real world” (Simulation Academic Leader Transcript)

Furthermore it is important for the Academic Leader to really understand what can actually be used by the company rather than getting excited in the blue-sky theoretical research aspects of it.

“it’s about how to put this regulatory path ways and commercialisation pathway’s into a language that I, as the academic supervisor, understand” (Simulation Academic Leader Transcript)

The knowledge based view usually discusses the term language from a technical language aspect. However, the Associate also differentiated between technical communication and social communication:
“If we step outside technical language communication but in terms of just social communication as well, speaking with people that you are comfortable discussing things with and know that you can understand things on roughly the same level, that also helps to aid technical communication as well, you can use other tools, other language tools to help explain” (Simulation Associate Transcript)

The main phrase here is “people that you are comfortable discussing things with”. As discussed in the previous themes the communication in this particular KTP is face to face with a high degree of interaction and, for instance, group problem solving or informal discussions with other members of the team. Hence, to have a better degree of communication social communication seems to be an enabling factor.

“So say I can’t explain to you something very, very idiosyncratic from a project, I can possibly draw analogies or use external references to help describe. Although, it happen a lot, much more important in our line of work is the technical language it’s an additional help to have personable social communication as well. It can be as simple, sharing jokes with people when you are not working, that actually helps losing it up a little bit to when you are actually working together and trying to communicate things. I don’t know how that fits exactly into your question there, I think it ties into your earlier question about communication is that we have got a very relaxed, informal way of communicating and that helps with the sharing of ideas” (Simulation Associate Transcript)

This social language dimension receives very little discussion in the KBV debate and is not considered in the original work. Nevertheless there is a lack in informal communication aspects which needs to be considered. So far, social communication could also be seen to aid technical communication by setting the right culture.

Another aspect which is discussed in the literature review is the importance of ‘Shared meaning’ as a type of common knowledge. Undoubtedly, a higher degree of shared meaning will make the communication more effective. In the previous Crystal
case study, the Associate linked shared meaning back to the language aspect. The same is true for the AL in this case study who sees the communality of specialised knowledge and the language aspect which are both types of common knowledge, discussed in the literature review, as an enabler to achieve a shared meaning.

“Shared meaning, I suppose that is a consequence of the other two I guess” (Simulation Academic Leader Transcript)

The literature review highlighted knowledge loss by trying to explain tacit forms of knowledge within explicit ways. However, the Associate also highlights a more social element of the shared meaning in terms of how you ask questions, what you mean by them. This probably links to the earlier social language discussion moving from a shared meaning position of specialised knowledge to a shared meaning of social communication:

“been able to communicate with somebody outside their specific job or project having a shared meaning and understanding the way somebody answers your question and understanding your question and what they mean by it is, we had a shared meaning in our KTP, it comes back to the thing, that part of our success is that we don’t seem to struggle, if there is a problem you can get it across to someone, if there is a solution you can get it across to someone” (Simulation Associate Transcript)

4.2.5.2.3 - E-PLATFORM

Similar to the ‘Integration of specialised knowledge’ theme, there was limited impact from the AL transcript to make any judgement on this matter. However, he mentioned the commonality of specialist knowledge and the language aspects as follows:

“So the detail was done by Associate so, he was communicating that in ways that CEO (Company Supervisor) understood. Again, that was quite important. These sort of project, it’s easy to have a communication gap when two people can’t find the
common language to use to convey what each other are doing. Because the Associate has some business background and CEO has some technical background as well” (E-PLATFORM Academic Leader Transcript)

However, since this is about eLearning platforms there was a degree of technical knowledge that needed to be understood.

“[Associate] and [Academic Leader] had a very good common knowledge and worked well together, and sometimes we didn’t know what they were talking about” (E-PLATFORM Company Supervisor Transcript)

The previous themes also analysed that the integration process between Associate and company supervisor was successful, there was a lack of further dissemination within the company. This was, in hindsight, because of the lack of common knowledge when it came to the technical aspect.

“I don’t think we were open enough in terms of sharing that knowledge properly, and almost translating that knowledge” (E-PLATFORM Company Supervisor Transcript)

This language barrier was hindering the knowledge integration process. Furthermore, there was a lack of commonality of specialised knowledge. The rest of the company somehow accepted that the Associate is doing the technical stuff and there was no drive from the company to get wider dissemination of the knowledge. We already discussed that the online segment of the company became the biggest segment so it is even more important that some of the knowledge should have been integrated further. In hindsight the company supervisor describes it as follows.

“We could have added an extra set of activities if you like to translate the technical terms and what would have been done so we had regular updates to the rest of the team so we had better shared knowledge of what’s going on and what was
happening. I think that would have helped the transition from the technical development into the business. Again, this is classic thing as well, we teach this stuff so it’s crazy that we didn’t do it” (E-PLATFORM Company Supervisor Transcript)

The role of common knowledge for this KTP increased after they recruited new staff into the company with some common language and knowledge within platform systems. Admittedly, this only happened years after the KTP was finished. Part of the problem was the isolation of this project and other firm members either not understanding the reason for the change towards an ePlatform or the fact that other individuals were uneasy about the change (mentioned by Academic Supervisor). The company is now in a position where the whole organisation has caught up with the ePlatform.

“Most people in the organisation now know how that all operates, they know the terminology I think the transfer of knowledge from a support point of view for the KTP delivered is resonated throughout everybody in the organisation” (E-PLATFORM Company Supervisor Transcript)

The company already has more than 20 years of training experience when it comes to products such as PRINCE2. Although some of the learning concepts changed from a face to face training aspect to an online training aspect the common language for training itself did not change that much. However, the only challenge was to communicate some of the ideas for an online environment which is a different context:

“whilst you could pass on the knowledge that you understood in that moment in time and articulate that in that context but applying that into a different context required a little bit more evolution from the person receiving it as well as a business” (E-PLATFORM Associate Transcript)
4.2.5.2.4 - Conclusion

The literature review assumption is that:

There is increased organisational gain in knowledge production if integration mechanisms involve common knowledge between individuals.

This assumption does reflect the analysis of the KTP case studies and sheds light into how and which types of common knowledge are leading to the integration mechanisms with the biggest impact on SCA.

Interestingly, the two KTPs who established an SCA highlighted the importance of team work. The Crystal case study mentioned this several times as well as the Simulation case study, who linked the team work effort to rich communication which happens face to face. Another enabler to establish and increase common knowledge is the limited size of the organisation as a whole. All KTP case studies are small companies and the Associate and Academic Leader in the Simulation case study referred to the size as an enabler for the common knowledge types especially shared meaning, recognition of individual knowledge domains and commonality of specialised knowledge. Furthermore, all case studies explained or referenced, within the role of common knowledge, the idea of effective and clear communication as well as knowledge production. Therefore, knowledge production (creation) and knowledge integration (transfer) does not seem to be viewed differently as some of the literature may suggest (Grant 1996, Krogh 2002).

Barriers in the ePlatform KTP to effective integration was lacking on four out of the five types of common knowledge. Recognition of individual knowledge domains was not a barrier as the Associate was clearly identified as the knowledge holder. Only years after the KTP had finished and after employing several people with an ePlatform background, did the case study achieve to increase its degree of common knowledge in eLearning. As the critical mass of individuals sharing common knowledge
increased, the overall common knowledge base of the firms’ individuals increased over time.

On the other hand, the Simulation case study did not struggle as much with the knowledge integration of the simulation operation of the black-box. The black-box is using the directives and standardisation mode of integration to lower the overall complexity of the simulation, however, the black box operation itself can still be viewed as having a higher complexity of knowledge than the ePlatform KTP. Nevertheless, the Simulation knowledge integration was less challenging as the other individuals were highly skilled with a good level of symbolic communication (e.g. statistical understanding and numeracy) which was important to make sense to the simulation outcome, as well as the other types of common knowledge.

Hence, I would argue to view common knowledge as a strategic pre-requisite for more effective knowledge integration mechanisms and knowledge production.

The Simulation case study described the common knowledge as a basic overlapping skill set that advocates ‘symbolic communication’, ‘communality of specialised knowledge’ and ‘shared meaning’ that was considered by the KTP projects when recruiting the Associate. The ‘language’ as a type of common knowledge is strengthened when individuals have a similar background. However, assuming that background diversity adds to a more complex and innovative creation of individual knowledge bases highlights a potential dilemma between common knowledge and diverse backgrounds.

Within the analysis so far, I already highlighted that group problem solving was the primary mechanism for knowledge coordination that lead to SCA. In light of common knowledge this would strengthen that group problem solving is a way of team building which in turn is a distinct knowledge-creation activity to build further common knowledge. The crystal and Simulation case study already linked small sized organisational structures to increased common knowledge. Appealing to my own
personal experience, I would argue that small organisation structures can be achieved by projects (such as a KTP) and even with diverse background of individuals a common ‘project language’ emerges and could be positively reinforced. Hence, positively affecting the other types of common knowledge, including the recognition of individual knowledge domains in which team members sense other team members’ capabilities. Therefore, I see organisation capability which will be further discussed in the next theme section, as an act of strategy that a manager can influence by considering ‘common knowledge’ as a pre-requisite for the integration of specialist knowledge aspects. Unlike most of the literature which views knowledge creation (production) as separate from knowledge integration, I conclude that such differential view, although logical, is counterproductive. Spender (2002) shares this view and highlights that Grant (1996) was unclear if coordination activities requires the generation of new knowledge while concluding that integration requires additional knowledge creation. Considering my earlier observations, I support this and go a step further and claim that any strategic KBV should consider group problem solving and decision-making as a main activity, not just for knowledge creation but for knowledge integration as well. The literature review argued that a firm should try and use as many formal integration mechanisms as possible, such as rules and directives and sequencing, as they are a cheap and generally effective integration mechanism economising on knowledge transfer and redundant communication. Grant argues in the literature review that knowledge transfer is not an efficient approach to integrating knowledge, which may be the reason the common literature concentrates on more formal integration mechanisms. However, there is a danger for companies to be side-tracked by the pursuit of effectiveness when it comes to strategic knowledge creation and integration. Instead, the case study analysis suggests that focus should be given to group problem solving culture to increase common knowledge as a team and allow for continuous improvement. There should be freedom for a project language to emerge and the organisation to ease the integration of potential new team members with similar or diverse backgrounds.
4.2.5.3 - Organisational Capability (Scope of Knowledge Integration)

This discussion is very much linked to the role of common knowledge and the integration of specialised knowledge and hence the outcome of knowledge integration. The structure I used for this theme is slightly different as it is not divided into the separate case studies and earlier discussion made, will be used to conclude the organisational capability theme. The Crystal case study suggests that:

“The supervisor and the Associate and the company needs to be able to absorb it and have common knowledge.” (Crystal Academic Leader Transcript)

The quote above links the organisational capability to the absorptive capacity of the individuals involved and the ability for the actors to communicate effectively. The ‘Specialisation in knowledge acquisition theme’ already discussed this. The point is, if the main knowledge component to create competitive advantage is tacit knowledge and if tacit knowledge lies within individuals then any organisational capability discussion becomes more challenging. Although there is no direct evidence to Gant’s original assumption that complexity of a capability depends critically upon the scope of knowledge which is integrated, it is evident that for problem solving purposes for example, when the Simulation Associate cannot solve a specific problem on his own, there is a reliance on other knowledge actors to establish group problem solving. Hence, organisational capability can be criticised as a misleading term as it is the absorptive capacity and tacit knowledge of individuals who form a capability. Hence, a KBV strategy should concentrate on the accessibility of individual knowledge domains if and when needed. To see individual knowledge domains as ‘organisational capabilities’ somehow indicates that the knowledge has idiosyncratic isolation, however the academic leader in the Simulation case study suggests:

“there may also be some group knowledge, so taken one out the group wouldn’t collapse but if you take two out the group, it may collapse” (Simulation Academic Leader)
This ‘group knowledge’ suggest that the key to form a key capability is to have effective communication and knowledge integration of groups, either inside or outside the organisation. The quote above also shows the danger if individuals should leave the company. Even in group capabilities, when based on highly complex knowledge, it is unlikely that all group members have replicated all of each other’s knowledge. This means that the loss of an individual knowledge base may already be substantial to weaken the group capability. The KTP case study capability is not ‘of the shelf’ but needs knowledge transfer and new tacit knowledge production by the Associate to fill a knowledge gap. This Knowledge creation makes the capability very unique and innovative and hence, it would be unlikely to recruit somebody else who could just fill the gap in the company if the knowledge holder is no longer available.

The case studies suggest that the ‘Organisational capability’ should be seen as the integration of different individual capabilities to integrate knowledge for a specific outcome using the ‘Integration of specialist knowledge” theme.

The term ‘organisational’ capability implies that the knowledge is accessible within the firm and therefore, be readily available for any individual to access. This makes the use of the ‘organisational’ capability independent of specific individuals. However, my thesis discussion so far has already shown that any knowledge which does not take the individual into consideration would be highly explicit knowledge and purely data or information based. However, I already dismissed codified and explicit knowledge as enabling a sustainable competitive advantage in the literature review due to its nature of being easily copied. Furthermore, the use of explicit knowledge to form advantages which is part of the ‘Knowledge Management’ literature and the technological discussions around it are outside the scope of this study.

**4.2.5.3.1 - Conclusion**

So far, the case studies suggest that the high level of knowledge integration is due to the high level of common knowledge which is also in line with the literature review. The main assumption within this theme identified in the literature review is:
The more individuals are used to broaden the integration of knowledge scope within each capability the more difficult imitation becomes.

The literature review discussed that ‘broad scale’ integration creates greater causal ambiguity, which is in turn one of the main reasons for the lack of empirical research. The idea that ‘broader scale’ integration creates greater causal ambiguity which in turn strengthens the firms competitive positioning as the knowledge is harder to imitate sounds, at glance, very logical.

Grant (1997) argued that the complexity of a capability depends critically upon the scope of knowledge which is integrated. This has led several authors to link the complexity of a capability to the number of actors involved. However, the analysis of the case studies, so far, showed a different picture. As mentioned earlier, the Simulation case study shows a very limited number of actors. The Associate produced new knowledge in the creation of a simulation tool which has overcome current challenges of new design ideas and the implications on safety which need to be done prior to clinical trial. Undoubtedly, this has led to a quicker turnaround and higher degree of innovation and opened many more possibilities, some of which are still confidential. The analysis also discussed that the Associate to this is key which means that without the Associate’s knowledge the company could not operate at the current pace. I already established that the case study has a very high degree of knowledge complexity due to the Associate’s aggregated tacit knowledge base in the knowledge integration process, which lasted three years.

Grant’s reference to scope which he sees as the breadth of knowledge could not be linked to the complexity of a capability within my case study analysis. It is the depth of knowledge integrated which formed the complexity of a capability. Furthermore, the actual meaning in size for the word ‘board’ is not discussed in the common literature. However, the implication is that broad scale integration suggest, that whole company functions (e.g. marketing and R&D) involving ‘many’ individuals lead to breadth of knowledge, which in turn may have the risk to show lower levels of
common knowledge between team members. This assumption that organisational capabilities, which require a greater breadth of knowledge supposedly show lower levels of common knowledge between individuals cannot be discussed within my research constraints nor does it seem to be of any critical impact within a KTP environment. KTPs are not meant to have a huge number of individuals involved which is one of the reasons why KTPs are a strategic research fit environment for this study. For instance, in the Simulation Case study the main project team was the Associate, the design engineer who is also the MD and acted as the company supervisor, the R&D engineer and the academic leader. The competitive advantage is achieved because the key knowledge benefiter gained a very high level of tacit knowledge and therefore, reached high complexities of knowledge. This suggests that greater causal ambiguity may not only be achieved by ‘broad scale’ integration but by the amount of complex tacit knowledge integrated or produced. Hence, I think that there is an important breadth vs depth of knowledge integration discussion for the literature to have. This is a somewhat different view to Grant’s original discussion. In short, I argue that the robustness of a capability is not dependent on the size of knowledge actors involved created the capability but on the degree of tacitness achieved by the individual(s).

Linking this back to my degree of knowledge diagram (Figure 2) which has been created for this purpose of illustration, true complexity can only be achieved by the amount of tacitness created by the individual or group of individuals. Hence, I would like to rephrase Grant’s definition to the following: The KBV should view organisational capability as the outcome of knowledge integration and production of disparate specialist knowledge domains into one or more individuals whereby the complexity of a capability depends upon the depth of knowledge achieved which has been aggregated by such individual(s).

