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Dynamic Capabilities and Strategic Management: Explicating the Multi-Level Nature of Dynamic Capabilities – Insights from the Information Technology Security Consulting Industry.

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DECLARATION

This thesis is submitted in fulfilment of requirements for the degree of Doctor of Philosophy in Stirling Management School at the University of Stirling, Scotland, United Kingdom. I declare that this thesis is based on my own original work except for quotations and citations which I have duly acknowledged. I also declare that this thesis has not been previously or concurrently submitted, either in whole or in part, for any other qualification at the University of Stirling or other institutions. I am responsible for any errors and omissions present in the thesis.

Signed _____

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ABSTRACT

The dynamic capabilities perspective has become one of the most vibrant approaches to strategic management. Despite its growing popularity, it has faced criticism because of ambiguity and contradictions in dynamic capabilities literature. There has been increasing calls to address the fragmentation in the literature and provide empirically collaborated insights if it is to fulfil its potential as a distinct approach to strategic management. The microfoundations research agenda remains an emerging theme in the dynamic capabilities literature and since the overarching emphasis of a microfoundational approach is in the explanatory primacy of the micro-level especially in its relation to macro-level entities, it covers a wide array of subjects at several levels. One of the main criticisms of the microfoundations approach is a lack of multi-level analysis and there has been calls for multi-level theory development to connect levels within particular contexts since dynamic capabilities are path dependent and context-specific. This thesis explores the multi-level nature of dynamic capabilities in the Information Technology Security context and empirically investigates the impact of microfoundations of dynamic capabilities on firm capability renewal and reconfiguration. It overcomes the challenge associated with fragmentation in dynamic capabilities by presenting a conceptual model for the multi-level nature of dynamic capabilities. By explicating where dynamic capabilities reside, we can more purposely impact on them to advance our scholarly understanding and proffer practical managerial interventions to directly enhance specific abilities of sensing, seizing and reconfiguring to achieve superior outcomes. The research employed the Gioia qualitative case study research methodology and research methods used were 35 semi-structured interviews and observations. The research findings suggest that firms renew and reconfigure their capabilities to align with the changing industry and industry standards, and client needs. Firms also renew and reconfigure capabilities and capability framework due to internal strategic organisational learning and to align with firm's specific business strategies. Capability renewal and reconfiguration is vital to achieve technical and evolutionary fitness. In addition, findings inform that dynamic capabilities in the form of ability to sense, seize and reconfigure exhibit at macro, meso and micro levels. Actor's external engagement with significant institutions enables superior sensing ability. Accumulated experience is exploited to gain credibility with clients to win business, and demystifying firm processes and clarity of language in firm artefacts achieve superior knowledge articulation and codification processes by actors. Structuring of simple routines and capabilities enable ease of internal knowledge transfer but susceptibility to intellectual property theft by outsiders whereas complex routines and capabilities create challenges for knowledge transfer but are harder for competitors to discern and copy. Drawing on the research findings, the thesis presents a conceptual model for the multi-level microfoundations of dynamic capabilities in knowledge-intensive domains with relevance for theory and practice.

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CHAPTER 1: INTRODUCTION

1.1   INTRODUCTION

The Introduction chapter will provide the theoretical context and overview of the dynamic capabilities approach in strategic management as well as the industry and business ecosystem in the IT security industry. It will discuss the research challenge of the PhD research project and present the general research questions of the research and go on to discuss the motivations behind the research project. Finally, the chapter will outline the research design and process adopted in the work and provides an outline of the structure of the thesis to guide the reader through the chapters of the thesis.

1.2   THEORETICAL CONTEXT AND OVERVIEW

The Dynamic Capabilities View (DCV) has become one of the most vibrant approaches in strategic management over the last couple of decades. As an extension of resource-based view of a view (Barney, 1991) its central proposition is to seek to provide an explanation for how firms renew their VRIN (valuable, rare, non-imitable and non-substitutable) resource base and capabilities in the face of ever changing external environment in order to match new market conditions and achieve what is termed, evolutionary fitness. The dynamic capabilities (DC) concept started in the early 1990s when strategy scholars and practitioners began to recognise that once successful firms e.g. Xerox Plc, were faltering due to increasing globalization and competition, and fast changing technological advancements, and that current strategic management theories (including RBV) could not fully account for why such films falter while some others were able to adapt and prosper (Teece, 1994). In 1997, Teece et al. seminar paper which remains the most cited paper in the DC field, defined dynamic capabilities as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997: 1319). Since then, the DC scholarship has grown immensely with various definitions and conceptual frameworks with some degree of theoretical convergence and divergence, as expected in any theoretical construct in relatively early stages of theoretical and empirical infancy.

In a parallel development over the past few decades, there has been increasing focus in both management and strategic management research to explicate the macro-micro connect in organizations to advance our understanding of organizational behaviour, thus drawing insights from evolutionary economics, organizational theory and behavioural science, to mention a few

(Felin and Foss, 2005; Gavetti, 2005; Teece, 2007). Some of the motivations for this pursuit has been to elucidate the sources of firm heterogeneity, and also to root macro, firm-level phenomena such as competitive advantage and value creation, in more concrete, stable, micro-level entities. An umbrella term for this domain of research has arisen, called microfoundations. While there are many definitions of the term, microfoundations are generally about locating (theoretically and empirically) the proximate causes of a phenomenon (that is, the explanation for an outcome) at levels of analysis lower than the phenomenon itself (Felin, Foss, Heimeriks and Madsen, 2012). Rather unsurprisingly, microfoundations research agenda has featured prominently within the dynamic capabilities field. Teece (2007: 1319) identified the building blocks or microfoundations of dynamic capabilities as consisting of the capabilities to "(1) sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting, and, when necessary reconfiguring the business enterprise's intangible and tangible assets". Dynamic capabilities are generally regarded as higher-level activities that reside within a firm's top management team, and which enable the managerial orchestration of a firm's innovative capacity, enhancing its performance and long-run survival potential. As DC scholarship continues to gain prominence in strategic management, some of the core and emerging themes/topics in DC research has remained microfoundations, and strategic Learning and change. Since a microfoundational focus is primarily to explain any origins of organizational phenomena and thus, macro-micro link, it is a broad church that encompasses diverse areas such as top management teams (Heavey and Simsek, 2015, managerial cognitive capability (Helfat and Peteraf, 2015), transactive memory within groups (Kogut and Zander, 1992), and routines and capabilities (Teece, 2007). Research in these areas have made immense contributions to DC literature, however there remains unanswered questions and criticism of the approach.

First, despite the general consensus that DC reside in large measure within a firm's top management, there is a growing acknowledgement in scholarship that DC stems across several levels in organization. This calls for a multi-level analysis, link and theory development rather than a fragmented approach which investigates top management team or routines and capabilities, in isolation, as is prominent in current DC literature. One possible explanation for a lack of multi-level analysis is that it would require a fine-grained, situated, empirical qualitative research in order to capture the connections across levels, and this would take time and is costly. Second and related to the first, current DC publications are mainly theoretical and conceptual works with little but growing body of empirical work on dynamic capabilities. While these theoretical contributions have no doubt been extremely valuable in advancing the DC perspective and defining the path for DC research, empirically collaborated insights are crucial if the dynamic capability construct is to

fulfil its potential to become a central construct in strategic management. Strategic management is also very much about providing prescriptive solutions to managers on how they can affect firm outcomes and results, thus empirically supported advice based on a microfoundational approach would be vital in this endeavour. These gaps in DC research has informed the work undertook in this PhD with a particular focus on empirically studying the microfoundations of dynamic capabilities and the role of organizational structure within dynamic capabilities. The PhD research is a case study of a niche consulting firm operating in the highly dynamic information technology security industry in the United Kingdom.

1.2.2 THE INDUSTRY AND BUSINESS ECOSYSTEM

The dynamic capabilities literature categorises firms into market-driven and market-driving firms (Wilden et al, 2016). Market-driven firms primarily respond to industry or market changes whereas market-driving firms are entrepreneurial in nature and shape the business ecosystem by creating new markets.

Market-driven firms

Information technology security is arguably the most important industry in the developed world today as it affects virtually every aspect of our lives from politics and hacking of electoral computer systems to influence elections, banks and money stolen by hackers, businesses and loss of sensitive data, to individuals and personal social media accounts being hacked or the connection between home electronic devices being compromised. Instances of such information security failure occur at an increasingly alarming rate daily as information technology advances and continue to be embedded even more in our lives. For example, in December 2016, the United States FBI and Homeland Security released a report of alleged Russian government-sponsored hacking groups blamed for breaching several parts of the Democratic National Committee computer systems during 2016 elections – then President Obama responded by announcing sanctions against Russia for interfering in the 2016 elections (The Guardian, 30 December 2016). In November 2016, Tesco Bank revealed that it lost £2.5 million when 9000 customer accounts were affected in a cyberattack (SC Magazine, 09 November 2016). Internet giants are also not immune from such attacks as in February 2017, Yahoo warned its users of potential malicious activity on their accounts between 2015 and 2016, the latest of a string of cybersecurity problems faced by the technology company (The Guardian, 17 February 2017). This announcement came after the company initially revealed in December 2016 that data from more than 1 billion user accounts had been compromised in August 2013, the largest such breach in history (The Guardian, 15 December 2016) These few examples presented illustrate the ever-present and varied nature of IT security threats and perpetuators continue to adapt their methods and tactics

as technology and its application advance. This means that governments and organizations and in particular, IT Security functions at organizations and firms that provide solutions to protect information and information assets need to constantly renew their resources and capabilities in this rapidly changing environment to respond to new and emerging IT security risks and threats. In many ways, they need to renew their skills and capabilities to be ahead of the perpetuators of cybercrimes.