Grant further argues, that organisational capability from a KBV is linked to the complexity of a capability which is critically dependent on the scope of the knowledge of many individuals. This analysis section highlighted disagreement of an
organisational capability view in the KBV. I argue, that organisational capability is the capability of the individuals to make sense of their own knowledge base in the reality of the organisation. A football player could be a star player in one team as he understands the ‘organisation’, meaning the skills and preferences from other players, their endurance, and their overall style. For example, offensive or defensive, the managers’ preconceptions and the particular likes and dislikes of the fan base to cheer. This means the player does not just perform on his own but performance is reliant on the organisational context as well. This background knowledge could be argued as part of the role of common knowledge which may explain why some players underperform when switching to another team. Their own skillset which made them a star player has not changed but the organisational context has.

The literature already argued that Grant (1996) neglected the consideration that knowledge integration may need new knowledge production as common knowledge which needs to include the organisational understanding and the formation of group based common knowledge of the knowledge actors working on a specific goal. Therefore, I argue that organisational capability is dependent on the role of common knowledge as a prerequisite to achieve knowledge production and integration that can be linked to a specific benefit.
4.2.6 - Organisational Structure/Design

The KBV literature review highlighted the ‘Role of hierarchy in decision-making’ and ‘Location of decision-making’ as the two themes in the discussion of organisational structure and design. The Organisational structure and design theme assumption is:

Knowledge production, coordination and decision-making put emphasis on efficiency and therefore, organisational structure and design will be determinant to success

4.2.6.1 - Role of Hierarchy in Decision-making

The main assumption within this theme is:

If a firm is integrating knowledge which is possessed by individuals in tacit form, then hierarchical coordination will fail

4.2.6.1.1 - Crystal Case Study

Current good practice in project management methodologies would stress the importance of buy-in from the senior level (PRINCE2 2017, AgilePM 2015). However, in this case study the former CEO did not take the views of the knowledge specialists into account and was driven by the market opportunity to tackle the laser market rather than focusing on the crystal manufacturing. Hence, this decision was based on hierarchical decision making and therefore, resulted in a centralised decision. The CEO made that decision without really understanding the technology, nor the problems or restrictions, which I have already discussed. The CEO also ignored the advice from the knowledge specialists and ‘forced’ the project onto the team. It is clear from the interview that there was no team buy-in for this new strategic direction:
“So he basically said we are going to do this and ignored the advice from the technical team and we sat there thinking it’s not going to work and he tried to force the issue” (Crystal Academic Leader Transcript)

The implication here is that cooperation was affected as the lower-level team showed very limited buy-in. The word ‘forced’ further strengthen this observation.

The company had to realise after some time that this drive and the decision to change the original scope of the KTP did not work. I cannot say for certain how much the possibility of cooperation issues and the divergent goals between lower-level and higher-level played a role in this failure. However, there is a real possibility that the relatively high complexity of knowledge involved gave the team a leverage in their defence to explain the failure. The CEO left shortly after.

The above discussion indicates how a typical hierarchal structure failed for tacit driven, highly complex knowledge and effected efficacy in the production of company outputs. This is in-line and therefore, strengthens the literature review discussion which indicated that decisions centred on highly complex tacit knowledge is immobile and hierarchy will impoverish the quality of decisions. This also links to the Location of Decision-making theme which will follow in the next section.

The CEO’s main driver was to achieve increased market positioning. The AL describes the change in project scope as:

“Mainly driven by the CEO who was trying to get a bigger chunk of the market rather than sticking to what we thought we could actually achieve” (Crystal Academic Supervisor Transcript)

It is clear that this theme has to include the coordination and cooperation problem to achieve success and efficiency. Divergent goals of individuals and therefore, failure to align principal, agent or task was discussed in the literature review. This challenge,
mainly discussed between principal and agent, needs some clear attention between task and agent as well. Hierarchical structure, in this case, is used to make sure that the strategic idea of top management is communicated down. However, the Crystal case study illustrates the danger of such approach in a highly complex knowledge driven environment. Here the overall strategy and scope change failed because of immobile lower-level knowledge which adversely influenced the strategic decision-making process.

4.2.6.1.2 - Simulation Case Study

So far, the case study analysis has highlighted, that the Associate is very much the main knowledge holder for the development of the tool and its modification. The only other person who seems to understand parts of this is the academic leader. As in the Crystal case study the main distinction will be between the two main problems, coordination (technical problem) and cooperation (divergent roles of individuals) problem. Overall the Associate describes the KTP as:

“\textit{I would describe it as a fairly flat structure (Simulation Associate Transcript)}”

This is also true from the AL perspective who described it as follows:

“\textit{again it is a relatively flat pyramid of Simulation and the MD listens to us and helps us to generate the evidence that we need to inform our decisions}” (Simulation Academic Leader Transcript)

Within the ‘Coordination’ problem, the Associate agreed that he is allowed to make more decisions himself where the knowledge is based on the tool itself and hence more tacit knowledge driven:

“\textit{yeah absolutely, that’s definitely part of it as its very hard to explain. I think everybody in the KTP team understands what this tool is being used for and why we}
are doing it, but to varying degrees do they know the mechanics of it” (Simulation Associate Transcript)

However, another interesting aspect is that the project structure itself for the KTP also includes the MD of the company who acts as Company Supervisor for this KTP project. A traditional company structure would normally delegate from the owner, to the senior team, to the middle management team to the lower team levels. However, the case study company is different to a traditional approach:

“Because there isn’t a strict hierarchy, everything is much more discussion based” (Simulation Associate Transcript)

This is also true from the AL perspective:

“So there would be a conversation between us and, where they would be guided by the evidence that we can provide from simulations and physical tests whether or not we think something is usable” (Simulation Academic Leader Transcript)

The CS also strengthen this and differentiates between operation and commercialisation.

“Operational activity is Associate and Academic leader. Commercialisation is mainly under my decision. However, we tend to discuss things before we make decisions.” (Simulation Company Supervisor Transcript)

I already mentioned that the commercialisation aspect of the project was based on lower levels of knowledge complexity. Hence, the hierarchy and the decision-making aspect (next theme) are in line with earlier literature review considerations.

I already discussed, under the ‘Integration of specialist knowledge’ theme, that discussion and group problem solving help the knowledge integration process and
decision-making. Having access to the right tacit knowledge holder has been highlighted as ‘immensely’ important. There is a generalisation in the KBV literature that assumes that technical knowledge is mainly embedded within operational staff and not with management. Although this may be true for many examples, it may not be always the case. Recognition of individual knowledge domains was discussed under the role of common knowledge and traditional hierarchies were seen to lack communication, which can be explained by the lack of intensity of interaction between substructures. However, in this case study the Managing Director is part of informal discussions and problem solving, especially if it is within his expertise area. He has a clear role as the CS within the KTP project.

“And then the ability to approach people with that specific knowledge and occasionally it is that someone that within the company, like [name] (MD) has got an unbelievable knowledge in a lot of engineering fields, like really more so than everybody I have ever met. More so then not, I say let’s go to speak to [name] about it these things but it’s not always him…” (Simulation Associate Transcript)

This borrowing of knowledge to the KTP team structure was throughout the KTP. Hence, this seems to link to the specific literature review discussion, which argued that the challenge for team-based structures is, that membership needs to be fluid as their knowledge base may be needed in different teams. I argue that project management as a team-based organisational structure has two advantages. One, this ‘structure’ shows high intensity of communication as any hierarchical structure would assume. Two, it can be used non-hierarchically, which also permits an organisation to access lower-level and higher-level knowledge in the same structure and furthermore, supports multiple memberships within different projects, supporting a knowledge based capability view of individuals.

However, linking coordination to the cooperation aspect, shows that even within a flat structure there may be divergent goals of individuals:
“I would say that we know that there are various people that we have to keep happy, self for one, make sure we are happy with what we are doing, the government and there are project stakeholders involved, so the hierarchy of decision-making ultimately I would be happy to defer an explicit decision-making process to someone else if they had a strong feeling one way or another to balance a particular decision with respect to those three categories, so something that necessarily make us happy as a project team may not be the same thing that makes the people happy that are funding this, or the stakeholders or the government because we have got obligations to them” (Simulation Associate Transcript)

Not surprisingly, the senior team is mainly motivated by the bottom line whereas the R&D team is very much motivated by the research itself. The academic leader gave a typical example where the senior team wanted a big overall solution to make money quickly:

“they wanted a statistical model for each and we have to say well in 2 years we can deliver you one really good one for everything at the front portion of the mouth where all of the teeth just have one route, but if you want to have a statistical model for all of the back teeth as well - which have 3 routes. We can work on this for 12 years and if you want all of them at once, it wouldn’t happen” (Simulation Associate Transcript)

The team had an open discussion about expectations and technical feasibility and decided that the business incentives was for the front teeth as patients are more concerned about front teeth than the back teeth, purely because of aesthetic reasoning. Hence, the flat structure and the high degree of complex knowledge environment meant that ‘group problem solving and decision’ making was favoured again. The decision, such as, which part of the mouth to start with has a fairly low complexity of knowledge and was ultimately made by the senior team. So the lower-level team could not just decide to work on the back teeth because the research element may be more interesting.
However, interestingly, even very explicit low knowledge complexity driven decisions is made as a collaborative team decision which is very much linked to the earlier identified principle “Outperform through collaboration”. On the other hand, once the strategic direction was set, the team was allowed to take sole control. Hence, this case study very much overcomes the cooperation challenge by using rich and open discussions and by achieving consensus in the wider project team.

“I believe that our staff has less conflicting views as to what is important for our company. We are all very innovative people and like the challenge but we also understand that if we don’t have anything commercial by the end of it we have no job. I’m always very honest with the team and I trust the team” (Simulation Company Supervisor Transcript)

Interestingly, just like the Crystal case study which is also highly tacit knowledge driven, decisions are often based on ‘trust’. There is however, an appearing danger, that the knowledge holder could potentially influence even very strategic decisions based on individual goals rather than company goals:

“People who only understand it from a top level, without going in and explaining it from the very bottom level up, don’t understand where the bottle necks and the problems come from and if you explain the problem, they don’t have the context of actually what that means and why some parts of it are more difficult than others. So it raises communication, not issues, but you got to be tactful what and how much information you disclose otherwise you end up all going backwards because you just don’t have the same foundation and understanding” (Simulation Associate Transcript)

Although the Associate highlights that discussions raises communication, there is also an undertone of how much information should be communicated from the tacit knowledge holder. From a negative point of view, the Associate who is sometimes very new to the company might have high levels of decision power or high levels of
decision influence due to the high tacit nature of the project and the opportunity to
withhold information.

A strong KBV assumption is, by default, that the knowledge specialist will be the
better person to make the decision rather than trying to transfer tacit knowledge and
loose important knowledge aspects in the transfer where instant decisions are
required. As a minimum to overcome the barrier for vertical knowledge transfer, the
knowledge holder should be present and integrated which can be easily achieved by
project structures, as already highlighted. Hence, the case study seems to have a
knowledge exchange strategy, whereby the higher-level should clearly communicate
cOMPANY GOALS TO MAKE SURE THAT THE ASSOCIATE CENTRES DISCUSSIONS WITH THE COMPANY
goals in mind. There could be a continuation strategy, where managers could judge
the team knowledge of company alignment and decide to either rest the decision
completely with the relevant specific knowledge holder or as a minimum integrate
them through the mechanism of group problem solving which is the favoured
mechanism of the cases studies.

4.2.6.1.3 - E-PLATFORM

There was no sign for any of the parties to have had divergent roles and therefore
there is not much to contribute to the cooperation issue identified in the literature
review from this perspective.

However, it should be noted that decisions were made by and large from the
COMPANY SUPERVISOR OR SOMewhat UNDER HIS CONTROL WHICH IN TURN, ACCORDING TO THE
literature review would have less cooperation problems and is based on hierarchy.

Interestingly the company used some ‘Routine‘ in the decision-making process which
also effected the ‘knowledge integration process‘. Any major decision was done by
the Associate and Company Supervisor coming together and the Associate explaining
the issue or the next possible move. The Associate usually comes up with three
options and his recommendation before the Company Supervisor took the decision.
"It was a relatively flat structure open doors, you came out with a proposal saying, look here is an idea here are the three options and here is my recommendation. That was the general approach" (E-PLATFORM Associate Transcript)

The associate was clearly involved in the decision-making process however, the routine process came across as less discussion based (compared to the other KTPs) but more process based. This also indicates that the knowledge to be integrated, to make a decision, was transferred relatively easy when compared to the previous two case studies. The previous ‘transfer’ theme identified that the knowledge complexity achieved for this case study was comparably lower. Hence, it could be argued that a more central decision is still in-line with general KBV assumptions.

The above quote also mentions the flat structure and open door policy which suggest that it is not a problem to approach people. Like the Simulation Case study, the ePlatform case study also has the MD as the Company Supervisor which strengthens the flat structure straight away and shows the importance of the KTP from a company’s perspective. Therefore, even this case study is considering the minimum involvement discussion to overcome the barrier for vertical knowledge transfer as the knowledge holder (Associate) is present and integrated in the decision-making process. The flat structure and reporting was described by the Associate to be fit for purpose:

“I think is very effective, we sort of evolved a model that worked where there was enough reporting, without being too much” (E-PLATFORM Associate Transcript)

We already know from the analysis of the previous two KTPs, that trust was a major enabler to keep the hierarchies flat with relative big decision power for the Associate.

“One of the challenges for the KTP was that [Company Supervisor] had to trust what we were doing, he knew what we wanted was the online learning but he had no access to the technology didn’t really understand about online learning either, just
wanted it to be done, so he shared an awful lot of TRUST to myself and particularly Associate” (E-PLATFORM Academic Leader Transcript)

The Academic Leader also mentioned that he had been involved in KTPs where the lack of trust was a reason for failure:

“I have been involved in KTP were that was not unanimous in any case and that’s not helped. Associate been undermined all the time” (E-PLATFORM Academic Leader Transcript)

The eLearning environment was the idea of the newly established MD who was also the company Supervisor for the KTP. So there was no lack of buy in for the project from the MD’s point of view. However, the old MD (his father) and some of the other directors had their reservations with the new eLearning drive. There was a fear of making a wrong strategic decision:

“So the biggest risk was, will this cannibalise the existing business and that was a legitimate question to ask you know. If you can do something for half the price you know but the observation since then was the classroom business is actually increased because of the exposure it provided, it is easy to say afterwards when it happens and when you making those decisions fear is an important element that you do need to factor” (E-PLATFORM Associate Transcript)

The element of fear is of course also linked to the decision-making which will be discussed in the next theme.

4.2.6.1.4 - Conclusion

The role of hierarchy theme assumption is:

💡 If a firm is integrating knowledge which is possessed by individuals in tacit form, then hierarchical coordination will fail
The KTP analysis has strengthened this point raised as an assumption within the literature review.

All KTPs have shown a relatively flat structure. In fact, in all KTPs there is also strong involvement from the senior management mostly the CEO. This could be because of the significant and importance for the KTP to the company. Whatever the reason, the outcome of this cooperation is the intensity of interaction between top level management and the Associate at the lower end. Simon (1981) highlighted that interaction within a substructure is more intense than between substructures which also implies that for traditional functions, the high-level structure would not benefit from intensive communication. This challenge was resolved by using a project structure which included a higher-level senior management individual and therefore overcoming some of the vertical knowledge transfer barriers by combining higher- and lower-level individuals within a project based team-structure.

Furthermore, the case studies highlighted that strategic decisions that could be made using a higher degree of explicit knowledge, were generally made at higher-level, whereas decision with a higher degree of tacit knowledge was done by the tacit knowledge holder and therefore by the lower-level. However, there was no central decision as such as in all case studies a higher-level individual was a member of the project team. The only example in the Crystal case study where this was not followed (at the beginning of the KTP) resulted in inefficiencies of the overall project output and the KTP was eventually shaped in the direction led by the tacit knowledge holders.

Another observation in the case studies is that coordination is best achieved through the direct involvement of specialist individual knowledge, in which the case studies used primarily the mechanism of ‘group problem solving and decision-making’, which therefore favours the team-based organisational structure discussion in the literature. The only exception seems to be the e-platform case study which has a routine process for decision-making whereby the associate seems to be able to explain the knowledge
needed to the company supervisor. The analysis also mentioned that this particular case study achieved lower levels of knowledge complexity which possibly explains the success of this process.

Although, the Simulation Associate highlights that discussion raises communication, there is also an undertone of how much information should be communicated from the tacit knowledge holder. The potential disadvantage highlighted, was that the Associate, who is sometimes very new to the company, might have high levels of decision-making power or high levels of decision influence due to the high tacit nature of the project. However, I could not spot any negative influence made by the Associate within the case studies. The case studies highlighted, that the knowledge specialist is the better person to make the decision rather than trying to transfer tacit knowledge and loose important knowledge aspects in the transfer where instant decisions are required.