Market-driving firms and Industry Shaping

IT security firms not only respond to changes in the industry but also shape the business ecosystem. "Dynamic capabilities assist in achieving evolutionary fitness, in part by helping to shape the environment. The element of dynamic capabilities that involves shaping (and not just adapting to) the environment is entrepreneurial in nature" (Teece, 2007: 1321). Dynamic capabilities involve managerial agency embedded in entrepreneurial behaviours such as creating new paths (Teece, 2012). Such entrepreneurial activities to create new business models and solutions or to solve novel problems often influence the entire business landscape including competitors, regulators and governments in the highly dynamic information technology security environment. A few examples here illustrate this point. The technological advancement called blockchain which is a secure database system and cryptography created in 2008 and implemented in the digital bitcoin currency in 2009, has transformed the financial services industry and will have wide-reaching implications in many other industries, for example health and medical records (Forbes Magazine, 02 May 2017). Technology source, WIRED magazine reported in July 2014 how security researchers forever altered the automobile industry's notion of "vehicle safety" when they demonstrated that they could remotely hack a 2014 Cherokee Jeep to disable its transmission and brakes. Their work led Fiat Chrysler to issue an unprecedented recall for 1.4 million vehicles, mailing out USB drives with a patch for the vulnerable infotainment systems and blocking the attack on the Sprint telecommunications network that connected its cars and trucks. Subsequently, other security firms followed that path and identified security vulnerabilities in other companies in the industry including the Tesla Model S car, General Motors vehicles, BMW and Mercedes Benz apps (Wired Magazine, 24 August 2015). The outcome of these works is the creation of a new market for security solutions to address these vulnerabilities which has helped to shape the automobile industry as manufacturers, customers and regulators realise the dangers of these software vulnerabilities and demand solutions to them.

In 2016, the FBI and Apple engaged in a public relations battle and a halted court hearing over iPhone encryption as the FBI was unable to unlock the iPhone 5c belonging to Syed Farook, one of the perpetrators involved in a 2015 terrorist attack in San Bernadino, California. Apple refused to provide access to the phone citing personal data protection, security and privacy concerns. The

FBI eventually unlocked the phone by employing the services of a third party named in some report as an Isreali company Cellebrite, (neither the FBI nor Cellebrite has confirmed the reports), which is a company that specialises in transforming and extracting data from phones. Leading data security experts have long argued that there might be a different way to break into devices without placing the cybersecurity of all iPhone users at risk (as argued by Apple in refusing the FBI access request) and this claimed seem to find merit in the statement of the then FBI Director James Comey that the government purchased 'a tool' from a private party in order to unlock the iPhone used by one of the San Bernardino shooters (CNN Money, 07 April 2016). There certainly appears to be a need for such services and the creation of a market to meet that customer need. What is evident is an increasingly emergent market in the IT security industry, especially with more and more security companies seizing the opportunities presented and touting their abilities to access data residing in any locked iPhone and Android device. With the rapidly changing technologies in the information technology security industry, entrepreneurial companies are constantly renewing their capabilities and creating new solutions to emerging challenges, thus shaping the responses of competitor companies, governments and the entire business ecosystem. In fact, so vital is cybersecurity to UK National infrastructure including defence and electricity supply, that Her Majesty The Queen opened The National Cyber Security Centre (part of intelligence agency GCHQ) as part of a £1.9bn five-year strategy, on February 14, 2017. The Centre based in Victoria, London will work with both the public and private sectors to protect the nation and sensitive data from hackers and cyberattacks (BBC, 14 February 2017).

Importantly, these aforementioned discussions presented provide practical examples of the relevance of the market-driven and marketing driving firms in the IT security industry and society in general today which can be referenced to the theoretical notion of dynamic capabilities found in the strategic management literature. In this light, it is necessary to recap of some of the definitions of dynamic capabilities presented earlier. Dynamic capabilities are defined as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997: 1319) In addition, Teece (2007: 1319) identified the microfoundations of dynamic capabilities as consisting of the capabilities to "(1) sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting, and, when necessary reconfiguring the business enterprise's intangible and tangible assets". Furthermore, "Dynamic capabilities assist in achieving evolutionary fitness, in part by helping to shape the environment. The element of dynamic capabilities that involves shaping (and not just adapting to) the environment is entrepreneurial in nature" (Teece, 2007: 1321). Viewing these definitions in the light of the discussions in the industry and business ecosystem section, it is evident that the IT security

industry is an industry in which dynamic capabilities are significantly present and hugely important for firms to compete, survive and prosper. A study of the industry and an IT security firm provides the opportunity to make contributions to the dynamic capabilities literature and potentially address some of the field's research gaps. Specifically, an empirical case study research of an IT Security company on the processes of dynamic capabilities and how the firm renewed its capabilities could provide some illuminating insights. There is limited research in knowledge-intensive domains and consultancy firms within dynamic capabilities scholarship, hence another unique opportunity for this research. These formed some of the drivers for the PhD research project.

1.3   DEFINITIONS AND TERMS IN THE DYNAMIC CAPABILITIES PERSPECTIVE

There are a number of definitions and terms which are prevalent in the dynamic capabilities literature and a selection of key ones used in this thesis are presented here.

Resources: Resources are firm-specific assets and are the foundation of a firm and the basis for developing firm capabilities. Such assets are often difficult to imitate and difficult to transfer among firms because of transaction costs and transfer costs, and because the assets may contain tacit knowledge. Trade secrets, intellectual property and engineering know-how are examples of firm resources (Teece et al., 1997).

Capability: An organisational capability is a 'firm's capacity to deploy resources for a desired end result.' (Grant and Jordan, 2013: 122).

Competences: Firm-specific assets are combined and integrated by individuals and groups often across an organisation and beyond, so that distinctive activities can be performed and such activities constitute organizational routines and processes. Examples of such competences are quality control and integrated data processing.

Core competences: Teece et al., (1997) define core competences as 'those competences that define a firm's fundamental business as core'. Firms that have exhibited core competences in the past include Eastman Kodak's imaging and Motorola's untethered communications and such core competences can be further enhanced to create value with the use of complementary assets.

Processes: Processes are often explicit or codifiable structuring and combination of resources and thus can be transferred more easily within a firm or across firms. Organisational processes have three roles; coordination/integration (of resources), learning and reconfiguration/transformation (of resources).

Positions: The strategic position of a firm in an industry or market is determined by its learning processes and the coordination of its internal and external processes which creates its distinctive competences. The value of a firm's distinctive competences depends on how endowed the firm is relative to its competitors and this could have an impact on its position. Positions are also affected by a firm's endowment with specific assets which could provide it a competitive advantage at a given time. Such assets include knowledge assets and technological assets and assets complementary to them e.g. reputational assets and relational assets.

Adaptive capacity: A firm's ability to identify and capitalise on emerging market opportunities (Chakravarthy, 1982; Miles and Snow, 1978).

Absorptive capacity: Cohen and Levinthal (1990: 128) refer to as absorptive capacity as 'the ability of a firm to recognise the value of new, external information, assimilate it, and apply it to commercial ends… the ability to evaluate and utilise outside knowledge is largely a function of the level of prior knowledge'.

Innovative capacity: refers to a firm's ability to develop new products and/or markets, through aligning strategic innovation orientation with innovative behaviours and processes (Wang and Ahmed, 2004).

1.4 THE RESEARCH CHALLENGE: OVERALL RESEARCH AIMS AND GENERAL RESEARCH QUESTIONS

1.4.1 OVERALL RESEARCH AIMS

One of the main criticisms of the microfoundations approach is a lack of multi-level analysis within the firm context and particularly, a lack of multi-level theory development to connect organizational levels. The PhD research seeks to address this criticism. Through an empirical study of an organization in the Information Technology security industry, this study proposes the following research aims:

First, by performing a case study research of how a firm renews its strategy and capabilities, it seeks to explore the activities, processes, actors and teams involved and industry and organizational wide issues, thus engaging in multi-level analysis from case study research - thereby addressing a main criticism of the microfoundations approach and answering a similar call in dynamic capabilities research.

Second, it aims to answer the calls by microfoundations research scholars for more empirical, in-depth small N case study research, to supplement current research approaches as this will address the major challenge to the microfoundations research agenda in strategy – to provide

practical advice to managers on strategy and organizational issues which are grounded on empirically corroborated insights. Research into a single case study can be valuable because they can shed light on what accounts for superior performance of firms, which can be used to inform prescription for managerial practice.