To overcome coordination issues, the decision maker is in a dilemma to either go through intensive knowledge transfer mechanism which, will be face to face, timely and costly; or to make decisions based on potentially insufficient knowledge or decentralising the decision to the knowledge holder who may not be aligned to the company goal and understand company direction. As a minimum to overcome the barrier for vertical knowledge transfer, the knowledge holder should be present and integrated in high-level decision-making which requires complex knowledge domains. Hence, the Simulation case study seems to have a knowledge exchange strategy whereby the higher-level clearly communicate company goals to make sure that the Associate (knowledge holder) bases discussions with the company goals in mind. The emerging KBV-Principle is to ‘focus on benefits’. Once the higher-level has communicated the benefits, they would like to achieve from a strategic point of view, the project team can translate this benefit to project outputs. Therefore, this could link to another KBV-principle to ‘manage by exception only’. This means, that as long as the team can deliver the outputs within the time, cost, and quality targets, the team should receive autonomy and trust to deliver the output.
4.2.6.2 - Location of Decision-Making

The main assumption within the literature review for this theme is:

Co-location of decision-making will produce better decisions if the nature of the knowledge is in tacit form

4.2.6.2.1 - Crystal Case Study

The earlier discussion on the ‘Role of hierarchy in decision-making’ very much links to the challenge where the location of decision-making should take place. The Crystal case study very much strengthens the point of co-location made in the literature review discussion. At the beginning of the KTP project, the CEO decided to build the whole laser rather than the crystal itself. Concerns by the Knowledge Specialists (AL and the five laser post doctorate physicians) were not listened to. The CEO got sidetracked by the market opportunity and mandated a new direction without consensus from the knowledge specialists. The academic Leader commented following in this regard:

“It is possible that most companies who have done it never made any money out of it. It is possible to build but then it comes down to stability and reproducibility. With infinite resources, we would have achieved it but it was too ambitious for that point in time.” (Crystal Academic Leader Transcript)

Considering this failure of making the right decision, a KBV-principle emerges to 'Use a knowledge Based approach for decision-making'. The following case study discussion will further highlight what this means.

The initial drive by the former CEO supported a traditional centralised decision-making process which was led by market opportunity. However, the KBV discussion argued that for complex tacit driven knowledge decisions a co-location approach of decision-making delivers better quality decisions where tacit knowledge decisions
should be decentralised. As the first attempt of the KTP failed to produce any usable outcomes, the assumption about the quality of decisions in this case is strengthened. Furthermore, the AL who is also part of the company (due to the company’s nature of being a university spin-off), gained full decision-making power and was allowed to make any subsequent decisions about the KTP with complete autonomy.

This strengthens the literature review discussion around the KBV of the Firm as it unveiled that failure and success is very strongly linked to the location of decision-making. It is also interesting to note, that within a knowledge intensive project like this particular case study, the CEO left shortly after the failed strategic move. However, it is inconclusive, in my analysis, if this move is directly related to the failure as I did not receive any further comments on this.

From a Crystal case study perspective, the earlier assumption that co-location of decision will produce better quality of decisions is true and centralised decisions based on highly tacit knowledge and therefore a high complexity of knowledge turned out to be counterproductive.

4.2.6.2.2 - Simulation Case Study

Just like the Crystal case study, the Simulation case study also very much strengthens the point of co-location. As a starting note, and from the Associates’ point of view, the decision-making process was fit for purpose:

“I think the decision-making has been pretty well distributed” (Simulation Associate Transcript)

The KBV would argue that any decision, whereby the knowledge that needs to be used cannot be aggregated or where the transfer of knowledge is too costly and time-consuming, should be decentralised and lie within the particular knowledge owner or the knowledge team. In the Simulation case study, some of the senior members do
not have the specialised knowledge to make decisions around the use of the tool, or can afford the time investment to understand the simulation in more detail:

“They know just the top level stuff which is an interesting problem in itself or which raises interesting questions” (Simulation Associate Transcript)

The implication above is, that the specific knowledge holder has to manage expectations. However, the KTP has overcome part of the issue of simulation-fit to strategic ideas for capitalisation. The senior team usually comes up with market driven ideas but it is the Associates and Academic leader decision to confirm their feasibility:

“Design and analysis I would say with me (Associate) and (Academic Supervisor) in particular” (Simulation Associate Transcript)

Again, as in previous parts throughout the KBV theme analysis, the word trust is used several times with this form of location for decision-making. This highlights, that the high-level senior team understands the highly tacit nature and recognises the earlier mentioned ‘Specialisation in knowledge acquisition’ theme:

“trust is a right word to use, there is enough trust that actually you can go off in your own direction and do your own thing” (Simulation Associate Transcript)

Furthermore, the company has a diverse project range and the tool is only one aspect. Each division has knowledge specialists and rather than having to transfer considerable amounts of tacit knowledge to one or another, the company focuses on building a common knowledge base with a culture of using individuals’ ad-hoc when needed to overcome challenges or make decisions. Which is linked to the earlier hierarchy theme and fluid membership approach. Therefore, the coordination structure is really loose between those division which seem to be very much project based. The case study company operates also very lean in terms of the head-count
versus the different knowledge-areas, the KTP project structure with interfaces to other projects seems to be a good solution for the company. This approach is used throughout the hierarchy where the CEO is part of the project team in some projects or used ad-hoc if his knowledge is needed:

“we refer to [MD] as and when we need and when it needs their input so there happy to let it run that way” (Simulation Associate Transcript)

The MD, who has the Company Supervisor role in this KTP also describes the location of decision-making as a team effort:

“We have a very flat structure and make decisions as a team” (Simulation Company Supervisor)

To the question “does he gets involved in some of the operational decisions” the response is:

“I wouldn’t want to interfere in operational decisions around the mechanics of the simulations. The Associate is much better placed in making judgements on that” (Simulation Company Supervisor)

Again, the recognition of individual knowledge domains and the trust in the specialist knowledge of the individuals seem to be a dominant part when it comes to the overall organisational structure and design and location of decision-making. It is also clear, that, for the right location of decision-making, the coordination within the firm and the cooperation needs to be intact:

“if I have a specific [question], then I meet [the AL] occasionally but usually it’s much more informal conversations, that discussions about this project are almost driven or I’m included in all of them as far as I’m aware at least. Certainly the once that make significant changes or significant decisions so I would say that from my point
of view the right people (with the tacit knowledge) are always involved” (Simulation Associate Transcript)

The quote above illustrates that because of the complexity of knowledge the Associate is part of all decisions either operational or strategic as long as it involves his specialist knowledge area. The academic leader also describes mainly two different interest areas. The first one being, the technical aspects in which the senior management team usually does not interfere and allows the knowledge holder to have full autonomy when making any decisions:

“we are free to do that by ourselves” (Simulation Academic Leader Transcript)

The second one being, what is described as the route to market in which the senior management team has more of a say but where the Associate and Academic Leader is still involved:

“in terms of how to exploit it and turn it to an output” (Simulation Academic Leader Transcript)

However, even big commercial decisions are done with the Associate and the academic leader:

“I feel that particular in this case [KTP] our expertise is trusted and valued for ... they value our input” (Simulation Academic Leader Transcript)

This again shows the relatively flat structure in the case study. Another example to strengthen the points made and illustrate a possible strategy that is in line with the KBV is following. To begin with, the strategic decision to tackle and research the front teeth was mainly a corporate decision. The decision process has been already discussed in more detail in the previous theme ‘Role of hierarchy in the organisation’. However, once the decision was made the team was consulted about feasibility from
a technical perspective in terms of ability to deliver. Once this was established, the team was allowed to take over control:

“so nobody says you need to use the procostives method of aligning teeth in generation of a statistical shape. We can decide that our self and he [MD] wouldn’t tell us what to do” (Simulation Academic Leader Transcript)

For the tool itself, the Associate seems to be solely responsible for configuration decisions. The Associate highlights that he is the decision maker for the operational side of the tool. Furthermore, the above quote also suggest that the Associate is consulted for any significant strategic decisions around the new use and application of the tool.

In traditional projects the knowledge owner is usually represented by a senior user or senior supplier with the executive taking the final decision. However, the Simulation case study seems to have the Associate embedded in any major decisions which is more in line with the earlier discussed agile approach to project management.

For decisions based on strategic patents, where the Associate was not able to reach higher degrees of complex patent knowledge, a patent attorney was introduced into the team as a consultant. In the below quote, number one refers to the simulation whereas number two refers to the patent application.

“If you were to say me and [AL] where almost entirely involved in number one we were 40-50 percent involved in number 2. Because it was a commercial strategic decision from them, it sort of came from them, and all of the decisions had to be really cleared by them, by the end of the day it cost them a lot of money to get the patent as simple as that” (Simulation Associate Transcript)

Number two which refers to the patent application and process. The Associate was involved in the patent application and had major contribution (40-50 percent) but
was not part in every decision-making process as some decisions were purely based on specific patent knowledge where decisions were outsourced. Although the outsourcing of decisions was not part of my literature review discussion, it seem to follow mechanisms of making decisions based on co-location:

“To be fair our patent attorney had a lot of experience and we paid him a lot of money so we went with his recommendation really” (Simulation Company Supervisor)

4.2.6.2.3 - E-PLATFORM

So far, the discussion analysis highlighted the positive effect of a flat structure. The elements of trust and consensus decision-making in the respective knowledge areas of individuals seem to be minimising potential cooperation issues.

Within this case study, there was a lot of fear around the ePlatform project from senior directors and staff other than the newly appointed MD who was the main driving force for this KTP. I highlighted this KTP earlier as having achieved lower levels of complexity compared to the other two.

At first glance, the fear element throughout the company results in the Company Supervisor (MD) trying to establish more control and therefore, establishing some rules and directives for the Associate when it came to decision-making. Having a more centralised approach, I anticipated some form of inefficiencies when it comes to the quality of decision-making (such as the Crystal case study example). However, the centralised approach had worked and I would explain this through the relatively low complexity of knowledge achieved within the KTP.

The fear within the company was linked to the online delivery of training and the potential cannibalisation of the existing provision:
“so the biggest risk was, will this cannibalise the existing business and that was a legitimate question to ask you know. If you can do something for half the price you know but the observation since then was the classroom business is actually increased because of the exposure it provided, it’s easy to say afterwards when it happens and when you making those decisions fear is an important element” (E-PLATFORM Associate Transcript)

The feeling I had was, that the KTP project would not have happened if it was not for the newly appointed MD who had faith in the online idea and wanted to make his stance.

Some of the earlier mentioned literature would have argue that the drive from the Company Supervisor to have more control over the project would result in decreased motivation of the knowledge holder. However, this was not the case as the Company Supervisor collaborated and communicated with the Associate throughout and highlighted the need for control. Furthermore, within this case study, the trust element was gradually increased from about 3 month into the KTP.

“when some of the results were shown in 3-6 month there was an element of respect growing saying wow I didn’t think this could have been done and it’s been done. Now where are the limits so all of a sudden the ceiling got removed there was a little bit of a lot more buy in as well not just from the top management but the immediate line management and things like that” (E-PLATFORM Associate Transcript)

Not surprisingly, the word trust was mentioned several times by each KTP stakeholder interviewed. This also means that with the increasing establishment of trust, there was decreasing control compared to the beginning of the KTP but the control was apparent through the lifecycle of the KTP and was stronger than the previous two case studies.
“so you need two things, one is obviously the Capability and Motivation of the Associate but you also need Believe and Trust on behalf of the company because it takes time to learn something” (E-PLATFORM Associate Transcript)

In contrast to the two previous KTPs discussion, even technical decisions were not solely made by the Associate and a routine was established through a more informal mechanism of mutual adjustment in the decision-making process:

“Technical decision was always by the business, the Associate would come out with a mandate and there proposals if you like and the business would choose one. Even tactical came down to this approach if there was a strategic impact” (E-PLATFORM Associate Transcript)

The established structure of the decision-making process, included an overall objective for a task and some options for the CEO to choose from. This made the decision-making process more streamlined than the other two KTPs and on the surface more effective. The other two KTPs were based primarily on ad-hoc group problem solving where options usually emerged as part of the group discussion. Although, this was similar, the difference was that even specific outputs were discussed rather than concentrating purely on benefits. I already explained this approach due to the lower level of knowledge complexity involved and the high level of common knowledge.

When compared to the KBV literature this strengthens the assumption that outputs which are based on more explicit knowledge can show a centralised decision-making location which in turn is more effective and realises economies of decision-making.

“because there was confidence in each of the people involved, decision-making was very straight forward” (E-PLATFORM Academic Leader Transcript)
The Company Supervisor described that, in the end, every eLearning decision was between the Associate and the Company Supervisor using their process routine:

“he [Associate] made some recommendation and some strong recommendation. It was largely he and me [Company Supervisor] to be honest. What he [would] do is take a lot of advice from the academic supervisor, then he would tell me what he things and 99 out of 100 times I said good, not because I wasn’t interested our I didn’t understand but because we very much had the same ideas and same level of thinking” (E-PLATFORM Company Supervisor Transcript)

For very technical aspects of the ePlatform the Associate had more autonomy when it came to decision-making and the trust was given to technical aspects the Company Supervisor would not understand:

“The eLearning technical side and the platforms and such that was very much the Associate’s decision. I don’t have that knowledge and I trusted his judgement I knew how much research he had been doing on it, that was a real comfort if you like, so when he proposed different solutions and platforms I knew he done a lot of research. Therefore, it was very unlikely that he came up with a suggestion that was not fully examined, he is a very studious guy” (E-PLATFORM Company Supervisor Transcript)

This quote above illustrates why the Associate was also buying into the location of decision-making. The decision-making process was between the Associate and the CS via feedback loops which was used to keep each other updated and for the CS to exercise more control.

This KTP case study therefore, also followed the ‘Outperform through Collaboration’ KBV-principle, identified. The Associate, was always part of the discussion and presented some options which included the preferred option. Only a few decisions came back to the Associate and this was when the CS could not make the decision,
arguably because it was too technical and there was a higher degree of tacit knowledge needed.

“There were instances, if the business felt that they didn’t have the know how to make that decision, that decision came back to the Associate saying right, you pick the right one for us and go ahead with what you think is best. So there is a fair amount of freedom actually” (E-PLATFORM Associate Transcript)

However, even to work with business or operational options for the CS to choose from, there needs to be trust in the options presented. The AL added:

“[Company Supervisor] represented the management had a really good feel for the strategic knowledge of what the product did and what it could do for them. It wasn’t the questions of it’s the Associate baby and I’m just talked to him, CEO had an idea where the product was going to go, where it’s going to be sold, how it’s going to be sold” (E-PLATFORM Academic Leader Transcript)

However, as mentioned before, the Associate agreed with this approach and did not feel left out because he was involved in the process and gave his options which made the Associate indirectly part of the decision-making progress. The Company Supervisor understood that collaboration and a feel for consensus was important to motivate:

“It would be very demoralising if I knocked him back all the time” (E-PLATFORM Company Supervisor Transcript)

The main point is, that the KTP stakeholders did feel like they were listened to. Decisions were made by listening to the views of the Associate and then decisions were also explained to make sure there was buy in from the team. Although, it was mentioned that some rules and directives existed for the decision-making process, it is also important to mention that there was flexibility for ad-hoc decisions and I
already mentioned the mechanism of mutual adjustment within this context. Like the previous two KTPs, this KTP also showed a culture in which different people could be approached:

“.and an environment where you didn’t have to wait for the next monthly meeting. You could go to the key decision maker and ask: ‘can I have 5 minutes of your time’. Here is my problem, here are my 3 options and what can we do. If I could relate to a phrase that you could apply as a best practice of management I would call it management by exception...” (E-PLATFORM Associate Transcript)

The Company Supervisor breaks some of the decisions down further. He differentiates between content decisions such as the visuals to be used, narratives and case studies etc. The CS is the original creator of the learning content and therefore the main knowledge holder:

“Group decisions for general directions and stuff. Content decisions was myself. Technical for the product was the Associate mainly but with major final decision of myself of course. You employ an expert for a reason” (E-PLATFORM Company Supervisor Transcript)

Also, the Company Supervisor did not interfere with some of the programming elements and what programming language to use or how to write the code was an Associate only decision. However, what the code should achieve was where the CS was back on the decision-making process. However, neither the Associate, nor the AL thought that the CS was micro managing.

“Strategic decisions all done by CEO [Company Supervisor] and he communicated what he wanted but he is not a micro manager” (E-PLATFORM Academic Leader Transcript)
This could be explained by the fact, that the Associate and Company Supervisor (CEO) had a continued dialog.

“He [Company Supervisor] set the goals but then in terms of how those were met was very much down to the Associate as long as the Associate was able to communicate that he was able to make progress and [Company Supervisor] trusted that” (E-PLATFORM Academic Leader Transcript)

This shows that by using the KBV-principle of ‘manage by exception’ the ‘focus on benefit’ KBV-principle can be further refined to ‘focus on outputs or products’. However, this was only possible because of the lower level of complexities of knowledge. Furthermore, there may be a misalignment in drilling down into output level control and the achievement of SCA.

4.2.6.2.4 - Conclusion

The location of decision-making theme assumption is:

💡 Co-location of decision-making will produce better decisions if the nature of the knowledge is in tacit form

The KTP analysis has strengthened this point and raises further interesting concepts for future KBV discussion.

The dilemma in general hierarchy of firm discussions, from a KBV context, is mainly about decision-making processes. In our knowledge intensive case studies, production requires different types of knowledge from different individuals all centred on one or two individuals who gain most of the tacit knowledge. Hence the KBV argument would be, that the role of hierarchy in the decision-making process needs to appreciate this. Overall, the case studies analysis highlights the positive affect of a flat structure within a context, in which the use of the KBV leads to SCA.
The Crystal case study highlights the dangers of centralised decision-making, when the person with the knowledge domain is not consulted or listened to. I would argue that for complex-tacit driven decisions, a co-location approach of decision-making delivers better quality decisions when tacit knowledge decisions are decentralised. Hence, the centralised decision of the CEO failed to produce any usable outcomes.

I argue that the knowledge specialist should be part of any discussions that needs the individual knowledge holder’s expertise and where such expertise is judged as having a high level of knowledge complexity. The favoured integration mechanism for such knowledge seems to be group problem solving. The success of such an approach was particularly strong in the Simulation case study.

I deliberately do not make any distinctions between operational or strategic decisions when it comes to idiosyncratic knowledge. Hence, I would argue that major strategic decisions that are tacit knowledge driven should still be in line with the KBV-principle to ‘use a knowledge-based approach for decision-making’. This would mean that for strategic decisions which are based on idiosyncratic knowledge, the knowledge holder should still be part of the strategic decision-making process. Once the company values its tacit knowledge base as the strategically most important resource which is linked to SCA, and once, the company understands that such knowledge is not easily copied by competitors because it is embedded in the knowledge holder, then any decision-making even (and especially) for strategic decisions should follow and include the individual with the specialist knowledge.

Furthermore, the deficiencies of hierarchy can be overcome by the project-base structure within the KTPs in which team members are a fluid resource with the big difference that the Associate, who is the constant person in knowledge specialisation, is kept throughout the KTP project and preferably thereafter. The Simulation case study highlighted a diverse project range and the simulation-tool is only one aspect. Each division has knowledge specialists and rather than having to transfer considerable amounts of tacit knowledge to one or another, the company focuses on building a common knowledge base with a culture of using individual’s ad-hoc when
needed to overcome challenges or make decisions. This links to the earlier discussed ‘Role of hierarchy in decision-making’ theme and fluid membership approach. The coordination structure within the Simulation case study is really loose between those divisions, which seem to be very much project based.

The Simulation case study operates very lean in terms of head-count versus the different knowledge-areas. The case study shows interfaces with other projects, in the sense, that the specialist knowledge of the individual is used throughout the different project teams. The approach of fluid members is used throughout the hierarchy where, the CEO is part of the project team in some projects or used ad-hoc if his knowledge is needed in other projects.

Another interesting aspect to consider which was unveiled by the case study analysis, is the considerably high decision-making power and overall influence of the Associate, especially, when considering that the Associate is a new recruit to the company. The case study unveiled that achieving an SCA by also making major strategic decisions which are made with the company goal in mind, where best, when the knowledge holder was included.

For decision makers this means that any centrally made decisions which are based on high complexities of knowledge and can therefore, not be easily transferred from the knowledge holder should include the knowledge holder in the decision process. Another enabler in decision-making, is the fact, that all of the KTPs involved a senior management member as part of the KTP team. This has strengthened the common knowledge between high-level and lower-level, which the project has built over time. The case studies mention that the senior team values lower-level project team input so even high-level decisions are made in consensus with the knowledge holders which in turn strengths and overcomes coordination and cooperation issues, which was highlighted in the literature review as a potential threat.
The ePlatform case study also revealed insight into an established structure of the decision-making process. This included an overall objective for a task and some options for the CEO to choose from. This made the decision-making process more streamlined than the other two KTPs and on the surface more effective. Since, the other two KTPs were based primarily on ad-hoc group problem solving where options usually emerged as part of the group discussion. Although this approach is not new in the general field of project management it adds to a different perspective, especially for the strategic management literature. When compared to the KBV literature this strengthens the assumption that outputs, which are based on more explicit knowledge can show a centralised decision-making location, which in turn is more effective and realises economies of decision-making.

Interestingly, although this constant decision-making process for outputs was more effective from the outset, it did not lead to an SCA. I already argued that the complexity of knowledge stayed relatively low. My assumption here is, if the knowledge can be constantly transferred for the non-specialist to make decisions, then this indicates easier codifiability of the knowledge which suggest a high degree of explicit knowledge resulting in lower complexity of knowledge. Using the KBV-principle to ‘manage by benefits’ should allow the higher-level to gain enough control from a strategic perspective but also allow the team to reach higher levels of knowledge complexities while also making the decision process more effective. However, strategic decisions should be based on a more communication-intensive mechanism of group problem solving and decision-making. The case studies which achieved an SCA indicate that trust and autonomy for outputs are important to allow the knowledge holder to build idiosyncratic knowledge, which show a link between continuous knowledge specialisation of individuals and sustainability of an advantage. Hence another KBV-principle emerges to ‘continuously develop your knowledge base’.

There is also an interesting link how the KTP case studies used different project management approaches. There is a link to agile approaches within projects that are
driven by high complexities of knowledge (e.g. Simulation and Crystal) and a more traditional approach for a project which is more driven by explicit knowledge and which established a form of decision-making routine (ePlatform).

So far, recognition of individual knowledge domains and the trust in the specialist knowledge of the individuals, as well as a common knowledge type, all of which have been discussed in different themes, become enablers in their own right when it comes to the overall organisational structure and design and location of decision-making. This further highlights that themes are very much interlinked and should not be implemented in isolation of each other.
Chapter 5 - KBV value chain conclusion - three primary knowledge processes

This section will focus on the three primary knowledge processes identified in the KBV value chain. The previous section, explained why and how KTPs used specific KBV themes and activities to explain SCA. This knowledge will now be used to gain further insights into a holistic view with focus on the primary processes.

My analysis argued that the ‘capacity of aggregation’ theme can be subsumed into the ‘transferability’ and ‘location of decision-making’ themes and subsequently end up as an enabler for knowledge coordination. Furthermore, I argued that, if the knowledge that leads to SCA is embedded within individuals in a highly tacit form and if individuals are classified as voluntary actors within a firm, then the only appropriation discussion important for a KBV as company strategy is its capability to create goods or service by using relevant knowledge actors to create or transfer knowledge and therefore, any other ‘appropriability’ discussions are obsolete. Hence, the focus of this research is not concerned if knowledge in itself can be appropriated but how such knowledge can be strategically linked to the achievement of a product or service that can be linked to SCA.

I have already discussed the specific KBV-theme assumptions. The next section will discuss the general assumptions, before focusing on the holistic view of the primary knowledge processes.
5.1 - Main and Subsequent KBV Assumptions

I identified four main assumptions within the literature review. Although there is justified reasons for some of the assumptions, other key assumptions could not be strengthened. This in turn raises issues for any studies that are based on such assumptions. In order for the KBV to be strengthened as an act of strategy formulation, assumptions must be fully understood and justifiable.

The first assumption is that knowledge is considered the most strategically important resource of the firm. This assumption is already widely discussed and accepted as per my literature review. Furthermore, two out of the three case studies achieved an SCA by strategically placing knowledge as a capability, whereas the other case study achieved internal superior performance resulting in a temporary competitive advantage. Therefore, I would argue that considering knowledge strategically is linked to the achievement of SCA and, within knowledge intensive companies, should be placed as the most strategically important resource of the firm.

The second assumption is the differentiation between explicit and tacit knowledge, with tacit knowledge being essential to achieve SCA. My literature review highlighted that all knowledge has a degree of tacitness, as information is processed within the individual who has their own cognitive reality and therefore, idiosyncratic elements. Thus, I was interested to look at complexities of knowledge by judging the degree of tacitness. This is not an exact science, nor does it need to be, as my focus is to judge complexity by comparison of knowledge domains internally within the KTP and by judging the end result of one KTP externally to the other KTPs. This allowed me to make conclusion on the outputs and their degree of knowledge complexity. I used my complexity of knowledge diagram to inform my decisions.

My conclusion is that there is a link to superior performance achieved between the strategic knowledge gap identified and the degree of the level of knowledge complexity achieved. Therefore, not surprisingly, the pilot study only achieved internal superior performance (lowest complexity), the ePlatform case study showed
a lower degree of complexity compared to the Crystal and Simulation case studies and achieved a CA that could not be sustained in the long run. The Crystal and Simulation KTPs however, achieved a competitive advantage which could be sustained, by achieving higher complexities of knowledge which my analysis identified as highly personal.

The third assumption is that tacit knowledge is acquired and stored in a highly specialised form within individuals. The KTPs analysis shows that the individual who gains the highest specialisation of knowledge is the Associate. They are the main ‘knowledge benefiter’ who act as the key to achieve increased firm performance. The case studies were very clear about highlighting the importance of the Associate and the knowledge gap that would appear, if the Associate was to leave. Furthermore, all three KTPs illustrate that knowledge replication using additional KT is challenging, as the knowledge was formed in highly specialised form embedded in the individual. This in turn links issues around transferability mainly to higher complexities of knowledge due to its increased tacit nature.

The fourth assumption is that knowledge production needs a widespread range of knowledge. This assumption is linked to the organisational capability argument that complexity of capability depends upon the scope of ‘many individuals’. Although this view is widely accepted, the evidence within the KTPs tell a different story. Since, knowledge which leads to SCA is stored in highly specialised form within individuals, it is the individual absorptive capacity and cognitive ability that achieves complexity of knowledge. My complexity of knowledge diagram (Figure 2) showed that highly personal knowledge was next to the knowledge being ineffable. Although, there is a logic in linking capability to ‘many individuals’ knowledge coming together, the KTPs achieved SCA with a relative small number of actors. It was the intensity of the knowledge creation process and Integration of knowledge of those limited actors and the resulting capability of the associate that led to a CA not the number of individuals involved. This insight was observable due to the KTPs main limitation of key stakeholders and the link to the isolated actors and the achievement of increased firm
performance that could be traced back to SCA. I therefore rephrased Grant’s definition to the following: The KBV should view organisational capability as the outcome of knowledge integration and production of disparate specialist knowledge domains into one or more individuals whereby the complexity of a capability depends upon the depth of knowledge achieved which has been aggregated by such individual(s).

The subsequent assumption is the existence of ‘economies of scale’ for knowledge which Grant (2002) referred to after his original contribution in 1996. The literature review already identified that economies of scale for knowledge do exist. However, considering that SCA is linked to the complexity of knowledge and that knowledge complexity increases with increasing tacitness of knowledge, this assumption is debateable although very plausible for explicit knowledge. Grant (2002) based his argument on Winter (1995) who reasoned that replication of knowledge will be lower than those incurred in its original creation. My stance on this is slightly different, as my case study analysis has indicated that knowledge creation, by the Associate, is very much correlating to the absorptive capacity of the Associate. The Academic leaders in the Crystal and Simulation case studies highlighted, that projects have failed when the absorptive capacity of the individual did not match the knowledge capability needed in the project. Following this string of thought, I would then argue that economies of scale for knowledge and the proportionate saving in costs is not automatically realised with increased level of production when replicating knowledge. Socialisation (mode of knowledge conversion from tacit to tacit knowledge) would be needed in order to achieve replication of tacit knowledge.

The Associate is the main knowledge benefiter who specialises in filling the knowledge gap. My literature review highlighted within the coordination related theme that specialisation in knowledge increases efficiency in learning which was observable especially when it comes to problem solving. Following this logic, I would suggest that replicating the knowledge of the associate may be more costly, if the knowledge complexity (since production) has increased and is based on a highly
complex circumstance. The associate gained efficiency in new knowledge production through specialisation. Hence, new knowledge acquisition, classified as highly personal (Figure 2) will be easier to produce by the associate and comparably more time consuming, less effective and harder to reproduce by individuals without the same context and specialisation in knowledge. The Simulation and Crystal case studies explicitly argued that individuals had their own knowledge domains. I would disagree with Grant’s (2002) statement that all knowledge has higher creation cost than subsequent replication. If the new knowledge benefiter has a lower absorptive capacity or a lower knowledge complexity relevant to the specialisation in knowledge required, then increased level of production could mean a proportionate increase in time and cost for the firm. Furthermore, idiosyncratic, high complex knowledge may not just be harder to transfer but could also be ineffable (not transferable at all) as shown in my knowledge complexity diagram (Figure 2). Moreover, individuals are not perfectly configured computer systems but individuals who have different absorptive capabilities hence, any knowledge exchange between individuals will be dependent on the communicating ability of the source and the absorptive capabilities of the receiving individual. Hence, economies of scale or dis-economies of scale in knowledge replication is primarily dependent on the complexity of knowledge and the absorptive capabilities of the individual.

There could be a counter argument, saying that not all the knowledge needs to be shared, but this would blur the economies of scale in knowledge production argument. There was no evidence in the KTP case studies that showed a focus on replication while achieving SCA for the firm. However integration of knowledge was achieved by the fluid membership of knowledge actors which will be discussed further below. However, I also argued, within the organisational structure and especially the decision-making perspective, that knowledge that has a potentially high capability of aggregation and transferability (and therefore lower knowledge complexity) can be replicated at lower cost and therefore, could be used to achieve economies of scale in decision-making.
5.2 - Holistic View with Focus on Knowledge Production and Knowledge Transfer

This subchapter will discuss the first primary knowledge process of knowledge production by given a holistic view of the supporting knowledge elements identified in the literature review.

![Diagram of Knowledge Elements]

**Figure 12: KBV value chain focus on knowledge production**

The overall assumption that explicit knowledge has high transferability whereas tacit knowledge shows low transferability could be strengthened by all the KTP case studies.

The fundamental Knowledge-based objective is to sustain above normal profits by continually discovering new knowledge and integrating this knowledge to achieve maximum results. The literature review argued that a firm can gain greater knowledge by converting tacit knowledge into explicit knowledge. However, this thesis would argue that such a viewpoint is not fit for purpose when it comes to a knowledge-based strategy formulation, unless it is needed for integration purposes and to increase clear and effective communication within it. In fact, there is no evidence that any of the tacit knowledge driven outputs within the KTPs, linked to the SCA, involved Externalisation.
When it comes to use the idea of transferability in a strategic context, a firm following a KBV should not be concerned to make tacit knowledge explicit so it can be used throughout the firm. In fact, the case studies showed that this is largely not possible nor desirable in the context of the KTPs. It only appears to be useful in the achievement of a common knowledge base, which will be further discussed in the next section. This common knowledge has mainly helped with communication between individuals.

None of the KTPs achieved Externalisation from tacit knowledge into some kind of super manual that could be picked up by individuals to aid knowledge replication. The following knowledge coordination section of my conclusion will discuss this further and argue that the specialist knowledge is best transferred by transferring the individual who hold that knowledge. This will overcome a substantial part of the current literature discussion and the challenge to use specific knowledge throughout the company without losing its VRIN capacity to sustain competitive advantage of that knowledge.

Decision Makers should put less emphasis on the pursuit to replicate tacit knowledge using knowledge transfer. There is a long history of failed attempts to capture expertise, such as early attempts by the World Bank to video interviews with experts around the world, just to end up with a library of impressive videos nobody cared to look at. The same is true, in my experience, working with companies who create vast Lessons Reports within projects which are then not used or if used, only show very limited success. Hence, the real trigger for success and therefore, concern of decision makers, should be to decide which individuals show the right skillset of tacit knowledge and absorptive capacity for the specific output in mind.

The analysis of the capacity of aggregation theme illustrated its importance for knowledge production and transfer. In my research, the capacity of aggregation is focused on the individuals’ level of knowledge absorption which in turn depends partly on the capacity of aggregation, which is the ability to add new knowledge to
existing knowledge using knowledge production and knowledge transfer. My theme analysis only partially supports the assumption made that explicit knowledge has a higher potential of aggregation to a single location than tacit knowledge. However, this assumption is based on codifiable knowledge systems (IT systems). This view of a single location loses importance when it comes to idiosyncratic knowledge which in turn could also be argued to be easier aggregated to a single location (knowledge holder). Therefore, the implication for decision makers is that efficiency of knowledge transfer and production is to do with the knowledge potential for aggregation which are very individual centric as shown in the case study analysis. Therefore, efficiency must be linked to the absorptive capacity, which in turn will influence the holistic view with focus on knowledge coordination and organisational structure and design.