Third, related to the second point, the research adopts a microfoundational thinking to dynamic capabilities research, and thus aligns itself with the emerging and growing microfoundations research theme in dynamic capabilities research. It aims to answers the call for research in dynamic capabilities within firm/industry specific contexts due to the fact that dynamic capabilities are context- specific and path-dependent, for example, particularly in small and medium firms that may not have the capacities or slack to create and keep dynamic capabilities residing fully in the firms. In this regard, it aims to make contributions to the microfoundations of dynamic capabilities research agenda by exploring the IT security industry.

Fourth, it adopts a social epistemological lens to seek to advance our understanding of routines and dynamic capabilities by unpacking the micro-aspects of these constructs, particularly the role of structure in firm routines and dynamic capabilities.

1.4.2 GENERAL RESEARCH QUESTIONS

- **How do the microfoundations of dynamic capabilities impact on capability renewal and reconfiguration in firms in the IT security industry?** There is a vast amount of literature on microfoundations of dynamic capabilities, which includes firm's ability to sense and seize opportunities, and reconfigure assets (Teece, 2007); managerial cognitive capability (Helfat and Peteraf, 2015); transactive memory systems (Kogut and Zander (1992); and individuals, processes and structure (Felin et al., 2012). By empirically investigating a firm as it embarks on re-evaluation of its strategies and capability reconfiguration, the research explores how microfoundations of dynamic capabilities create firm-level outcomes.

- **What is the multi-level nature of dynamic capabilities in the IT security industry?** Despite the general consensus in the dynamic capabilities literature that dynamic capabilities reside in large measure with a firm's top management that make strategic decisions e.g. to reconfigure assets, there is an increasing acknowledgement that dynamic capabilities exhibit across multiple levels e.g. transactive memory systems within functional teams and individual actors during routine adaptation. Similarly, the strategy-as-practice literature argues that strategy-making process and implementation is an outcome of processes across organisations rather than prescriptive, rational, deliberate activities confined to a firm's top hierarchy (Jarzabkowski, 2005; 2008; Johnson et al.,

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2003; et al, 2007; Whittington, 2007). By taking a practice-based view to research and exploring what actually happens in organizations, this research aims to investigate in what levels do dynamic capabilities reside.

- **What are the processes and activities that sustain or enable dynamic capabilities in firms?** The research applies the microfoundations of dynamic capabilities framework (Teece, 2007) to understand how firms go about sensing and seizing opportunities, and reconfiguring assets in practice. By doing so, it seeks to delve into the learning mechanisms of experience accumulation, knowledge articulation and knowledge codification (Zollo and Winter, 2002) and to identify the processes and activities in firms that support or inhibit sensing, seizing, and reconfiguring abilities. In addition, the research aims to build on the findings to provide practical prescriptions to managers on how to achieve superior sensing, seizing, and reconfiguring abilities.

- **Does structure enable or constrain dynamic capabilities in organizations?** Felin et al. (2012) identify organizational structure as a microfoundation of routines and capabilities and stated that future research could explore the effect of different organizational structures in certain context. Similarly, in the background to the research section of this thesis, the researcher's experience at an engineering company highlights the potential impact structure may have in enhancing routines and capabilities. This research seeks to investigate how structure affects dynamic capabilities within a certain industry and firm context.

1.5 OUTLINE OF THE RESEARCH DESIGN

A case study research design is employed (Yin 2009, Eisenhardt 1989) which is rooted in the naturalistic paradigm (Lincoln and Guba, 1985), with an IT security consulting firm constituting the case. Substantial background information had to be collected about the industry and the firm. This contextual information is integral to the understanding of the case.

Two main data collection instruments were used in the study. The principal instrument was thirty-five extended semi-structured interviews with respondents across the organizational hierarchy. These extended interviews included follow-up interviews as the firm progressed from one phase of its activities to others. The second data collection instrument came in the form of fieldnotes from non-participant observations at meetings and company activities which served to enrich and triangulate the data collected from the interviews (Eisenhardt, 1989). Qualitative data collected was analysed according to open, axial and thematic techniques, developed by Glaser & Strauss (1967) and adopted in the Gioia methodology (Gioia & Pitre, 1990) which was used in this work.

The outline of the research design and process adopted allows for the validation of the research process, scrutiny and replicability of the research which is illustrated next:

Figure 1. The research process adopted in this PhD research work (Source: Quinlan, 2011)
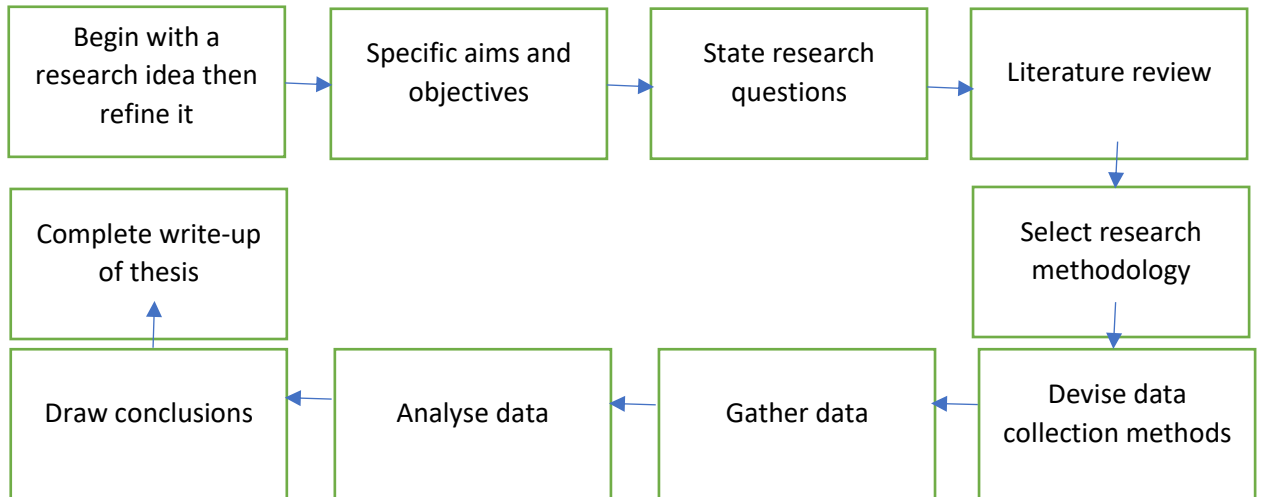
1.6 BACKGROUND TO RESEARCH AND RESEARCH MOTIVATIONS

The background to research informs of the motivations behind the research. During the author's first degree in electrical and electronics engineering, he found computer related modules that dealt with control systems and microprocessors most exciting, so it was hardly surprising that the decision was made to pursue a master's degree in computing/IT. In a subsequent degree in MSc Information Technology Security, he took business modules which were a core component of the course context. In 2007 after graduating, the researcher joined a database company, The Database Marketing Partnership (DMP) in Redhill UK, as a Junior IT Business Analyst. Some of the firm's leading clients were blue-chip organizations including Amnesty International UK, The RSPB, RSPCA, The Salvation Army, SightSavers International and The Society of London Theatres (Theatre Tokens).

1.6.1 A RATIONAL, ECONOMIC VIEW OF INDIVIDUAL BEHAVIOUR (ROUTINES) – A DATABASE COMPANY

DMP Limited was an IT company that deployed database-driven marketing strategies to help clients achieve their business objectives. That period was 2007-2009 was long before the concept of data science and analytics or 'Big Data' became prominent and mainstream as it is today. Even though the client organizations employed different business strategies and 'approaches', a

common theme was the use of data intelligence to generate and maximise revenue growth. Direct marketing capabilities were built by exploiting insights about individual behavioural patterns (routines) based on data analytics and behavioural economics techniques.

The Salvation Army (TSA) adopted a 'source code' approach. For example, for a TSA Christmas Appeal project, multichannel (i.e. different sources) adverts placed in TV, radio, newspapers and other print media will be used to appeal for donations from the public to help homeless people at Christmas – a general-public appeal was termed 'cold appeal' in the industry. Each of the channels was assigned a unique source code which is matched with every individual donor response received together with personal data captured. By analysing the data and codes for hundreds of thousands of responses received using database analysis, the revenue derived from each channel is ascertained and could be compared with the cost of advert for each channel, thus determining the most profit-generating channel. Such insights are valuable to use for future projects. Perhaps more significant is the personal data of donors collected. The data is used to build personal profiles of individuals who are segmented into groups based on behavioural, demographic and/or psychological segmentation attributes and each individual is 'targeted' or 'approached' or 'direct marketed' to buy the 'intangible product', that is, to buy into the vision and goals of the organization and support it by making donations, preferably repeat donations – a donation appeal to already known supporters is called a 'warm appeal'. Every segment group is assigned a unique approach code and data analytics is used to gain understanding of traits, patterns and behaviours of individual group so that they can be approached in the most intelligent way. DMP Ltd working with client organisations delivered these entire projects using segmentation and marketing which were supported by database driven business strategies.