The above discussion further links to the assumption that the KBV requires for individuals to specialise in particular areas of knowledge while considering their absorptive capacity to increase success of knowledge integration, which the ‘Specialisation in Knowledge Acquisition’ theme analysis supported.

My data finding and analysis chapter showed that knowledge production of the Associate led to the ability to solve specific problems which in turn added to the ‘Specialisation in Knowledge Acquisition’ and therefore created some new knowledge. The figure below illustrates this point.

![Figure 13: Problem solving circle effect (in high complexity of knowledge environments)](image-url)
The illustration in Figure 13 can be explained by the Crystal case study were the knowledge holder had to solve problems with dis-functioning batches of crystals. This led to further specialisation in knowledge acquisition as he was able to make sense of prior difficulties over time which in turn led to new knowledge production. The case study discussed that some externalisation took place so that the technicians could operate the crystal transformation. This is also true for the second engineer who supposedly received intense KT. However, this Externalisation of knowledge did not translate into the problem solving capabilities of the individuals in question who had to refer back to the original knowledge holder for problem solving, leading to even further specialisation in knowledge and knowledge production of the original knowledge holder and therefore, achieving greater idiosyncratic complexities of knowledge.

Considering all the above, decision makers should have a strategic outlook for knowledge production. Therefore, to identify and then systematically close a knowledge gap should be of strategic importance. By doing so, the company receives experts in particular fields all linked to the idea of achieving a competitive advantage through superior knowledge compared to competition. The ePLATFORM case study argued that by filling the knowledge gap they “did get an even better output if you like, which was a fully developed expert resource if we see (name), the Associate as an output” (E-PLATFORM Company Supervisor Transcript). Therefore, decision makers’ activity should consider not only the project output but also the individual(s) involved and their specialisation and therefore, knowledge capability in that particular field as a subsequent output of organisational activity.

Furthermore, the case study analysis highlights that any strategic view needs to consider a trade-off between dissemination of knowledge using knowledge transfer and specialisation of knowledge. The specialisation of knowledge which led to a competitive advantage was sustained by the continuous specialisation in that knowledge domain and the resulting innovation, e.g. Simulation case study. However, managers also need to consider the operationalisation of a capability. This means if
the desirability of knowledge capability of the firm increases, e.g. simulation tool use from other projects/divisions, then the knowledge holder is automatically deeply involved into the operationalisation and therefore, may not have enough time and freedom to specialise further, which in turn could jeopardise sustainability of an advantage. This point was also highlighted in the E-PLATFORM case study. Furthermore, managers will need to consider the growing dependency towards the knowledge and the knowledge gap if the individual leaves the firm.

The Simulation case study highlighted that for outputs, linking to high tacit driven knowledge, the Capacity of Aggregation outside the individual’s knowledge domain was weak. There is a sense within the case studies that, the more the Associate is able to aggregate new tacit knowledge, within the knowledge production process, the harder it is for other knowledge actors to replicate that knowledge through knowledge transfer by the Associate. I already discussed Grant’s (2002) assumption on ‘Economies of Scale’ who argued that knowledge is subject to economies of scale. He characterised that all knowledge has higher creation costs then subsequent replication, which I was able to challenge within my research findings. Considering the thought process, I would argue the complete opposite for knowledge that is linked to SCA. The only economies of scale that could be gained for tacit knowledge is further production of tacit knowledge by the same individual. Therefore, if decision makers like to achieve economies of scale for knowledge, they should aid specialisation in knowledge of their knowledge holders and limit their breadth of knowledge to a level that is important to achieve enough common knowledge for effective communication within the company. Furthermore, a constant deepening of knowledge which led to a CA is also important to sustain this advantage and therefore is a very important strategic direction that is fundamentally different to my literature review assumptions.
5.3 - Holistic View with Focus on Knowledge Coordination

This subchapter will discuss the second primary knowledge process of knowledge coordination by giving a holistic view of the supporting knowledge elements identified in the literature review.

![Knowledge Elements Diagram]

**Figure 14: KBV value chain focus on knowledge coordination**

The overall assumption, that minimising knowledge transfer but emphasising on absorptive capacity and henceforth, coordination of people’s specialised knowledge will increase efficiency and success, could be strengthened by the case study analysis.

I argued in my literature review that the first two mechanisms (Rules & directives and sequencing) represent formal mechanism, whereas the third mechanism (routines) is viewed in Grant’s (1996) original paper as a formal mechanism too. Further research however, also point to mutual adjustment which has informal roots. The fourth mechanism (group problem solving and decision-making) is informal and highly interactive.

A tendency to view mechanisms as a predominantly formal act when considering organisational efficiency makes sense and therefore, dominates the knowledge
coordination debate in the KBV literature. I highlighted and referenced different studies that showed how formal mechanisms allowed companies to effectively integrate and coordinate tacit knowledge. Nevertheless, such studies lacked the link back to SCA. I already established, that knowledge linked to SCA is deeply embedded within individuals and is not readily accessible or even identifiable by others. This in turn bears a risk that predominantly formal mechanisms may discourage out of the box knowledge sharing due to the knowledge fragility which was discussed within the context of potential knowledge creation and transfer enablers.

Furthermore, capacity of aggregation of knowledge is also dependent on the absorptive capacity and cognitive development of individuals. Therefore, a focus on efficiency and streamlining of knowledge processes may be contradictory to knowledge production, coordination and innovation that is based on high complexity of knowledge. The most effective mechanism within the case studies was, by far, group problem solving and decision-making. The literature review identified this mechanism as the most costly and slow mechanism for knowledge integration. However, the case studies highlighted and showed the link that group problem solving, in particular, also strengthened the common knowledge and reached deeper levels of knowledge complexity which in turn strengthened the organisational capability and led to the SCA of the firm. Therefore, the assumption that problem solving and decision-making in groups is reduced to unusual, complex and important tasks as the firm is maximising efficiency through the other formal integration mechanisms could not be supported and is misleading in the pursuit to achieve SCA.

My study suggests, that managers need to understand, that for SCA to occur, individuals need to achieve a high complexity of knowledge. Group problem solving and routines established as mutual adjustment were identified as the main mechanisms to achieve the SCA gained by the case studies and are therefore, of main strategic importance when it comes to strategy formulation by managers. Therefore, my research case studies do not agree with Nickerson and Zengers’ (2004) view that the higher the problem complexity, the more challenging it may become to identify
and solve problems with multiple actors involved. I rather support Ditillo (2004), who argues that increased task complexity needs increased interaction.

My case study analysis also suggests that having a core base of individuals who form the main group of actors for a specific output is preferable as it supports collaboration, communication and the build-up of common knowledge. The project structure enabled all of this to occur in the KTP case studies and the shared location also played a crucial enabling role for those ad-hoc and unstructured meetings which were formed based on a particular problem.

Since individual knowledge is fragile, firm knowledge development as social activity can be challenging or impossible. Given this fragility, I argue that relationships in organizations must be given more attention. The case studies identified ‘trust and freedom’ as a major driver to be able to generate the specialist knowledge which created the SCA for the firm. The literature review discussed this theme from a ‘care’ perspective which the analysis of my research supports. A major enabler for knowledge transfer within the analysis of my case studies is the flexibility and the unstructured approach to come together and discuss issues and problems. This has evidently contributed to increased commonality of specialist knowledge, shared meaning and recognition of individual knowledge domains.

My case study analysis highlighted, that the level of relationships of trust, degree of common value and the level of commitment to the task of the organisation are crucial. Especially the simulation and ePlatform case studies established socialisation which followed naturally. There was no evidence of direct management control. However, the KTP context enabled an environment where there was a shared goal (fill the knowledge gap). The indirect influence of managers, to build a culture that is based on autonomy and trust was positively linked within the case studies. The fact that the KTP has limited knowledge agents all working towards a common goal within a ‘project’ setting has therefore, become an enabler in this context.
The Simulation case study highlighted that for outputs, linking to high tacit driven knowledge, the Capacity of Aggregation outside the individuals’ knowledge domain was weak. There is a sense within the case studies that the more the Associate is able to aggregate new tacit knowledge within the knowledge production process, the harder it is for other knowledge actors to replicate that knowledge through knowledge transfer by the Associate. This provides a further challenge best highlighted in the Simulation and E-PLATFORM case study, where the tool was increasingly used across projects or departments, resulting in increased operationalisation efforts of the Associates and hence, slowing down the advancement of the tool itself.

Theoretically, the transfer of knowledge to replicate capabilities makes sense. However, the case studies, especially in the ‘capacity of Aggregation’ theme analysis, highlighted that knowledge replication was not the chosen option. This could be because knowledge transfer does not justify the amount of effort and time it takes to achieve knowledge replication, when linked to SCA. Especially, as economies of scale for high complex knowledge is, at best, questionable. I already mentioned, that emphasis may be given to the Associates ability to innovate further by reaching more in-depth tacit knowledge and therefore unveiling new capabilities and innovation rather than using the time for knowledge transfer. Even the E-PLATFORM case study with a higher degree of explicit knowledge in which the literature review argued that, although it may be costly to produce the explicit knowledge, it should be relatively cheap to replicate (Simon 1999) failed to use KT to achieve the economies of scale claimed in the literature review. The case study analysis showed two phenomenon for this.

First, is the firm dependency of the associate. The knowledge bottleneck forms around the associate who is the main tacit knowledge holder and therefore, critical for e.g., problem solving.
The earlier mentioned downturn to this is that the knowledge holder spent considerable time in the operationalisation of the competitive advantage. Hence, leaving limited time for further innovation and KT whereby KT seemed to be the first mechanism to be dropped. The potential spiralling effect on this is, that if the company or more specifically a critical mass does not keep up with the specialised knowledge of the Associate, then the knowledge discrepancy between Associate and company will grow with decreasing commonality of specialist knowledge resulting in even bigger dependencies of the Associate. The Simulation case study highlighted that for outputs, linking to high tacit driven knowledge, the Capacity of Aggregation outside the individuals knowledge domain was weak. There is a sense within the case studies that the more the Associate is able to aggregate new tacit knowledge within the knowledge production process, the harder it is for other knowledge actors to replicate that knowledge through knowledge transfer by the Associate. This provides a further challenge best highlighted in the Simulation case study where the simulation tool was increasingly used across projects and the Associates work on the operational side increased dramatically resulting in slowing down the advancement of the simulation.

This was also apparent in some of the answers in the case studies who admitted that the competitive advantage, in that knowledge domain, may be lost if the Associate was to go. On the opposite, this was further strengthened by the shorter KTP used for the transfer report which only had operational gain and whereby the associate gained very explicit driven knowledge and was argued to have somewhat limited absorptive capacity. The company did not lose the internal superior performance gained and the company supervisor was able to continue even after the associate left. However, no SCA was achieved.

This thesis highlighted that if the knowledge production that leads to superior performance is mostly of a tacit nature, then knowledge transfer between individuals prove difficult. Every KTP has knowledge replication as an objective however, it becomes obvious that some of the tacit knowledge stays with the individual.
Nevertheless, considering discussions about absorptive capacity of individuals, some of the time and effort spend may not yield in new knowledge production that would link to a stronger competitive position for the company. This thesis concludes that emphasis such as Nonaka (1994) conversion from tacit into explicit may not be the best strategic focus for a firm. It could be argued that the KTP case studies support Brown and Duguid (1991) in the discussion about ‘communities of practice’ for the transfer of expertise, especially as I would argue that a project environment could be classified as exactly that. However, the question would remain if emphasising on knowledge transfer is an efficient approach to knowledge integration? The case studies suggest that recognising individual knowledge domains and group problem solving is far superior than hierarchical decision-making. Although commonality of specialised knowledge seems to be important, company strategy should consider to keep knowledge transfer to a minimum, just enough for the team to understand each other. The case study also suggests the element of trust as a critical success factor.

The assumption for the role of common knowledge is, that there is increased organisational gain in knowledge production if integration mechanisms involve common knowledge between individuals. The case study analysis was able to support this assumption. However, unlike most of the literature which views knowledge creation (production) as separate from knowledge integration, I conclude that such differential view, although logical, is counterproductive. This thesis is therefore, in line with Spender (2002) who also highlights that Grant was unclear if coordination activities requires the generation of new knowledge and concluded that integration requires additional knowledge creation. My theme conclusion is going a step further and I propose that a knowledge-based strategic view should consider group problem solving and decision-making as a main strategic activity, not just for knowledge creation but for knowledge coordination as well. In light of common knowledge, group problem solving is a way of team building which in turn is a distinct knowledge-creation activity to build further common knowledge.
On the outset, one of the KTP missions is to integrate the KTP knowledge across the company. However, the case studies showed that integration of tacit knowledge within the company is not the most effective activity and the case studies struggled with tacit knowledge transfer and did not pursue it in most cases. Instead, companies naturally fall into the coordination aspect of how to use specific knowledge domains to achieve a common goal. Interestingly, the companies did not communicate the fear aspect to have tacit knowledge leakage and jeopardise the competitive position as the literature review would suggest, but deemed that such tacit knowledge transfer would be too expensive and ineffective within the time and money constraints given.

Another important discussion linked to the organisational capability theme, is the assumption that, the more individuals are used to broaden the integration of knowledge scope within each capability the more difficult imitation becomes. The case study analysis highlighted that SCA was achieved because the limited participants showed a very high level of tacit knowledge with the key individual achieving highly personal and very complex degrees of knowledge. This suggests that greater causal ambiguity may not only be achieved by ‘broad scale’ integration but by the amount of complex tacit knowledge integrated or produced. The implication for managers is therefore, that the argument to use a project structure by involving limited actors and the focus to achieve individual specialisation in knowledge acquisition is a favourable strategy to achieve and sustain CA.
5.4 - Holistic View with Focus on Organisation Structure for Decision-Making

This subchapter will discuss the third primary knowledge process of organisational structure for decision-making by giving a holistic view of the supporting knowledge elements identified in the literature review.

![Knowledge Elements Diagram]

**Figure 15: KBV value chain focus on decision-making**

The overall assumption, that knowledge production, integration and decision-making put emphasis on efficiency could be strengthened within my case study analysis. Therefore, organisational structure for decision-making is a determinant for success.

Discussion in the Organisational structure theme above highlighted that for example, earlier identified types of common knowledge, in the role of common knowledge theme can in turn become enablers for the location of decision-making. It was important to untangle the KBV into themes to understand and shed light into their characteristics but managers need to recognise that themes are in fact all interlinked which each other.

The literature review highlighted that traditional hierarchical structures may be counterproductive when considering the KBV as an environment for firm strategy. Based on the limitation of this study, my thesis introduced a discussion in which
organisational structure and effectiveness was linked together. The discussion focused around the centralised VS decentralised view and also included a detour to project based structures. This emphasis was given because of the project based nature in KTPs. Overall the project based structure worked favourably to consider the KBV as an act of strategy to achieve SCA.

The assumption that, if a firm is integrating knowledge which is possessed by individuals in tacit form, then hierarchical coordination will fail, is strengthened. All studied KTPs have shown a relatively flat structure. The case studies highlighted that strategic decisions based on lower complexity of knowledge was made by higher-level senior management whereas, decision with a higher degree of tacit knowledge was done by the tacit knowledge holder and therefore, by the lower-level. However, the main advantage was that all decisions were made within the project team structure and there was no additional central decision as such as in all case studies a higher-level individual was a member of the project team.

The Crystal case study was able to present a counter example where the complexity of knowledge consideration was not followed and hence, resulted in inefficiencies of the overall project output. In large, it is likely that for more traditional firms this tendency would be exacerbated. Therefore, to follow an effective KBV strategy this thesis favours the project-based structure.

To overcome coordination issues, the decision maker is in a dilemma to either go through intensive knowledge transfer mechanism which will be face to face, timely and costly; or to make decisions based on potentially insufficient knowledge; or decentralising the decision to the knowledge holder who may not be aligned to the company goal and understand company direction. As a minimum strategy to overcome the barrier for vertical knowledge transfer, the knowledge holder should be present and integrated in high-level decision-making which requires complex knowledge domains. Hence, the Simulation case study seem to have a knowledge exchange strategy whereby the higher-level clearly communicates company goals to
make sure that the Associate (knowledge holder) bases discussions with the company goals in mind.

The primary observation in the case studies is that coordination is best achieved through the direct involvement of specialist individual knowledge, in which the case studies used primarily the mechanism of ‘group problem solving and decision-making’. This favours the team-based organisational structure discussion in the literature. The case studies suggested that the tacit knowledge holder can usually solve problems more effectively than subsequent explicit knowledge holder. The advantage of the KTP project based structure is that the higher level and the lower level work together and increase their common knowledge base by default and hence, all KTPs showed a strong involvement and representation from the senior management team, mostly the CEO. The efficiency of such an approach could be related back to the literature review discussion that intensity within substructures are higher than those between substructures which would support hierarchical organisation design. However, the inclusion of the high-level in the substructure overcomes the traditional hierarchical organisation model while still expediting on the intensity aspect. Therefore, managers should consider a flat project structure in which the knowledge holder is represented in any central project board meetings and whereby the senior manager is also part of the informal group problem solving and decision-making activities which would change emphasis and roles and responsibilities from any ‘business as usual’ structure to be tailored specifically to the project.

This then brings the decision makers’ attention to the location of decision-making. The assumption is that co-location of decision-making will produce better decisions if the nature of the knowledge is in tacit form and the case studies certainly strengthened this position. I already mentioned the Crystal case study which highlighted the danger of centralisation and therefore, decision-making, when the person with the knowledge domain is not consulted or listened to. However, can a KBV approach for decision-making still be defended for major strategic decisions? My
conclusion in the theme discussion is that it should. Once the company values its tacit knowledge base as the strategically most important resource which is linked to SCA, and once the company understands that such knowledge is not easily copied by competitors but embedded in the individual, then any decision-making, even for strategic decisions, should follow or at least include the individual with the specialist knowledge.

The project based structure has the ability to overcome deficiencies of hierarchy within the KTPs in which team members are a fluid resource. The big difference is that the Associate, who is the constant person in knowledge specialisation, is kept throughout the KTP project and preferably thereafter. This has helped the success of a KTP throughout the KBV-theme discussions. Therefore, and considering the earlier discussions, decision makers should identify who the main knowledge benefiter for a specific benefit is. In the pursuit of achieving an SCA, such benefit should be linked to an internal superior performance that can achieve a CA. A project management team should be built with clear roles and responsibilities which includes a high level representative in the project team. Furthermore, managers should facilitate the emerging KBV-principle to use a knowledge based approach for decision-making by differentiating between complexities of knowledge.
Chapter 6: Conclusion and Contribution to Knowledge

6.1 - Introduction

The aim of this chapter is to revisit and address my research aims and objectives and provide a critically reflective summary of the contribution to knowledge. Furthermore, I will provide a contribution to practice as well as a knowledge-based project management view before discussing the limitations of this study and the need for further research.

In chapter one, I began my thesis by asking the following research question:

How (if at all) can the knowledge-based view (KBV) be used as an act of strategy formulation to achieve a sustainable competitive advantage (SCA)?

To satisfy my research question, I stated four main research objectives. The first objective stated is:

To specify and critically evaluate the KBV as an act of strategy formulation and associate themes key to a KBV

My literature review highlighted that the KBV holds that knowledge is the key determinant to achieve a competitive advantage for the firm. Knowledge that can be linked to an SCA, should be valuable, rare, inimitable and non-substitutable (VRIN). I identified that any VRIN knowledge characteristic needs to have a higher degree of tacitness (see Figure 2: Complexity of knowledge). I also highlighted a link between a higher degree of knowledge complexities and the ambiguous nature of knowledge. The positive contribution of knowledge ambiguity is, that it hinders knowledge leakage to competitors and therefore, contributes to sustain an advantage. However, the literature review highlighted also the empirical challenges that come with knowledge ambiguity. I identified a research gap which interlinks all identified KBV-themes into a holistic view within a specific context. Hence, for the KBV to be used as an act of strategy formulation, it is vital to gain a deeper understanding of knowledge...
elements that can be linked to SCA. Therefore, I broke the KBV into specific KBV-themes using Grant’s (1996) original paper: toward a knowledge-based theory of the firm. Once, the KBV-themes were critically understood the next challenge was to find a context that could theoretically minimise the challenges identified in the literature, such as, the ambiguous nature of knowledge. Hence, the second research objective to be satisfied is:

**To situate the KBV in a context favourable to unveil SCA for the firm**

My literature review concluded that there is a need for a research stream to create a holistic KBV-theme understanding, with the need of an environment that can best link SCA to the KBV-themes. There is lack of empirical research incorporating those elements, mainly due to the challenge to unveil the context and the knowledge elements that can be directly related to an SCA. I referred to this as the magician’s trick. My literature review also highlighted that the typical approach, is to measure performance indirectly by using indicators (e.g. number of patents). It was concluded that such measures do not unveil performance that can shed light into the nature SCA, nor the source of such advantage.

I determined and critically analysed the link between KBV-themes and SCA. I then placed Knowledge Transfer Partnerships (KTPs) as a context which provided me with a strategic research fit environment to overcome the challenges stipulated in my literature review. I concluded that KTPs are special, as they are set up to achieve an SCA for the firm by filling a predefined knowledge gap. As such KTP projects are typically classified as strategically important for the firm, they are usually 3 years of duration and partly funded by the government. Hence, KTPs are set up in a somewhat controlled environment with minimum knowledge actors, which the literature review also identified as a favourable environment.

However, even with identified KBV-themes and an environment that has achieved an SCA, the challenge still remained how to gain an insight into the KBV through a sound methodology. Hence, the third research objective to be satisfied is:
To develop a research construct most likely to overcome issues of causal ambiguity of knowledge

My main concern is to establish a link between KBV-themes and SCA to aid strategic thinking and strategy formulation. The literature review revealed that there is no research into a holistic approach of the KBV-themes to grasp how the KBV-themes interlink with one and another; and if they can be used as an act of strategy formulation. The literature only shows limited empirical research and such research is merely restricted around single KBV-themes or phenomena, whereas other KBV-themes have not received much empirical examination at all. Some studies even neglect differences between complexities of knowledge. Although logical, there is very little, if any, empirical research to suggest that different types of knowledge link to actual SCA. The literature review used the analogy of the magician to show the difficulty placed by the sleight of hand (knowledge ambiguity) and the success of the whole illusion that the viewer cannot replicate. Hence, to gain an understanding of specific knowledge elements responsible for SCA of the firm, it is important that the context of the trick and the outcome is fixed from the start. This enables the viewer to know what he or she is looking for. In order to aid with this challenge, the literature review identified a theoretical link between a context, variable knowledge elements and an output that could be theoretically linked to an SCA. I used that discussion to build a knowledge-based value chain construct that uses a KTP project as a context. Since, each KTP project was set up to gain an SCA; and since each KTP has an end project report, I could identify successful firms that have already established an SCA. In order to gain further insight into the KBV, I also built a knowledge-based view value chain which included knowledge processes and knowledge elements. Hence, the fourth research objective to be satisfied is:

To understand, how and why, the identified knowledge elements (if at all) explain SCA and how they can be used to recommend a holistic KBV strategy

The last objective was then linked to my methodology chapter to gain a primary research objective. The Methodology chapter identified four KTP case studies (including the pilot case study) with 11 in-depth interviews of knowledge actors. Each
knowledge actor was asked about KTP project and the outputs that they sought were linked to the achievement of the SCA. Once understood, all KBV-theme questions were asked in line with the KTP outputs responsible for the SCA. This allowed insight into, how and why KBV-themes interlink with one and another and allowed the analysis of the primary knowledge processes of knowledge production, knowledge coordination and organisational structure for decision-making. Thus, enabling a holistic view for strategy formulation.

My review suggests that knowledge activities are primarily conducted within individuals while the organisation is a complex activity system supporting knowledge processes. My analysis argued that the ‘capacity of aggregation’ theme can be subsumed into other themes, such as, transferability and location of decision-making themes and subsequently end up as an enabler for other KBV-themes rather than a theme itself. Whereas the ‘appropriability’ theme is, within this research objective and overall research goal, of limited value to the KBV as an act of strategy formulation. I argued that, since knowledge that leads to SCA is embedded within individuals in a highly tacit form and since individuals are classified as voluntary actors within a firm, the only appropriation discussion important for a KBV as company strategy is its capability to create goods or service by using relevant knowledge actors to create or transfer knowledge. The KBV and the focus of this research is not concerned if knowledge in itself can be appropriated but how such knowledge can be strategically linked to the achievement of a product or service that can be linked to SCA.

6.2 - Contribution to knowledge

My contribution to knowledge has been within the area of the knowledge–based view of the firm, particularly with a focus of a context or social architecture in support of an SCA. I unfolded specific themes and made sense of them by using mainly a qualitative case study approach. This allowed me to unfold the total experience of isolated projects which were identified as a strategic research fit for my research purpose. This interactive process of untangling and making reflective sense allowed
me to share insights into a holistic approach of the KBV and its remarks within a competitive strategy formulation.

In strategic management, I have demonstrated a contribution to the KBV as a holistic concept of strategy formulation. The analysis of the KBV-themes have highlighted that the themes link with one and another. The concept of strategy formulation was achieved by interlinking the KBV-themes into a holistic view of primary knowledge processes. To illustrate my contribution to knowledge and form a new structure of an emerging KBV strategy, the analysis chapter used the earlier identified primary knowledge processes (see Figure 6) from the knowledge-based view value chain. The primary knowledge processes to sum up the bulk of the research undertaken, are:

- Knowledge production;
- Knowledge Coordination; and
- Organisational structure for decision-making

My work on understanding knowledge elements as a source for SCA, demonstrates an important contribution to the explanation how knowledge processes and knowledge elements can be used to inform KBV strategies. However, there are limitations to my research approach and thus, I cannot claim to have developed a fully integrated holistic approach to a KBV strategy formulation. However, I can claim to have contributed to the understanding of the complementary use of knowledge elements and knowledge processes more likely to achieve SCA.

In doing so, I have contributed to the knowledge value chain discussion, by formulating a value chain based on the KBV-themes and processes. I labelled it the KBV value chain which combines more operational knowledge elements with strategic knowledge processes. Within this work, I have contributed to develop the manager’s needs to understand that the KBV-themes cannot be seen in isolation when forming strategies but rather have to be understood as a complex web of interlinking counterparts which contributes or informs the knowledge production, knowledge coordination and organisational structure for decision-making. Hence, any
manager should view knowledge processes as a complex activity system of the organisation, while the knowledge elements as a secondary activity are conducted within individuals.

I have also contributed to the explanation why KTP projects have been so successful in achieving SCA for the firm and hence, have received continuous funding for the last four decades. Within this research context, the KTPs allowed me an unprecedented insight, through the use of ex-post in-depth analysis, that can explain the achievement of a particular SCA by explaining success and failure through the use of the KBV value chain. Hence, I contributed to the KBV discussion by being the first researcher to have used KTPs to explain how and why the KBV can be used as an act of strategy formulation to achieve an SCA.

Furthermore, I have contributed to supporting concepts (e.g. ‘communities of practice’ (COP)). For example, in my case studies, COP were fixed as a core group and only used other knowledge actors, selectively, supporting the idea of ‘fluid membership’. This selective use of knowledge production, is in line with earlier stated assumptions of Krogh et al. (2001) and my research supports Simon (1991) individual perspective on the locus of knowledge.

My KBV value chain conclusion in the analysis chapter also discussed some disparities with some of the major KBV assumptions. This is an important contribution to knowledge as KBV assumptions must be fully understood and justifiable to strengthen the KBV as an act of strategy formulation. The KBV assumptions are generally accepted by the majority of other KBV research studies. However, this research study does not support all assumptions and as such would raise concerns for any studies that are based on such assumptions. For example, my KTP study could not explain the assumption that organisational capability depends upon the scope of ‘many individuals’. Although this view is widely accepted, the KTP case studies tell a different story. My understanding is, that the main knowledge elements responsible for organisational capability is the individual absorptive capacity of the knowledge actor and their cognitive ability that achieves complexity of knowledge. Furthermore, I
contributed by linking this discussion to another discussion which assumes knowledge transfer to be subject to ‘knowledge economies of scale’. This assumption has its validation mainly in the KM literature discussion using technology. However, my interpretation based on the KTP case studies is, that knowledge which is predominantly within individuals and need to show a high degree of complexity to be linked to SCA, means that ‘dis-economies of scale’ are increasingly likely the more complexity of knowledge an individual knowledge actor has achieved. Hence, I would argue that: the KBV should view organisational capability as the outcome of knowledge production and coordination of disparate specialist knowledge domains into one or more individuals, whereby the complexity of a capability depends upon the depth of knowledge which has been aggregated by such individual(s).

The following summary explicitly highlights the theoretical, methodological and practical contributions made by my thesis:

**First** – I extrapolated a specific KBV value chain which comprehensively links the primary knowledge processes of knowledge production, coordination and decision making with identified KBV knowledge elements. This allowed for a unique holistic view of the KBV of strategy which no other model in the identified literature provided.

**Second** – I have created a distinctive KBV value chain construct which allowed me and will allow future researchers to make reflective sense of case study analysis in the understanding of complementary use of knowledge elements and knowledge processes more linked to SCA.

**Third** – I identified and defended the use of KTP as a strategic-fit environment for my KBV value chain construct. In doing so, I am the first researcher to have successfully demonstrated how and why the KBV can be used for strategy formulation, while understanding latent dynamics of a holistic KBV of strategy to explain the success and failures within KTP projects. This is different from other empirical research studies who mainly focus their contribution to one isolated KBV theme.

**Fourth** – My contribution to practice is the creation, understanding and implementation of my complexity of knowledge model in developing strategy.
formulation for managers requiring to implement a knowledge-based view of strategy within knowledge production, coordination and decision making.

6.2.1 - Practical Recommendations (Implications and Emerging KBV-Principles)

My results of a holistic view into KBV-themes offers practical insights for decision makers. I concluded that project environments are a good fit for implementing a KBV perspective to achieve SCA. Decision makers should place a KBV of Project Management (PM) as a context. Current PM practice is placing methodologies such as PRINCE2 as a context. A methodology as a context then formulates a belief system to deliver a project in the PRINCE2 way, which in turn is making this strategic approach very rigid. The literature review highlighted that project management is used to implement change and innovation in order to achieve superior performance. My thesis successfully linked the achievement of such increased competitive positioning to KBV-themes by also redefining some of the assumptions particular to the KBV-themes or the KBV as a whole. Therefore, by placing the KBV (for Project Management) as a context and use variable elements from methodologies in line with my conclusions, decision makers can place knowledge as the strategically most important resource of the firm and build the specialisation of their knowledge holders and therefore capabilities around that.

Earlier transferability discussion highlighted that a real trigger for success, and therefore concern of managers, should be to decide which individuals show the right skillset of knowledge and absorptive capacity for the specific output in mind. An important perspective established in the Crystal Case Study is the danger that the wrong team members may have too much of a particular knowledge which may even hinder the effective production of outputs. The case study company did not want the technician to have in depth tacit knowledge of how the crystal is built on a monocular level as there is a danger that technicians may play around with settings. Their responsibility is to focus on replicating and following the ‘recipe’ to achieve more outputs. The leading engineer, self-reflected and concluded, that he is not the best
person to take over the responsibility to achieve large quantities as his mind would be to play with every crystal batch to optimise the structure although it may not be needed and therefore ‘over engineered’. Hence, the knowledge-based PM Principle emerges to ‘Create a Diverse Team with clear roles and responsibilities’. To best adhere to this principles, decision makers would need to recognise individual knowledge domain by considering the current knowledge level and the main knowledge benefiter for the project. The case study analysis further suggested to have a high-level representative within the team. Managers should direct their attention to identify commonality or some overlap of specialised knowledge, preferably centred within the main knowledge holder.

This discussion around tacit knowledge however, does not undermine the importance of some form of explicit knowledge. Explicit knowledge can be shared easily amongst individuals which aid communication and a common understanding to achieve an output. Within an emerging KBV of projects, this would particularly put emphasis on the mode of Knowledge that needs to be transferred. If the knowledge is highly explicit in nature, than an email or a written report would be sufficient. However, if the mode has some tacitness involved and is henceforth, harder to communicate, then face to face communication would be key. Considering the earlier analysis of the case studies, the tacitness of knowledge is important to decide the complexity of knowledge. The complexity of knowledge also influences the efficiency of knowledge transferability. Hence, decision makers should use my complexity of knowledge diagram (Figure 2: Complexity of knowledge) and decide if the knowledge is transferable and if so, decide if knowledge transfer is the most effective way for knowledge production and coordination including considerations of cost and time implications. As a general rule, I would argue that any knowledge transfer over ‘Expert level’ (in which common knowledge is usually enough to achieve knowledge transfer) should be strategically considered (e.g. time, cost, and benefit).

The other emerging Principle is the importance of the project team to ‘communicate effectively and clearly’. The shared location as an enabler was already identified in
the KBV-theme analysis and should be the preferred option. I also identified that communication within substructures show a higher intensity then those between different substructures. To leverage that, earlier identified types of common knowledge, e.g. a common language, is important. I established that the commonality of specialised knowledge also enables shared meaning and since KBV projects have a diverse team, a common project management language would support the principle to communicate effectively and clearly.