Amnesty International UK (AIUK) employed both source and approach code data strategies but had an even deeper level of approach profiling. As a politically inclined organization, it campaigned on a diverse range of causes across the world including human rights and free speech in Burma or child labour in Bangladesh – its goals and aspirations are as diverse as the number of places around the world it operates in. Therefore, the 'product' it sold or 'its goals' meant different things to different people based on differences in individual perception, psychology or even behaviour. For example, while an individual might support the cause against child labour in Bangladesh, the same individual might view the opposition in Burma as unlawful dissidents and may not agree with that struggle. The most effective way for AIUK to target or directly market to individual AIUK members was to have a fine grain understanding of that individual traits or behaviours through psychological and behavioural segmentation to build profiles from personal data collected. This also included demographic segmentation, for example gender, income or affluence e.g. based on UK post code residence. So, in effect, it was common practice for AIUK to

send a completely different appeal letter to a middle aged, married woman who lived in affluent Chelsea in south-west London, to a teenage high school student resident in less affluent Hartlepool, in north-east England based on segmentation and data analytics performed. AIUK employed approach code segmentation to a much higher degree by exploiting data intelligence to build individual profiles based on perceived individual habits and behaviours. Interestingly, while TSA called donors supporters, AIUK referred to its warm supporters as AIUK members – perhaps an insight its approach to the build a deeper knowledge of, and relationship with its members rather than just supporters. For RSPB, it was even a deeper relationship with membership to achieve what it called life-time values.

RSPB adopted an approach and source codes and focused deeper on member retention and repeat custom. It implemented a 'lifetime values' strategy and pathway for membership. For example, kids enjoying a day out at RSPB Reserves and Parks were provided with free RSPB leaflets and magazines, and a small form used by the RSPB to collect their personal information. They were then sent more RSPB information and encouraged to participate in fun family activities such as the RSPB Big Garden Bird Watch and subsequently, offers to join RSPB kid membership followed. The path progressed to youth membership, adult membership and family membership with discount offers, free magazines and incentives to encourage them to support and make donations to RSPB. Each stage of the path had a unique code and a conversation code was allocated for every path progression towards lifetime values. Therefore, the RSPB implemented hundreds of data codes and segmentation based on personal data analysis to understand individual behavioural patterns and interests and exploit that data intelligence.

It is interesting to note that all the client organizations adopted database strategies based on seeking to understand and exploit individual patterns of behaviour or what the strategy literature terms *'routines'*. The notion of routines as 'patterns' or 'habits' has been central to the concept of routines (Becker, 2001). Sidney Winter (1964: 263) defined a routine as 'pattern of behaviour that is followed repeatedly, but it is subject to change if conditions change'. This rational, economic view of routines as human behaviour is still very significant today in applications of data science, for example, in understanding individual shopping habits by retailers who 'nudge' customers with offers and suggestions to make purchases. Capabilities built around an economic view of routines became an area of keen interest to the researcher.

Handling data at DMP Ltd required regulatory and contractual compliance. Two prominent legislations were Data Protection Act (DPA) and Payment Card Industry Data Security Standard (PCI DSS) – an information security standard for organizations that handle branded credit cards from the major card schemes, which applied to the firm since they processed payment card donations from charity supporters and payment security was paramount. IT legislation changed

very often which required the firm to adapt its process and IT systems to comply. For example, between 2007 and 2009 when the researcher was employed, PCI DSS standard had three new versions and the implications created big challenges for the firm. The firm was only able to achieve the transition to the new standards due to the work contracted to its suppliers, that is, specialist IT security companies who were largely responsible for delivering it. Client organizations at DMP also made requirement changes to comply with new data protection legislation. For example, data obligation to protect and store personal information for up to two years meant that credit card information written by donors on hundreds of thousands of donation forms were required to be 'blackened out' by DMP before storage of scanned forms. This required the IT team to develop a computer programming script to automate the blackening out process. In addition, mailing lists (personal data that had consensual approval given) were bought and sold in the direct marketing industry to be used by client organizations for 'cold appeals' to get new donors. In using mailing lists, it was important legal and contractual data obligations were complied with. These examples demonstrate the need to possess data/IT security capabilities at the firm to meet obligations and adapt to ever-changing legislation and the broader external environment, and with a master's degree in IT security this challenge became a subject of interest.

Having left DMP in 2009, the researcher joined the Data Processing and Control System (DPCS) project in the Technical Advice Group department of EDF Energy at Dungeness B nuclear power station.

1.6.2 AN ORGANIZATIONAL THEORY VIEW OF ROUTINES – A NUCLEAR ENGINEERING COMPANY

The DPCS project is a complex, software control and instrumentations project to replace the old data control system to ensure safe running of the nuclear power station. Engineering operations at the power station included performing maintenance activities (called Maintenance Schedule – MS) at the Technical Advice Group in the maintenance department. As with any data system, implementing IT security was vital to ensure the confidentiality, integrity and availability (referred to as CIA in IT security) of critical data and control systems within the nuclear power infrastructure in the United Kingdom. Best practices methods of performing tasks and activities at the organization were structured into routines to create operational capabilities for the safe and efficient running of the power station.

Within the fleet of eight power stations operated by EDF Energy, Dungeness B had a poor reputation for performance within the company for being off-line and generating no electricity (non-statutory outages) too often. There were two main reasons for the poor performance. First, it was the oldest power station in the fleet meaning that obsolesce and wear and tear meant that

it broke down more often. Second and related to the first, being the first station built, it was poorly designed and in fact learning from its design were incorporated in the design of the subsequent power stations – this meant that they were structurally and operationally more robust than Dungeness B.

Maintenance schedules are carried out to ensure the safe and reliable operation of nuclear power station. For example, the reactor protection system capability to ensure that the reactor remained within pre-defined safe limits and the system required routinized maintenance activities carried out by a team of three to five engineers using a work order card (WOC) with strict laid down procedures. WOCs were designed to allow engineers to capture on-the-job learning experiences and knowledge in course of performing routines. When performing routines, engineers often came up with new and better ways of performing routines through new knowledge and experiences, to improve performance at Dungeness B. However, to much frustration, it was extremely difficult to incorporate changes into routines and procedures in WOCs even when new knowledge was written down in WOCs. Changes to routines required going through a laborious engineering change process (ECC) involving stages of approval by several 'responsible engineers' and even outside of the company to the nuclear regulator (ONR) for higher category of changes and then back through the engineers – this was to ensure that the changes do not compromise nuclear safety. Despite the importance of nuclear safety case justification for changes to be made, the engineering change process to modify routines seemed overly tedious. The organization's structure and processes seemed to constrain routine change or at the very least, appeared to have an impact on ability to change routines.

How then can firm's performance in routines and in Dungeness B in particular, be improved if routines are difficult to modify? How is new knowledge and experiences captured in WOCs used or perhaps not used? When conflicting or different 'new' knowledge is captured by different engineers performing the same routine scheduled at intervals (commonly every 42 days), who decides which of the new knowledge is correct/superior and used in the organization? More so, efficient practices of performing routines are replicated across the fleet of eight power stations as best practices – how are decisions made about which practices are 'best practices'? Does organization's management recognise the effect of structure and process (e.g. ECC) on routine change? Engineering capabilities like the reactor protection capability are formed of several routines and the ability to improve routines lead to more efficient or superior capabilities. The routines at the power station appeared to fit the notion of living organism (Pentland and Feldman, 2003) with the inherent potential to grow and generate new knowledge and these several questions remained unanswered, conclusively.

The routines experienced at EDF Energy were not an individualistic, rational, economic view of individual behaviour but a different form of routines. These routines explicitly and collectively, involved multiple individuals in a socially constructed activity, giving meaning to their actions, rather than an individual-level phenomenon. It aligns with the definition of routines in the strategy literature as 'repetitive, recognizable patterns of independent actions, carried out by multiple actors' (Feldman and Pentland, 2003: 95). This view of routines focuses on collective individual and organizational behaviour founded on organizational theory rather than an economic view of routines. Such a study of routines allows for an exploration of the micro-aspects of individual and collective behaviour and informs more about what really happens in organizations and perhaps provide answers to some of the unanswered questions at EDF. Knowledge gained in strategic management during a subsequent MBA degree by the researcher, the work experience of routines and capabilities and a keen interest in the subject area progressed into a PhD study on routines and dynamic capabilities at the University of Stirling in 2013.

1.7 CONCLUSION – STRUCTURE OF THE THESIS

The current chapter has introduced the thesis, provided the theoretical context of the study and useful definitions, defined the research challenge, objectives and the questions under investigation. It also discussed the background and motivations for the research. This final section includes the outline for the remainder of this thesis, presented below:

Chapter Two has three sections and covers the development of paradigms of strategic management. Section one discusses the legacy contributions to the field of strategic management in order to provide the theoretical grounding for the literature in the chapter. Section two focuses on the content (prescriptive) stream of strategy, covering Porter's five competitive forces, The strategic conflict approach, and The resource based view (RBV) approach. In this way, the goal is to present the evolution in strategic management approaches and makes a case for the emergence of the dynamic capabilities view. Section three presents the process (analytical) stream of strategy. In doing so, the thesis covers the content versus process debate in strategic management. The section also discusses the emerging microfoundations research agenda in strategic management.

Chapter Three builds on chapter two and reviews the dynamic capabilities scholarship. The goal is to critique the body of literature on dynamic capabilities in order to arrive at an analysis of the main themes underlying the topic and the main research strategies and approaches conducted by researchers in the field. It identifies the microfoundations of dynamic capabilities arena as a fertile research domain.

Chapter Four builds on the literature presented on dynamic capabilities and the microfoundations research agenda to discuss the microfoundations of dynamic capabilities literature in strategic management which is the central theme of the PhD research. The goal is to identify research gaps which inform the research questions in this work.

Chapter Five has two sections. The first section is the methodology section which consists of detailed research questions as well as the case study research approach. In addition, the way in which the case study approach has been operationalized and the instruments employed to conduct the research approach is explained. After setting out the rationale for the research methodology and the case study approach adopted, the second section covers the case study in question which details the firm and the industry context in which it operates. Furthermore, it presents a data structure from the Gioia methodology adopted in the work and the main concepts and narratives emerging from the findings.

Chapter Six discusses the findings of the research data collected from the study from applying the microfoundations of dynamic capabilities framework and the Gioia methodology.

Chapter Seven is the discussions chapter and presents the main contributions to theory and practice, reflecting on the aims of the study. The chapter introduces a conceptual model for microfoundations of dynamic capabilities based on a narration of events at the research firm from the research findings.

Chapter Eight is the conclusions chapter. It provides an assessment of the limitations inherent to the study, implications of the study and practical advice for organisations on how to build and sustain dynamic capabilities. It also discusses possible areas for future research.

CHAPTER 2: THE PARADIGMS OF STRATEGIC MANAGEMENT – THE CONTENT AND PROCESS APPROACHES TO STRATEGIC MANAGEMENT

2.1 INTRODUCTION

This chapter begins the main literature review component of the thesis. The goal of the chapter is to provide the theoretical grounding of the thesis within the paradigms of strategic management. It seeks to account for the emergence of the dynamic capabilities view so that contributions of this work are rooted in extant strategic management theory and builds on existing streams of strategy to further advance strategic management scholarship. In the field of strategy, there is often a debate about two fundamental issues with regards to understanding strategy. First, is strategy a process or the outcome of a process? Second, is strategy an economic-rational phenomenon or is it an organizational-social phenomenon? Evaluating these two questions together it can be seen that there are two parallel, competing and, to an extent, interacting stream of ideas – known as the Prescriptive and the Analytical streams/approaches to strategy otherwise known as the content versus the process approaches to strategy. The Prescriptive stream views strategy as a controlled, intentional, prescriptive process based on a rational model of decision-making, which creates deliberate strategies (Ansoff, 1965; Steiner, 1969). This chapter will discuss the both the content and practice approaches to strategic management. Overall, the chapter has three sections. Section one discusses legacy literature that has fundamentally informed the mainstream of strategic management today. Section two focuses on the content (prescriptive) stream of strategy and presents the evolution in strategic management approaches leading on to the emergence of the dynamic capabilities view. Section three deals with the process (analytical) stream of strategy and discusses the microfoundations research agenda in strategic management.

SECTION ONE: LEGACY CONTRIBUTIONS TO THE FIELD OF STRATEGIC MANAGEMENT

This section discusses the pioneering works of early thinkers such as Schumpeter, Coase and Penrose and their contributions that have informed the field of strategic management.

2.2.1 SCHUMPETERIAN CREATIVE DESTRUCTION AND THEORY OF ECONOMIC GROWTH

Economic growth caused by firms and industries is one of the most important notions in capitalist economy and Joseph Schumpeter's The Theory of Economic Development (1934) is the prominent theory amongst theories and models of economic growth found in literature. Schumpeterian growth theory 'operationalised' Schumpeter's concept of creative destruction (Schumpeter,

1942). Unlike economic thinkers at the time, Schumpeter did not consider accumulation of capital or resources as the main driving force for economic growth. Instead, he attributed much importance to the entrepreneur-innovator and argued that it is the innovation and creativity of the entrepreneur that spurred economic development and growth. Driven by competition to improve technology, finance and organisation, the entrepreneur creates innovation and innovation in turn spurs the capitalist economy with 'gales of creative destruction' (Schumpeter, 1942).

Innovation causes the mutation or restructuring of the industrial system whereby the old economic structure is continually being destroyed and simultaneously creating a new one. This process of creative destruction is central to capitalist economies where change is ever-present in the evolution of the economy. Competition drives innovation and innovative firms replace incumbents in a seamless continuous cycle. However, innovation attracts imitator firms who copy the innovation thereby attracting investments which ultimately lead to a boom or long-run growth. When the original innovator's profit advantage is eroded, investment begins to move out of the sector which may cause it to shrink until the next disruptive innovation which restarts the cycle (Schumpeter, 1950). This has major implications for macroeconomic performance seen in the form of long-run growth, economic fluctuations and structural adjustments.

The process of creative destruction also has significant implications for the firm and the macroeconomic level. The process of restructuring to create and destroy production arrangements involve multiple, complex strategic and technological decisions. Getting such decisions right require sound managerial capacity at firms as well as the existence of well-functioning institutions that facilitate market transactions. Failure at firm and institutions could lead to serious macroeconomic consequences, for example recessions, once it interacts with the process of creative destruction (Caballero and Hammour, 1994). However, some degree of failure is inevitable due to the sheer complexity of these transactions whereas others are as a result of ill-conceived innovative ideas at firm level. At a moderate level, institutional deficiencies are responsible for business cycle patterns that occur in developed and flexible economies and exhibit in the form of cyclical patterns of unemployment, investment and wages. When they are severe, thus limiting the economy's ability to adopt new technologies to exploit opportunities in the evolving environment, they can lead to misallocation of resources, economic stagnation and even economic recession. In this regard, the process of creative destruction through innovation has profound implications for the firm and the economy. Schumpeter's insights into the role of innovation has largely influenced scholarly strategic thinking including the dynamic capabilities view which stresses the importance of innovation and entrepreneurial acts in market-shaping activities in dynamic environments.

2.2.3 RONALD COARSE'S NATURE OF THE FIRM

The neoinstitutional economic literature regards Ronald Coase as the ground-breaking initiator of what is called today transaction cost theory, through his article in 1937, The *Nature of the Firm*. In fact, Ronald Coase was awarded the Nobel Prize in economics for 1991 as recognition for being the initiator of the modern theory of the firm and importantly, the impact of his work on the rapidly expanding field of 'the theory of the firm' in economics (Foss, 1994). In the *Nature of the Firm*, Coarse analysed the nature of the firm in terms of transaction costs and in doing so, provided insights into two questions that had until then received very little scrutiny in economic analysis, why do firms exist and why is each firm a certain size? (Coarse, 1937)

The *Nature of the Firm* offered a new way thinking of economic organisations and Coarse developed a new theory of the firm founded on the belief that the economic system is being co-ordinated by the price mechanisms. Coarse argued that the market and the firm provided two alternative ways to organise the same transactions. First, that markets do not operate without costs; their operations necessitate a cost of the use of price mechanisms, called transaction costs (Coarse, 1937) Transaction costs exist because alongside production costs, there are costs for preparing, entering into and monitoring the execution of all kinds of contracts, as well as costs for implementing allocative measures – in entirety, these are costs associated with 'delivering' a contract transaction between parties in a market. Second, that firms exist as an alternative form to coordinate transactions because by internalising activities in its hierarchical structures, firms can partially or totally eliminate costs associated with transactions (Coarse, 1937). In other words, firms emerge when allocative measures are carried out at a lower total production, contract and administrative costs within the firm than by delivering purchases or sales contracts on the market. Firms are able to achieve lower costs than market exchange because some of these costs could be avoided by parties to a contract if the transaction could be internalised to happen within the firm, therefore replacing the allocation of resources through price mechanisms and exchange of property rights with hierarchical structures. This happens because multiple short market contracts are substituted by fewer cheaper and longer contracts, notably in the form of employment contracts of work underpinned by hierarchical structures and managerial directives. This argument is adeptly captured in Coase's statement, 'if a workman moves from department Y to department X, he does not go because of a change in relative prices, but because he is ordered to do so' (Coase, 1937: 387). However, there are costs associated with internal governance of hierarchical structures in firms, therefore, a recognition of these costs would allow one to determine the optimum (i.e. maximum) size of the firm i.e. such a point when it becomes cheaper for further transactions to take place outside in the market rather than internalised in the firm. Therefore, a firm expands to the point where an additional allocative measure costs more

internally than it would through a contract on the market (Williamson, 1975). It is pertinent to note that the argument proffered by Coarse that there is an 'optimum size of the firm' based on economic analysis is in contrasts to Penrose's (1959) proposition that there is 'no optimum size of the firm' that will be discussed later in this section. Coarse sought to answer two questions of why do firms exist and why is each firm a certain size, for which he provided robust solutions. Interestingly, Penrose took to a different focus in her work as she stressed, 'I am not attempting to present a theory which will enable an analyst to examine a particular firm and state in advance whether it will or will not successfully grow … I am not asking what determines whether a particular firm can grow, but rather the very different question: assuming that some firms can grow, what principles will then govern their growth, and how fast and how long can they grow? (Penrose, 1959:7). It is fair to conclude therefore, that Coarse and Penrose approached their intellectual pursuits from different theoretical and research dimensions and in doing so, uncovered insights that have contributed to our understanding of the nature and growth of the firm.