The leading mode of knowledge production and integration within the case studies is through the mechanism of group problem solving. Again, allowing freedom and trust for the team to reach socialisation and understanding that the achievement of common team knowledge takes initial time investment but is linked to the achievement of SCA within the case studies. The emerging principle here is ‘Outperform through collaboration’. The case study analysis highlighted the importance of a flat governance structure and a common goal within the team. This collaboration principle will in turn increase the common knowledge as an enabler for capability formation and improve the specialisation in knowledge acquisition. The main knowledge holder can challenge and discuss their current level of knowledge, especially in connection with problem solving, further fostering specialist knowledge creation of individuals. Projects should collaborate between knowledge specialists to achieve the output considering that the best way to communicate and collaborate is from a shared location. Knowledge production and coordination should be based on the same common knowledge types placing group problem solving as the main integration mechanism. This will help knowledge exchange and help team knowledge capabilities to then in-turn foster specialist knowledge creation of individuals. Individual absorptive capacities should be recognised and additional coordination mechanisms used to integrate tacit knowledge with e.g. rules and directives or formal routines, especially, if further knowledge transfer between individuals does not add to benefits. However, decision makers should consider the trade-offs between formal integration mechanisms and informal more rich communication based mechanisms.
However, the simulation case study highlighted, that with increasing demand of a particular knowledge domain, the individual involvement of the knowledge holder could increase into operationalisation efforts for others. This in turn could weaken further knowledge specialisation of the individual and the knowledge will start to stagnate and therefore, hindering further innovation which may well be a reason to not be able to sustain the competitive advantage. Therefore, another emerging KBV-Principle is to ‘Enhance continuous knowledge specialisation’. The case study analysis already linked the main driver for organisational capability to the ability for knowledge specialist to continuously evolve. The assumption that many individuals are needed for knowledge production and that such scope of knowledge is important to limit knowledge imitation, was weakened within my KTP analysis. Instead, a continuous knowledge specialisation strategy will allow firm capabilities to be based on more and more complexity of knowledge which, if the capability cannot be substituted by competitors, should support the sustainability of a CA.

Within the KTPs the overall benefit was to fill the knowledge gap which should be the preferred option for any KBV of project management. The case study analysis, further highlighted the importance of clearly identified benefits and the emerging KBV Principle for decision makers is therefore to ‘Focus on Benefits’. The effective use of tacit knowledge within the firms offering of a service or product, is primarily linked to achieving improved competitive positioning. Furthermore, tacit intensive knowledge is acquired, stored and new tacit intensive knowledge created within individuals. Once, this assumption is identified strategically, the firm can identify benefits that can create an improved competitive position. As a strategic objective, such benefits need to clearly address the link to achieving a competitive advantage. Focusing on benefits would have two main advantages. Firstly, this approach would increase the synergy between efforts of the lower-level project teams and goals of higher-level management.

Secondly, the project team, once the benefit to be achieved is understood, can use their knowledge-base to identify the output that would best lead to the outcome
needed to achieve the benefit. It would furthermore give the PM team freedom to establish the output themselves aiding to the collaborative culture and the feeling of trust and freedom, which was one of the biggest coordination enablers and motivators within the research case studies.

To further strengthen the ‘focus on benefit’ principle and capitalise on the effects of the autonomy and freedom discussion, decision makers should link this principle to a further principle of ‘Manage by exception only’. Once, the overall benefit is understood by the project team, the team should have autonomy to get on with creating the outputs. Typical project tolerances for e.g. time, cost, and quality and the benefit itself can be used to establish a control mechanism if needed.

The final Principle emerged in my thesis is to ‘Use a knowledge –based approach for decision-making’. The literature review and case study analysis made it clear, that the degree of tacitness of knowledge is important to decide the complexity of knowledge and therefore, the transferability. Decision makers should use my complexity of knowledge diagram (Figure 2: Complexity of knowledge) and decide if the knowledge is transferable in the first instance and if so what the cost and time implications are.

A pre-requisite of any KBV project management approach should be to include a senior management representative and the main knowledge-benefiter (e.g. customer) so that decisions can be made within the project management team structure.

Decisions within a KBV-project approach should be all done within the project management team as the team would include a high-level representative and the main knowledge benefiter. As the main mode of coordination within my KTP study is group problem solving and decision-making, professionals need to understand that a KBV-project is communication rich and therefore, communication may be more time intensive for the KBV project team, compared to other project teams. However, to further efficiency, decision-making should be based around consensus for low
complexity of knowledge decisions. On the other hand, when it comes to high complexities of knowledge, decision-making should be based on direction from the knowledge specialist.

Any company strategy following a KBV project approach should trust the tacit knowledge holder as the knowledge specialist to make the right decision as anybody else within the company would make that decision with less relevant knowledge than the knowledge specialist. This of course would suggest, that the top and middle management would lose some control hence, earlier identified KBV Principles like ‘Manage by exception only’ and ‘Focus on benefits’ become increasingly important if more strategic control is preferred.

Where the firm preferred a centralised decision-making approach, it is important that only decisions requiring a lower level of complexity are used for vertical decision-making whereby the knowledge specialist should be present in the centralised decision-making. Hence, the KBV-principles should act to shape an environment and act as a prerequisite guideline with the understanding that, if the principles are not adhered to, then the project does not follow a knowledge-based view on project management.

6.2.1.1. - A Knowledge-Based Project Management View

The literature review argued that a firm should try and use as many formal integration mechanism as possible such as rules and directives and sequencing, as they are a cheap and generally effective integration mechanism economising on knowledge transfer and redundant communication. However, the case study analysis revealed that decision makers should view rules and directives, sequencing and formal routines as supporting mechanism that will not directly lead to SCA. There is a danger for companies to be side-tracked by the pursuit of effectiveness, when it comes to strategic knowledge production and coordination. Instead, focus should be given to a
group problem solving culture to increase common knowledge as a team and allow for continuous improvement.

Having analysed the KTP projects within the lens of the KBV, it is apparent, that the KBV can explain SCA and hence, can be used to formalise KBV strategies to achieve SCA. Projects are seen as a major accelerator for innovation and organisational change in the pursuit of the companies drive to survive and compete (Webb 2017; Svejvig and Andersen 2015; Murray 2009). The KTP case studies used within this thesis, tick all the necessary characteristics of a project (e.g. time-bound, unique, uncertain, cross functional) and is an exemplar for company activity that is continuously leading to CA. Hence, focusing the KBV on project environments and forming KBV strategy on project management to achieve SCA of the firm, seems like a much needed fit.

Projects can be continually formed by viewing individuals as embodiments of specific knowledge that have potential to be interlinked and swopped with relatively low costs. Such coordination activities, can be used to achieve new benefits or to strengthen and improve existing capabilities.

KTP analysis showed that a limited size of the ‘project organisation structure’ enabled effective knowledge production. This is a real advantage for the KBV in a project context as projects by definition have a limited organisational structure which is independent to the ‘business as usual’ structure. Therefore, managers can influence the size as an act of strategy. Furthermore, individual actors can be interlinked to the project with a limited team-size and understand a new context to increase their own organisational specific knowledge and add to problem solving from other projects. The Simulation case study analysis supported individual interlinks between projects. Hence, the recognition of individual knowledge domains becomes an important type of common knowledge from a manager’s perspective in order to form the right project teams.
6.3 - Limitations and Future Research - PhD Level

As a multiple case study approach, this research has the typical limitations of qualitative research. The focus of my study is on tacit knowledge, as it is linked to SCA. However, explicit knowledge needs to be seen as a further dimension to enable tacit knowledge in the pursuit to achieve SCA. Consequently, further studies on internalisation and combination are needed to show how explicit knowledge and therefore, lower levels of complexity aid in the creation of high complexities of knowledge considering IT. However, in order to be in line with this thesis, such studies need to focus on effects as enablers rather than placing explicit knowledge as the major strategic direction or assuming that tacit knowledge can be made explicit without considering knowledge loss.

The risk to choose continuous knowledge specialisation over knowledge integration is increasing dependency of the organisation towards the knowledge holder, and the knowledge gap when the individual leaves or is not available, which in turn strengthens the knowledge holder’s position, if the knowledge domain has high demand. On the other hand, the knowledge holder would have a weaker positioning if the specific knowledge domain drops from the company priority. However, this assumption should receive some further attention and implications need to be further understood to strengthen strategy formulation.

Based on the above discussion, future researchers should focus on knowledge transfer versus knowledge specialisation discussion where an increasing internal company demand for specialised knowledge took place. The link between increasing dissemination of knowledge, internally, and the effects on knowledge specialisation and the barrier to continuous specialisation and therefore, knowledge innovation is not fully understood. This thesis highlighted the threat that continuing knowledge specialisation is slowed down when the knowledge dissemination activities require constant input from the knowledge holder. Hence, there is a need to further understand these competing secondary knowledge elements in order to form firm strategies.
The consideration of autonomy and care have shown a positive contribution as an enabler for knowledge creation and transfer within this study. Enablers are purely conditions of a firm’s context in which management can intentionally intervene. Undoubtedly, there are many more of such enablers that should be viewed and analysed from a KBV perspective considering that organizational design is one of the key areas where this intervention can take place. Although, such enablers were not a particular focus of this study, they certainly have a place in the strategic consideration of a holistic KBV and need to receive further attention.

My conclusion on the economies of scale in knowledge production has already highlighted that, since, high levels of complexity of knowledge is positively linked to the achievement and sustainability of competitive advantage, individual capacity becomes the predetermining factor for efficiency of knowledge production. Hence, an economies of scale for knowledge assumption, based on organisational mechanisms to achieve SCA cannot be agreed upon. Further empirical research based on these contradicting findings of economies of scale is therefore needed to clarify this further. I would argue, that future researchers should include the effects of knowledge redundancy, which is the existence of knowledge greater than the requirement of its organisational members and the correlation to SCA. Such a link could further dismiss the idea of economies of scale in research when linked to SCA. However, further research is needed in this regard.

The intention of my thesis was to come up with a general knowledge value chain model and provide a construct that may assist future researchers to construct a knowledge value chain model for their context and therefore, make it easier for future scholars to build on and collect evidence. Consequently, the knowledge-based value chain construct identified in my thesis should be developed further to create a knowledge-based value chain model that encompasses my complexity of knowledge discussion. While, my complexity of knowledge diagram shows an SCA-led nature and overlap between explicit and tacit knowledge as well as some indication of, for
example, expert level or highly personal level, this diagram should further distinguish such differentiations and link it further to possible knowledge transfer enablers.

Finally, my identified KBV-Principle needs further empirical studies as well as a KBV project framework that places knowledge and the KBV as a context rather than being driven by other methodologies. This would also have the advantage to take methodologies such as PRINCE2 or AgilePM out as a project context and place it as a further mechanism of project interaction and governance, allowing a KBV framework to act as a structural skeleton and the context to achieve an SCA.
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Appendix A – Example of Interview Transcript (short)

(In printed version only)
Appendix B – Pilot Study - Shorter KTP Project Analysis
General Findings

This pilot case study investigates a shorter KTP project also called sKTP. Unlike the ‘classic’ KTP, sKTPs are shorter in duration and may also tackle more operational issues concerning the company. Hence, a strong link to SCA as discussed in the Literature Review may prove difficult. This particular case study embedded a new eMarketing capability within the organisation enabling the firm to develop digital solutions as part of their product range. During the interview, the SP/CA which was described by the participants concentrated around eMarketing, eLearning and the ability to act quicker with a dynamic website that is fit for purpose. CS highlighted that 2/3 of the current portfolio did not exist five years ago (Link to Q2).

The KTP report identified this project as being able to achieve significant commercial benefits. However, the use of digital solutions is not unique within the industry and could be regarded as a strategic ‘catch up’ which will not present an SCA as discussed earlier but had very high impact for the company to survive and compete. The KTP report also highlights that this sKTP will safeguard three jobs, which it did. The interviews did not highlight any negative views and all participants rated the overall performance to achieve some sort of SP/CA as Medium (AL2), High (AL1,CS) and Very High (AC). However, AL2 highlighted that there was no SCA achieved but the KTP certainly added value to the company, while the CS stressed that this KTP was very important for the company to survive (link to Q1).

In order to satisfy the main research question and in particular objective three, key outputs of the sKTP were discussed as well as the outcomes. The last two questions of the interview asked if there was a measurable improvement from using the outcome (Link to Q17), which identified any benefits and the order of which the benefit was perceived to add to the companies SP/CA. The main output areas can be summarized into eProduct development and digital eMarketing capabilities. The outcomes are stated in Appendix A.
Furthermore, this case study validates all four main assumptions highlighted in the Literature Review:

**The first assumption** is that ‘knowledge’ is considered to be the most strategically important resource of the firm. The Literature already proved that this assumption is valid for my case study. Furthermore, CS also mentioned during the interview that filling the knowledge gap identified within the KTP was instrumental to stay in business.

**The second assumption** is the differentiation between explicit and tacit knowledge with tacit knowledge being essential to achieve sustainable competitive advantage due to its limited transferability and causal ambiguity. The following analysis of the Themes will show that the KTP indeed differentiated between explicit and tacit knowledge and also highlights that the outcomes which are perceived to have tacit knowledge are indeed the once linking to the benefits which were identified to link stronger to SP/CA.

**The third assumption** is that tacit knowledge is acquired and stored in a ‘highly specialised form’ within individuals. The following analysis of the Themes will support this assumption as being valid.

**The final assumption** is that production needs a widespread range of knowledge which the KTP structure supports within the knowledge integration process. The case study did not only identify the need to work as a team with the Key KTP Stakeholders to achieve the outcomes, it also evidenced that all knowledge actors contributed to fill the knowledge gap of the company.

Specific KBV Themes Findings
After identifying the perceived KTP outcomes of each Key KTP Stakeholder, every subsequent question which was linked to the themes was asked in context of the identified output and outcome, which was one of the earlier identified requirements to achieve valuable data and be transparent. Furthermore, the outcome is also linked to the SP/CA identified in this case study.

It is important to highlight that all themes are very much linked to each other providing considerable challenges to view each theme in isolation. However, dividing the themes was important to show the validity/invalidity of each theme. The analysis will cross reference some themes but will limit this cross referencing to only major links in order to achieve clarity within each theme.

Transferability

The ‘Transferability’ Theme is only one out of three ‘knowledge specific’ themes identified in the Literature review. The identified KBV assumption in the Literature Review is that explicit knowledge has high transferability whereas tacit knowledge shows low transferability. During the case study interview (Q6) it was evident that outcomes perceived as explicit knowledge were described as being transferable without major challenges whereas outcomes which were described as having a somewhat tacit nature seem to be more difficult and complex to transfer. Hence, this case study supports the ‘Transferability’ assumption of the KBV Theme.

The ‘Development of more training packages’ and the ‘International consultancy development’ was developed by using a mix between explicit and tacit knowledge e.g. the digital tools to reach the international market was mainly based on tacit knowledge. However, the implementation, networks and consultancy knowledge was very much tacit. Interestingly, the KTP recognized this and divided the activity based on the explicit and tacit nature. This case study had no identified Knowledge-based Strategy but nevertheless there was a ‘Recognition of Individual knowledge domains’ (0) which was taken into consideration within this project. The Literature Review
already revealed KTPs as a strategic research fit environment’ and the fact that the main aim of any KTP is to fill an identified knowledge gap which is highlighted by the company seem to be supporting a knowledge based approach in activities and decision-making. This is further strengthened by the fact that the project is done outside the business as usual structure.

Moreover, the difference in approach for explicit and tacit knowledge also translated into the ‘Specialisation in knowledge acquisition’ and ‘Integration of specialised knowledge’ KBV Themes discussed in subchapters 0 and 0 subsequently, as well as the ‘Location of Decision-making’ (0) theme. AL1 described the above mentioned ‘Development of more training packages’ and the ‘International consultancy development’ as being a mix of tacit and explicit knowledge as the Associate generated the ideas and digital tools by working with the ALs using mainly explicit knowledge but the decision which particular one to choose, for which countries, was done using the knowledge and experience of the CS.

Taking the upcoming discussions in the other KBV Themes into account it seems that the Transferability Theme plays a major role in the achievement of the outcomes which are linked to SP/CA. The differentiation between explicit and tacit knowledge seems to be a major criteria to facilitate the decision-making mechanism and supporting the ‘Coordination within the firm’ and ‘Organisational structure and design’.

Capacity of aggregation

The ‘Capacity of aggregation’ theme links to both strategic areas identified in the Literature Review which is Knowledge and organisation specific. This theme is mainly linked to the efficiency of knowledge transfer and subsequently the above discussed explicit vs tacit nature of knowledge (0) plays an important part in the ‘Capacity of aggregation’. This KBV Theme is concerned with the ability to aggregate and transfer knowledge into the optimum ‘Location of decision-making’ (0) authority, as well as
the location of knowledge e.g. AC, SP or the company structure as a whole. Hence, absorptive capacity of the location of knowledge is important. The recipients’ absorptive capacity will be discussed as part of the ‘Specialisation in knowledge acquisition’ Theme, whereas the organisational absorptive capacity is linked to technical Knowledge Management aspect e.g. the companies technology use is NOT part of the research aims and objectives.

No lack of absorptive capacity was identified during the interview. The following will highlight the absorptive capacity of the CS, AC, and Company structure:

**Company Supervisor:** Participants highlighted his experience an in-depth knowledge in this marketspace. However, not overly technical.

**Associate:** Participants were very impressed with his enthusiasm and understanding of the specifics. However, lack of strategic vision and a marketing but not digital service model focus was identified.

**Company Structure:** Participants described this as very positive as the company is small and AC created the databases and website needed to have the right absorptive capacity.

Interestingly, the outcome of ‘Engaging more clients regularly and easily’ using professional webmail and block posts, identified in the new stakeholder engagement strategy, was accessible to everybody within the company and hence, part of the company structure. Furthermore, the eMarketing development highlighted in the Interview transcript (Appendix2) shows that this knowledge also ended up in the company structure used by the whole company. Both outcomes were perceived as having an **explicit** knowledge nature. Question7 also highlights that explicit knowledge is mainly perceived as being easily transferable whereas tacit knowledge is described as being difficult or hard to transfer. Part of this sKTP was to train the whole organisation on the KTP outcomes in order to share the new knowledge. The
company itself has less than 10 employees but nevertheless, all the explicit sKTP outcomes which the KBV would argue as having a high ‘Capacity of aggregation’ ended up in the company knowledge domain. The knowledge, which was perceived to be tacit, stayed at individual level. Hence, this case study supports the ‘Capacity of aggregation’ assumption of the KBV Theme.

Appropriability

This ‘knowledge specific’ Theme identifies the importance to link knowledge to market value which is important to show how much the company’s knowledge is really worth. This theme would also argue, that the knowledge itself (as a product) is inappropriable by means of market transaction if it is not protected by copyright or patents. However, Patent and Copyright as a measure to identify market value is extensively discussed in the literature and although classified as important, critics would argue that patent based measures are less significant in determining market value as the sum of patents may not really reflect the companies measure for market value (Czarnitzki et al. 2006; Bloom et al. 2013; Hall et al. 2005). Another dilemma is the debate around transferability, which would argue that tacit knowledge is inappropriable as it cannot be easily transferred.

However, considering the research aims and objectives, this study is looking to bring light into the ‘mechanism’ in which the KBV Themes are used and which are linked to SP/CA. Hence, the seemingly inappropriability of tacit knowledge is somewhat irrelevant. More important is the question:

Can the outcome be linked to a benefit which in turn can be linked to company performance?
The KTP report shows that the sales turnover was £600,000 prior to the sKTP but £25,000 less than the previous audited year. The end report after the SKTP finished shows a sales turnover figure of £650,000 with an estimated £750,000 one year from KTP report date. The Net pre-tax profit was £90,000 prior to the sKTP but £22,000 less than the previous audited year. The end report after the SKTP finished shows a net pre-tax figure of £200,000 with an estimated £250,000 one year from KTP report date. Furthermore, during the interview it was highlighted that the company has seen a 174% increase in ecommerce sales and a 94% increase in inquiries as well as a better website visibility of 63% as part of the sKTP project. Hence, this case study supports the link between the outcomes of the sKTP and the achievement of SP/CA. Furthermore, this transfer report would argue to view ‘Appropriability’ and therefore, the link to company performance and market value NOT by reducing Knowledge to a product to make it appropriable but to view the KBV as a mechanism to achieve outcomes that have market value.

Specialisation in knowledge acquisition

The ‘Specialisation in knowledge acquisition’ Theme is one of the knowledge specific themes identified in the literature review which is very much linked to the ‘recipient’ or ‘knowledge actor’. The assumption for this KBV Theme requires for individuals to specialise in particular areas of knowledge.

The discussions around the ‘Capacity of aggregation’ Theme already highlighted that knowledge primarily linked to tacit knowledge is stored within individuals. This case study supports this assumption and it is quite clear that knowledge acquisition especially linked to a tacit sKTP outcome happened within individuals. The AC was the main individual who acquired specific knowledge during the duration of the sKTP. CS highlighted that the AC focused very much on marketing and showing some very useful understanding in this area. However, CS also discussed the shortfall of the AC in terms of understanding a wider digital service model. As this was not part of AC’s knowledge base he would have needed to spend more time understanding and
acquiring knowledge within digital service models. This project concentrated on the marketing aspects and from this KBV Theme perspective this probably made sense as only specialisation in tacit knowledge acquisition will lead to superior outputs. The capacity of aggregation and hence, the absorptive capacity of the AC was discussed above and played a role in identifying the strategy.

Another detection of the empirical research in line with the ‘Specialisation in knowledge acquisition’ theme is the fact that CS was most strongly involved in areas relating to the consultancy aspects and gained some new knowledge within this area although this was not originally envisaged by the KTP programme but nevertheless very highly rated by the team as being a major source for competitive advantage. The KTP was perceived to contribute to the common knowledge aspect as AC, CS and ALs worked strongly together. It was evident that a major success factor to achieve the sKTP outcomes was actually the continuous involvement of the CS which in this case is also the company director. However, the CS did not try to understand every aspect of the sKTP and it seems that the specialisation into particular areas of knowledge contributed to the successful outcomes of this sKTP. This case study also seems to show that ‘Specialisation into knowledge acquisition’ is supported when the roles, responsibilities and authorities is matched to the specialisation of knowledge areas of the individual.

Coordination within the firm (Organisation Specific)

This Theme is part of the ‘Organisation specific’ strategy area and has three subthemes which will be discussed in more detail below. This KBV Theme requires efficiency gains from specialisation in knowledge and requires input from a wide range of knowledge to create production.
The specialisation in knowledge acquisition is already discussed above and this case study also showed a range of knowledge reflected in the Key KTP Stakeholders to create the sKTP output. The Literature Review argued that the fundamental goal of the firm should be to coordinate the efforts of many specialists. The sKTP seems to be very strong on this point, especially, as this particular case study has had two AL's. However, the Literature Review also identified that transferring knowledge is not seen as an efficient approach to integrating knowledge. Individual specialist knowledge should be kept by minimising knowledge transfer but increasing effective integration of many people's specialised knowledge. The downside of having a somewhat controlled environment such as a KTP is that the team is relatively small and that emphasis was given to actually transfer knowledge into the organisation as the company identified a knowledge gap. However, the introduction of an AC into the company could be argued to try and overcome a pure knowledge transfer into the company as the AC was hired with its domain experience in mind. The knowledge transfer was hence, minimised to identified gaps within the project.

The following ‘Coordination within the firm’ themes will provide some more knowledge, understanding and analysis of how, if at all, the theme links to SP/CA of the firm.

Integration of specialist knowledge

As highlighted in the Literature, the KBV identifies four mechanisms for integrating specialised knowledge. ‘Rules and directives’ argue to standardise people interaction in general and facilitate Nonaka and Takeuchi’s (1995) assumption that ultimately all relevant tacit knowledge can be made explicit. ‘Sequencing’ would allow ordering activities as a step-by-step process in which knowledge specialists are lined up to contribute to the final product sequentially. Routines define a more flexible interaction for complex problem solving in the absence of ‘formal rules and directives’ whereas ‘group solving and decision-making’ is argued to be used only if the activity
is too complex or important to be solved by standardised processes as this integrating mechanism is time consuming and costly.

During the interview with the Key KTP Stakeholders none of the four mechanisms was seen as the predominant mechanism for integration. However, the ‘group solving and decision-making’ came closest. Although this is seen as time consuming and costly, there may be a case to use this approach, in outline, if the activity is believed to be linked to SCA.

It was clear during the interview that the approach of knowledge integration happened in the KTP context, outside the ‘business as usual’ company structure, and the knowledge domain e.g., of the AL’s, where used when the specialised knowledge was needed which would support a ‘community of practice’ view. Knowledge creation typically happens in ‘communities of practice’ or other small sized groups. Both knowledge creation and KT are mechanisms that should be used selectively: ‘not everybody in the company needs to know everything at all times’ (Krogh et al. 2001, p. 425). This was supported by the fact that, although the AC was the main knowledge receiver, the KTP distinguished between the consultancies aspects of the project which was deeply embedded in tacit knowledge within the CS and therefore recognised the transferability issues discussed in the ‘Transferability Theme’ (0). Moreover, the KTP Project moved away from the ‘group solving and decision-making’ in the sense that discussions happened collectively but the final decision was usually made by the individual who was believed to have the right knowledge for this activity/task/problem which this transfer report will call ‘Knowledge Fit’ of the individual.

This case study showed a successful integration which is evidenced by the knowledge gap which the company identified prior to the KTP and the fact that the outcomes could be linked to benefits (Q17) while the people structure of each outcome gave insight to the integrated knowledge to achieve SP/CA (Q12). Hence, the case study
evidenced that integration aspect of specialised knowledge plays an important factor to achieve SP/CA.

The role of common knowledge

The ‘Role of common knowledge’ Theme is the second subheading from the ‘Coordination within the firm’ theme which looks into the ‘Organisation specific strategy area’. The KBV Theme above (0) highlighted the importance of individuals specialising in knowledge. However, this KBV Theme argues that there is also a need to have some common knowledge, in the process of superior performance, for knowledge integration to work. In addition to the discussion above (0) the existence of common knowledge strongly increases the efficiency of managing knowledge within the firm (Grant 1996a; Grant 1997).

The Literature Review already highlighted five different types of common knowledge and all Key KTP stakeholders agree that having a common knowledge base was important but not seen as a major issue. The analysis of the case study (Q13) made it clear that the different types cannot be seen as either/or but work together to increase efficiency of managing knowledge. The following will highlight how this particular sKTP was linked to some of the types of common knowledge identified:

**Language** and overcoming barriers of communication was not seen as a barrier. CS highlighted that the company and in fact this project was small in terms of participants allowing everybody to have a common language. Another enabler is the fact that this company operates solely in a Project and Programme Management environment. Every staff member has professional project management qualifications and is used to the ‘project management language’ making it easier to communicate between knowledge actors.

**Shared meaning** is seen as an interpretive approach which aims to establish a ‘common meaning’ to overcome limits of knowledge exchange between knowledge
actors to effectively ‘share meanings’ (Dougherty 1992) or mechanisms’ to resolve differences in meaning (Nonaka and Takeuchi 1995). To establish shared meaning was not a challenge highlighted as a concern and although not directly evidenced in the interview, I believe, that the ‘community of practice’ environment facilitated the achievement of shared meaning.

**Recognition of individual knowledge domains** was already discussed within some other themes e.g. ‘Transferability’ and the importance of understanding each other’s knowledge was seen as very important. Everybody in this sKTP environment had clear roles and responsibilities in achieving the project goal.

Although there could not be a direct link identified between the role of common knowledge and the actual achievement of the supposed SP/CA, it is apparent that this theme provided a supporting role to achieve the KTP objective by making the management of the different knowledge actors more efficient.

**Organisational capability**

“If the strategically most important resource of the firm is knowledge, and if knowledge resides in specialized form among individual organizational members, then the essence of organizational capability is the integration of individuals' specialized knowledge”

(Grant 1996b)

The ‘Organisational capability’ Theme is the third and final subheading from the ‘Coordination within the firm’ themes. This KBV Theme argues that any outcome of knowledge integration needs to have the organisational capability to support this. It links strongly to the Theme of ‘Integration of specialized knowledge’ (0) and assumes that the wider the knowledge integration is within each capability, the harder imitation becomes.
The Literature Review already stated that a wide scope integration creates greater causal ambiguity and therefore barriers of replication. The KTP report analysis already highlighted that this report is more about Strategic Scope and survival (catch-up) and hence, a broader scope could not really linked to the difficulty of imitation. However, it appeared that any outcome which was perceived as most important to achieve SP/CA showed the widest integration of knowledge scope.

It is envisaged that classic KTPs will give a more meaningful insight into this particular Theme.

Organisational Structure/Design

This Theme will discuss the appropriateness of the firms’ arrangements to inhibit knowledge leakage by viewing the firms as a tacit knowledge integrator, whereby knowledge is recognised to play a strategic view for any knowledge based model and where tacit knowledge decisions can only be made by knowledge actors who possess it hence, making traditional bureaucratic models redundant. A KTP takes the firm outside the ‘business as usual’ structure and since knowledge is the predominant driver for any KTP, the 'Organisational structure/design' themes should give some insight into the importance of the three subthemes identified and the link to SP/CA.

Role of hierarchy

"Once firms are viewed as institutions for integrating knowledge, a major part of which is tacit and can be exercised only by those who possess it, then hierarchical coordination fails”

(Grant 1996)
The ‘Role of hierarchy’ Theme is first subheading from the ‘Organisational structure/design’ theme which is part of the ‘Organisation specific’ strategy area.

The discussions around the ‘Capacity of aggregation’ and ‘Integration of specialised knowledge’ Themes already highlighted that knowledge primarily linked to tacit knowledge is stored within individuals. The empirical evidence, supports the general KBV of this theme. Firstly, because the KTP project was undertaken outside the business as usual structure and by definition usual company hierarchies did not apply. Secondly, it seems that companies such as this case study with less than 10 employees have a considerably flat structure making role of hierarchy challenges less problematic. All Key KTP Stakeholders agreed that the role of hierarchy was appropriate and the general view was that there was no real hierarchy as the knowledge actors worked in a project environment whereby CS had the final say but was only concerned with the alignment to corporate objectives rather than interfering with the operational activities.

This case study supports the ‘Role of hierarchy’ assumption of the KBV Theme that this theme played an important role to have the right ‘Organisational structure’ in place to achieve the sKTP outcomes. Hence this theme will have a very strong link to the next subheading ‘Location of Decision-making’.

Location of decision-making

The ‘Location of decision-making’ Theme is the second subheading from the ‘Organisational structure/design’ theme. The Literature Review highlighted two principle implications for decision-making. The first implication can be described in the sense that the knowledge actor who owns the task/activity should also have decision rights for that particular task/activity. Using a KBV perspective to this theme it is also implied that the person who owns the task should be the knowledge actor
with the best ‘Knowledge Fit’. This study did not just ask for the ‘Location of decision-making’ (Q15) but has the opportunity to link the location of decision-making to the outcome and to its explicit and tacit nature (Q5 and Q6). The study found that all outcomes had the location of decision-making within the sKTP project structure. Furthermore, decisions based on explicit knowledge was usually made by the whole team. This is somehow contradictory to the KBV which would argue that decisions based on explicit knowledge can be centralised as they the information to make the decision is easily transferred. The KBV would also argue that group decision-making is rather costly (0). However, as the CS is also the company director in this case study and the fact that the CS was heavily involved in the sKTP may be a scenario where decisions even on explicit knowledge could be made within this ‘community of practice’ using a group decision-making approach. There seem to be a strong buy in from all Key KTP Stakeholders and everybody had a sense of involvement and decision-making which may be because of the group decision-making for outcomes based on explicit knowledge.

However, this research certainly supports the assumption that decisions based on tacit knowledge should be made by the individual perceived to have the best ‘Knowledge Fit’ to solve the problem. All decisions based on tacit knowledge in this case study were made by the knowledge actor who had the tacit knowledge to do so, rather than a group decision approach (discussed in 0).

Furthermore, all Key KTP Stakeholders were asked if they found the location of decision-making efficient (Q16) for this sKTP. Interestingly, everybody agreed that their roles within the sKTP and the location of decision-making was efficient.

This case study supports the tacit knowledge assumption of the ‘Location of decision-making’ Theme that decisions based on tacit knowledge should be made outside the usual company hierarchy and remain within the individual or group of individuals who have the right ‘Knowledge Fit’.
However, this case study does not agree entirely with the ‘Location of decision-making’ for explicit knowledge. In fact this case study and the empirical research would suggest that explicit knowledge should be made within a ‘community of practice’ or in a project environment as a group decision-making approach, rather than being centralised. This case study also reflects on the high buy in from the director who was heavily involved in this project. This seems to be another success factor to achieve effective decision-making as the ‘cooperate level’ and the ‘operational level’ had worked together as a team and overcome barriers of ‘common knowledge’ by having a clear and good communication, a shared meaning and recognition of individual knowledge domain.