2.2.3   PENROSE'S THEORY OF THE GROWTH OF THE FIRM

The origins of what is known today as the resource-based view of a firm can be traced to the pioneering work of Edith Penrose in her book, The Theory of the Growth of the Firm (Penrose, 1959). The Theory of the Growth of the firm provided an approach to industrial organisation which sought to break open the firm or "black box" to understand how it worked and the ideas proffered led to the term the 'Penrosian firm' (MacDonald, 1995). The approach broke from the plan or market dichotomy of neoclassical economic theory that focused on price, output and demand. Instead, it provided a perspective on industrial organisation that explained firm heterogeneity and the role of technology, competitive advantage and growth. Penrose, working as a research fellow at John Hopkins University, performed fieldwork at Hercules Powder Company and the research provided her empirical work for The Theory of the Growth of the Firm. Her research questions focused on the principles and factors that govern the growth of firms, and how fast and how long can firms grow (Pitelis, 2002).

Heterogeneity among firms within the same industry occur because even firms that have similar bundle of resources can combine and deploy them in unique ways that lead to a variety of services. According to Penrose, 'Resources … include the physical things a firm buys, leases or produces for its own use and the people hired on terms that make them effectively part of the firm. Services on the other hand are the contributions these resources can make to the productive operations of the firm' (Penrose, 1959: 67). She argues that, 'It is never resources themselves that are the "inputs" in the production process, but only the services that the resources can render… exactly the same resource when used for different purposes or in different ways and in

combination with different types or amounts of other resources provides a different service or set of services' (Penrose, 1959: 25). Every firm is unique and the uniqueness occurs due to the distinction between resources and the services created by those resources. This notion of services can be related to organisational capabilities (Barney, 1991) and the emphasis on the role of developing such capabilities, advanced in Alfred Chandler (1962). The services of resources *or capabilities* are developed from the unique experience, teamwork and purpose of each firm. The argument of Penrose's work, therefore, is that resources (and capabilities) cannot simply be purchased in the marketplace but are created in processes that are unique to a firm over time. The contribution made here to the resource-based theory is the focus on the capability of firms and their uniqueness and this heterogeneity explains the differences in profits of firms within the same industry (Nelson, 1996)

Another major contribution by Penrose is an explanation for how resources and the services they provide, create growth for a firm. Firm growth occurs because of the availability of excess or unused resources (including technological and entrepreneurial) which stimulate and shape the direction of expansion (through diversification into related markets). The direction and rate of growth of any firm depends on the patterns of its underused resources and opportunities identified and exploited by its entrepreneurial managers. Excess or unused resources occur because of indivisibilities of resources that firms acquire, that is, firms cannot fully 'optimise' use of resources such that achieving a state of equilibrium is a 'myth' (Penrose, 1959). While providing insights about the 'internal working of the firm' Penrose's perspective recognised the interactive relationship between the firm and the environment to identify, respond to, and shape market opportunities. A separation between internal/external view of the firm as seen in Porter (1985) 'structure, conduct, performance' paradigm, was not spelt out even though it can be argued that Penrose's views built primarily on the internal factors of a firm for explaining growth. Nonetheless, she introduced the concept of interstices of the economy and how that influences the growth of firms.

Interstices are new opportunities for firm expansion that develop out of macro-economic growth, change and innovation (Penrose, 1959). A firm's resources are particularly important in the context of its environment and how it is able to exploit interstices. Therefore, managers need to be entrepreneurial to interpret feedback information from the environment and respond by integrating services and emerging opportunities. The ability to respond to opportunities depends on a firm's unique services (i.e. capabilities), managerial capacity to astutely respond to opportunities by re-orchestrating resources and exploiting unused resources which stimulates growth. But firms are also able to strategically affect the market, their growth would require the capacity to both shape and respond to opportunities in the environment. More so, interstices are

particularly important to small and new firms since they permit them to expand despite the disadvantage of small size. Penrose further argued that diversification allows firms to grow by exploiting interstices using underused management (resources and managerial capacity). She stressed that such underused management is normally more profitably employed in related than in old product lines, and that interstices appear largely in new lines. She concludes on this point that, 'there may be an 'optimum' output for each the firm's product lines, but not an 'optimum' output for the firm as a whole' (Penrose, 1959: 98-99).

In addition to diversification, mergers and acquisitions are means by which firms grow by exploiting its goodwill or reputation and market position. There are considerations for a firm for mergers and acquisitions in terms of the differential economies of expansion and diversification and the relative costs of expanding internally and by acquisitions, that is, the opportunity cost involved in diversification or acquisitions (Penrose and Pitelis, 1999). It is argued that mergers may permit faster growth but does not necessarily lead to increased concentration because new and smaller firms continually remain in the marketplace because the evolving interstices of the economy create more opportunities than large firms can seize.

Interestingly, Penrose argued that successful firms continuously generate underused management resources which in turn can be continuously exploited for growth and because of that, 'there is no optimum or most profitable size of the firm' and a firm's size is 'but a by-product of the process of growth' (Penrose, 1959: 98). More so, firms are limited only in their rate of growth through time based on manager's ability to exploit underused management and interstices of the economy. The suggestion therefore, is that there were managerial limits to the rate of growth: the so-called "Penrose effect" which the economics literature aligns with the notion of equilibrium (Foss, 1997). She argued that although management constituted a primary source of uniqueness among firms and is responsible for growth, it also constrains growth. She noted, 'existing management limit the amount of new management that can be hired … but the plans put into effect by past management limits the rate at which newly hired personnel can gain the requisite experience' (Penrose, 1959: 47). The 'managerial limits' to the rate of growth and 'no optimum size' of the firm arguments made by Penrose is at odd with the views of neoclassical economics, notably the theory of transaction cost. These contradictions form some of the main criticisms of Penrose's work.

Criticisms and limitations of Penrose's contributions

The Theory of the Growth of the firm provided pioneering ideas about the growth of business firms and the outlook for capitalist industrial structure. Despite its significant contributions, Penrose's work has received criticisms in some quarters. One main area of criticism is the methodology adopted in her research work. Penrose observed and participated in the life and growth of Hercules Powder company during her fieldwork, and in doing some, built a body of knowledge that she used to develop her ground-breaking ideas, but she did not explicitly discuss methodology in her book. Her research method involved close observation and detailed documentation of facts and events to create case histories used to develop theoretical principles. Some scholars welcomed Penrose's approach as a departure from orthodoxy to challenge the dominant economic research paradigm and demonstrate the role that various methods can contribute to advancing economic knowledge. However, critics notably neoclassical economists questioned if her methodological departures met the four 'techniques' employed by a 'scientific' economist: history, statistics, theory and economic sociology (Park and King, 1992). For this reason, her work has not been fully incorporated into mainstream economic theory and she has been largely cast out, 'if you don't do economics our way then you aren't doing economics at all' (Humphries, 1995: 56). It remains debatable how much influence her ideas have had on the economic paragraph (Loasby, 2002) but her work has enjoyed more significant influence among scholars in the field of strategic management (Teece, 1982; Nelson and Winter, 1982; Wernerfelt, 1984; Barney, 1991).

A second criticism of Penrose's book relates to the testability of the theory that her work proffered at the time. What is quite significant is that she acknowledged that her use of case histories to develop theoretical principles meant that testing them were problematic. She stated, 'The factors determining the maximum rate of growth of firms – on the other hand, cannot, in its present formulation at any rate, be tested against the factors of the external world, partly because of the difficulties in expressing some of the concepts in quantitative terms and partly because of the impossibility of ever knowing for any given firm what is, or what would have been, its maximum rate of growth' (Penrose, 1959: 4). On the issue of growth rates of firms of different sizes, she noted, 'The testing of the theory set forth here is difficult indeed; all sorts of factors other than those controlling its "maximum" rate of growth will affect the actual rate of growth of an individual firm in specific circumstances at a particular time and the pitfalls of interpreting a "growth curve" when the end is not in sight are well known' (Penrose, 1959: 213). The arguments in her work relied on constructs such as management and entrepreneurship which were built on concepts that were quite broadly conceived, to develop theory which were rather discursive, rather than quantitative that lends itself for testability. Despite these perceived limitations, her work which broke from the neoclassical economic tradition offered new insights into the firm as a

'black box' as it grew and evolved over time. More so, credible theoretical works today in the management literature which adopt a similar approach of constructs and relationships to advance theory have received wide acceptance in the field of management and strategic management.

To summarize, the main contributions of Penrose's The Theory of the Growth of the Firm relate to its insights on the importance of resources and product services, management, entrepreneurship, and economic growth for capitalist industrial organisation. In many ways, Penrose's work pioneered the resource-based theory and the influence of her work is dominant among strategy and evolutionary theorists who building on Nelson and Winter (1982), seek a critique of static equilibrium theory. Wernerfelt (1984); Barney (1991; 2001); Mahoney (1992) and Teece (1982; 1997) represent some prominent scholars that have refined Penrose's ideas and have advanced the resource-based view of the firm.

To conclude this section, the theoretical works of Penrose, Coase and Schumpeter have made independent defining contributions to the fields of economics and strategic management and whose ideas continue to influence scholarship today. It can be argued that a central theme in their works is that they have elucidated our understanding of the nature and role of the firm in the capitalist economy and, in particular, economic growth and development. Also, the notions of firm resources, services (capabilities), management capacity, entrepreneurship and innovation have been stressed as being crucial to economic performance and industrialisation. The resource-based view and dynamic capabilities approach which are the core theoretical underpinnings of this thesis, have drawn profoundly on these concepts discussed in these legacy contributions (Wernerfelt, 1984; Barney, 1991; Eisenhardt and Martin, 2000; Teece, 1997; 2007; 2012). The next sections in this chapter would demonstrate how the RBV and dynamic capabilities view have built on these ideas to advance our understanding of the firm.

SECTION TWO: THE PRESCRIPTIVE (CONTENT) APPROACH TO STRATEGIC MANAGEMENT

One of the fundamental dilemmas of modern strategy research and the field of strategic management is that of how firms achieve and sustain competitive advantage. More broadly this relates to three business questions: (1) Why, and how, do firms form? (Coarse, 1937) (2) How do firms prosper and survive and what causes some firms to fail (3) Can firms persist in outperforming their rivals? (Wilden et al, 2016). A number of widely accepted paradigms of strategy theory, and strategic management frameworks have been developed to attempt to answer these questions. Strategic management began to emerge in the late 1960s in response to the failure of long-range planning. Unlike long-range planning, strategic management focuses on the environmental assumptions that underlie market trends and incorporates the possibility that

changes in trends can and do take place and is not based on the assumption that adequate growth as forecasted in long-range planning can be assured. Consequently, strategic management focuses more closely on winning market share from competitors, rather than assuming that organizations can rely solely on the expansion of markets for their growth (De Wit and Meyer, 2010). As Johnson and Scholes (2002: 15 -16) comment:

> *"Strategic management is concerned with complexity arising out of ambiguous and non-routine situations with organisation-wide rather than operations-specific implications…Nor is strategic management concerned only with taking decisions about major issues facing the organization. It is concerned with ensuring that the strategy is put into effect. It can be thought of as having three elements within it…understanding the strategic position of an organisation, strategic choices for the future and turning strategy into action.*

In this regard, strategic management takes a broader and more sophisticated view of an organisation's environment than long-range planning.

One of the most widely recognised approach to strategic management is the 'positioning' approach, the latest variant of which is Porter's (1980, 1990) 'competitive forces model' which has dominated the practice of strategic management and is one of the most relevant today. The Porter's Five Forces model, as it is commonly called, is rooted in the structure-conduct-performance paradigm of industrial organization (Mason, 1949; Bain, 1959). The structural attractiveness of an industry and its associated market forces play significant role in firm's business decisions and emphasize the actions a firm can take to create defensible positions against competitive forces. A second approach known as a strategic conflict approach (notably, Shapiro, 1989) and is related to the competitive forces approach in its focus of product market imperfections, uses the tools of game theory to effectively skilfully outwit rivals through measures such as strategic investments, pricing strategies, signalling, and the control of information. These two approaches hold the view that economic rents can be derived from privileged product market positions. In contrast, there are other strategy school of thoughts that seek to argue that competitive advantage and rents stem from vital firm-level efficiency and effectiveness, that is, a focus on internal firm strengths and weaknesses as opposed to industry manoeuvre tactics. A dominant strand of this paradigm is the resource-based view (RBV) which emphasizes firm-specific idiosyncratic resources and capabilities as determinants of long-term competitive advantage and superior performance (Penrose, 1959; Rumelt, 1984; Teece, 1984; Wernerfelt, 1984).   These are resources that are valuable, rare, non-imitable and non-substitutable, *commonly referred* to as VRIN. These three mentioned frameworks have been particularly useful in understanding firm-level strategies for sustaining and safeguarding extant competitive advantage.

However, strategic management scholars have long argued that these approaches have not adequately accounted for how firms sustain competitive advantage in the long-term, especially in rapidly changing (technological) environments. In addition, RBV perspective appears limited in that it recognises isolating mechanisms (that is, VRIN resources) but it does not attempt to explain the nature of these isolating mechanisms that enable entrepreneurial rents and competitive advantage to be sustained (Teece, 1997). In response to these shortcomings of these frameworks, over the last two decades there has been a growing emergence of another efficiency-based approach sharing similar theoretical underpins to the RBV, called the 'dynamic capabilities' view of strategic management (DCV). As an extension of the RBV, the dynamic capabilities approach seeks to explain how combinations of firm's internal and external resources and competences are developed, deployed and protected to address changing environments (Teece, 1997). The approach emphasizes the development of management capabilities, and difficult-to-imitate combination of organisational resources and skills and it integrates insights from research in many areas such as management of R&D, product and process development, technology transfer, intellectual property, manufacturing, human resources, and organizational learning, for this reason it is seen as a potentially integrative approach to understanding the newer sources of competitive advantage (Eisenhardt and Martin, 2000). As an emerging paradigm in strategic management which encompasses fields that are traditionally viewed as outside the core strategy boundary including concepts in social and behavioural sciences, it has invigorated strategy research. It has promising future research potential as well as to provide insights to inform practical managerial actions to achieve competitive advantage in rapid changing business environments experienced in many industries today.

In this introduction, the dominant strategy paradigms in strategic management literature have been briefly identified leading up to the dynamic capabilities perspective. In what follows, these paradigms are discussed in greater details explaining their origins and theoretical basis, the fundamental arguments, their known limitations and criticisms made of the frameworks. It is hoped that by doing this analysis, the case will be made for the growing interest in the dynamic capabilities approach and its contributions to strategic management. It must be noted, however, that the various strategic management frameworks are in many ways complementary each with different strengths and limitations, and a full understanding of firm-level, competitive advantage requires an appreciation of all these approaches and others not covered in this introductory section.

2.3 PORTER'S FIVE COMPETITIVE FORCES

The dominant paradigm in strategy during the 1980s and still popular today was pioneered by Michael Porter (1980). The key argument in the approach is that the environment and, specifically the industry structure of the industry or industries in which firms competes strongly influences the competitive rules in that environment as well as the strategies firms can adopt. In the framework, five industry-level forces namely; barriers to new entrants, threat of substitution of products and services, bargaining power of buyers, bargaining power of suppliers, and rivalry among industry incumbents determine the profit generating potential of an industry or sector within an industry. As a starting point in the framework, firms evaluate the potential or attractiveness of an industry then find a position in the industry from which it can best defend itself against competitive forces or even influence them in its favour (Porter, 1980: 4). The main strength of the model is that it provides a systematic way of evaluating the competitive forces at play at an industry level, the profitability potential of different industries and industry segments, and how firms could choose to position themselves to achieve economic rents.

The five forces approach has a number of underlying assumptions and theoretical foundations. Economic rents in the competitive forces model are derived through monopolistic positions (Teece, 1984) where firm adopt strategies to impede competitive forces from buyers, suppliers and competitors that drive economic returns to zero. Therefore, industry structure plays a vital role in determining and limiting strategic action based on strategic options available to firms. Porter (1980) identified three generic strategic options available to firms, namely cost leadership, differentiation and focus. Cost leadership refers to achieving the lowest price for a uniform product or service in a market to meet the demand of buyers who are price conscious. Differentiation strategy deals with providing 'unique' products in an industry in order to avoid head-on product competition and price wars, and these unique products are targeted at buyers who are less price-sensitive. On the other hand, focus strategy is to produce products that meet the needs of a particular customer segment within the market of an industry.

This approach to strategic management is largely focused on industry level dynamics as some industries or subsectors of industries offer a more attractive proposition because they have structural impediments to competitor forces, for example low level of threat of substitution, and this allows firm to enjoy monopolistic positions, maintain competitive advantages and generate economic rents. As such, rents are generally created at industry level rather than firm level and differences among firms relate essentially to firm strategic positioning within the industry and to scale hinged on a firm's power in the industry. This approach to strategy finds roots in the field of industrial organization prominent among scholars in the 1940s and in particular, the industrial

school of Mason and Bain (1945), at a time when competitive environments were characterised by sustainable and stable mobility and structural barriers and not rapidly changing environments (Teece, 1984).

2.3.1 CRITICISM OF PORTER'S FIVE FORCES APPROACH

In management and strategy literature, there have been several criticisms of Porter's five forces model with regards to its practical validity and mainly industry-focused approach. One of the main criticisms relate to the validity of the model in understanding today's competitive market environment otherwise called the 'New Economy' (Downes, 1997). Porter's approach developed in the early 1980s is rooted in the historical context of industrial organisations or 'Old Economy' (Downes, 1997) where the global economy was characterised by cyclical growth. The competitive environment showed predictability and stable mobility such that corporate strategies where aligned to the external environment to optimise profitability during cyclic upturn and survival during economic downturns. However, today's market environment is dynamic and less predictable which throws up several factors that greatly influence market and industry structures which were not significantly represented in the Porter's model. Downes (1997) argues that deregulation, globalisation and digitalisation have increasing significance in the 'New Economy' and impacts on the industry forces and this highlights some limitations of the use of Porter's Five Forces model in dynamic competitive environments. This section discusses the effects of deregulation, globalisation and digitalisation which is argued highlights the practical limitations of Porter's five forces model today. It also discusses the shortcomings of the mainly industry-focused approach of the model.

The Effects of Deregulation

Deregulation over the last decades by governments across the world especially in the USA and Europe has enabled cross border cooperation and created many unions and agreements such as EU, GATT, and NAFTA. Industries such as the Communication Industry and the Airline Industry have seen government regulations largely reduced (Bowen, 2002). These 'open markets' caused by deregulation has eliminated trade barriers and tariffs with further implications for industry structures and competitiveness. A good example is the airlines industry in Europe. Before deregulation it was quite difficult for airlines to enter a market and operate in other countries because entry barriers were high as countries introduced protectionism to regulate the intensity of rivalry within the industry and protect domestic airlines which were mostly state owned (Subramanian, 2010). The implications were that intensity of rivalry among existing competitors was low, buyers had little bargaining power because of limited choice of airlines, and the threat of substitutes such as train, car and bus were high because of a lack of intense competition in the

airline industry led to high air travel prices. Government ownership of airlines influenced the order decision for aircrafts to favour domestic manufacturers such that Air France purchased from Airbus, therefore suppliers had high power. Deregulation, however, removed entry barriers and new airlines predominantly low-budget airlines entered the market (Bowen, 2002; Williams, 1994) which led to higher rivalry among competitors, higher buyer choice and power, and reduced ticket prices due to price wars among competing airlines. Airlines had to change their business strategies to respond to the new competitive environment, for example the development of the 'hub-and spoke-system' to address the increasing competition and decreasing prices (Bailey, 1992). The consequence of deregulation is a significant structural change in market conditions and critiques argue that Porter's work focused predominantly on the economic conditions present in that era where it was proposed without adequate considerations for the effects of deregulation that shapes the 'New Economy' today (Grundy, 2006).

The Effects of Globalisation

Globalisation is another factor that impact on industry structure in terms of competitiveness and strategies that firms adopt. Companies that previously operated locally have built an international presence by capitalising on technological advancements and improvements in communication, distribution, logistics and transportation routes (Downes, 1997). This has led to increased collaboration such that partners and suppliers are no longer local but international. Critics state that while the Porter's five forces model proposes that firms defend against competitive forces in an industry (Porter, 1980), the importance of collaboration and not just competition, which is vital in today's global economy, is somewhat underemphasized (Karagiannopoulos et al., 2005; Holm, Eriksson and Johanson, 1996). Globalisation has an increasing impact on business practices such as partner networks and strategic alliances that support collaboration and innovation. Bang and Markeset (2012) identified five main drivers for globalisation namely; lower trade barriers, lower communication costs, lower transportation costs, spread of technology, and information and communication technology development. These drivers in turn give rise to size, location and pressure effects. Globalisation results in a larger size of market potential for both companies and customers since markets grow closer together while there is also a larger number of potential competitors, suppliers and partners. The location effects eliminate local boundaries in the form of internationally-fragmented value chains, offshoring and complex supply chains that exist today. The pressure effects relate to cost and price pressures, and rapidly changing and diverse markets (Bang and Markeset, 2012). Collectively, these effects have profound implications. Companies can buy from suppliers internationally and sell at a global level, collaborate better with other companies while small and medium companies benefit from international collaborations to operate in local and international markets – these decrease entry barriers such that the threat of

new entrants is high, and increases rivalry among competitors. Customers can compare prices globally and get the best price and quality for goods across international markets such that buyer power is significantly increased. In other words, globalisation impacts on all forces in Porter's model and has fundamentally changed the industry dynamics espoused by Porter such that many industry boundaries are increasingly blurred making it impossible to meaningfully define a discrete industry which is needed to comprehensively perform a strategic analysis of an industry in the manner that the five forces model stipulates. This represents a disruption in strategic analysis that the traditional five forces paradigm does not adequately account for (Grundy, 2006).

The Effects of Digitisation

Digitisation, which was not incorporated in Porter's model, has had probably the biggest impact on industry structure over the last three decades. The spread of the Internet and technological innovation has led to fundamental structural changes in the global economy and industries led by technologically innovative companies such as Google, Facebook, Amazon and Uber whose business models are centred on the possibilities of the internet. This process of change has been described as the 'Internet-Economy' (Rothermel, 2008). The internet and digitisation creating digital products has drastically changed the dynamics in almost all industries to an extent not articulated by Porter's five competitive forces. Porter considered IT as a tool for implementing strategies and changes (Andriotis, 2004) but today IT is profoundly more important as a driving force for change and is the cornerstone on which many companies build their business models (Downes, 1997) – Facebook and Uber are notable examples. Digitisation has changed the basic conditions of industries with significant implication for industry structure.

Due to the internet, all market players have access to extensive information, drastically eliminating information asymmetry thus changing the basis for competition. Companies use the internet to gain competitive insights about rivals and use IT as a sales medium such that companies can build a large customer base quickly due to the vast reach of the internet by exploiting the social era dynamics of YouTube, Facebook and Instagram as well as lowering ICT costs (Merchant, 2012). This is particularly beneficial to start-ups and smaller firms with the effects seen in the form of lower barriers-to-entry and increased competition. Size gave big companies purchasing power and financial ability to access mass market when mass media was the only way to reach an audience, thus creating high barriers to entry and keeping out potential competitors. Digitisation and the social media platforms mean capital requirements to enter markets have declined and marginal cost of reaching customers is effectively zero (Merchant, 2012). Porter (1979) identified six significant barriers to market entry namely, economic of scale, product differentiation, capital requirements, cost disadvantages, access to distribution channels, and government policy. Digitisation alongside globalisation and deregulation, has significantly

diminished these barriers and company size offers a much smaller advantage than it used to. Similarly, because digitisation reduces transaction costs for the acquisition and use of information, it leads to higher profits for companies (Downes, 1997).

Furthermore, companies have more possibilities to expand their business globally through ecommerce and exploit IT to implement new business models and strategies. For example, the tendency towards digital products from physical products is advantageous in that access to digital products is independent of time and place (Rothaermel, 2008) which increases customer engagement and sales. This has led to increasing virtualisation of business structures and markets, and full automation of business processes and service provision including payment and delivery of products, which can be achieved end-to-end entirely through electronic networks. The Spotify company in the music streaming market is good example. These new value-chains and business models have changed the nature of competition in radical ways and with new entrants having considerable bearing on industry structure. Take the example of the shopping mall as illustrated in Downess (1997). In the past, key to competitive advantage and profitability for operators of shopping malls is having a good location and a large variety of stores selling products. Today, digitisation has enabled ecommerce with 'electronic malls' which are more engaging to customers, provide the convenience of 24 hours shopping, offer a far greater product choice, and cheaper prices, led by companies like Amazon and Ebay.

This has fundamentally disrupted the industry with traditional brick-and-mortar retailers unable to compete in the market and a long list of household names such as Maplin, ToysRUs, BHS and House of Frasers, having undergone restructuring to be 'leaner' to compete or have gone into administration within the last year alone (BBC News, 2018). The implication has been the emergence of the phrase, 'What Amazon Can't Do' as retailers seek a way to avoid direct competition from Amazon and other major online retailers, by adapting or enhancing their business models and strategies to provide a differentiated retail experience. This can be seen in a shift from generic long aisles of commodity items in stores to customized and/or personal experiences like café spaces within retail stores. Customers are now swayed to walk into the retail store to check out product configuration, to see and feel it, or even experience it through interactive or virtual reality technologies – these enhance customer engagement would potentially lead to in-store purchases or subsequent online orders for home delivery. A combination of ecommerce and retail experience by retailers appears to be a winning differentiation strategy.

Furthermore, digitisation and technological advancements have provided specific benefits to buyers in the form of more information about products, access to a larger variety of products, shopping convenience, lower prices and better-quality products due to increased competition and

more streamlined value chains. These have increased buyer power especially in the internet era. In the past, distinct products that are artisanal in nature attracted a premium price and were experienced by a tiny fraction of the market (Merchant, 2012). However, today, technological advancements which utilises our personal information and data analytics especially from our online data footprints means that products can be more personalised and customised to our tastes and choices. For example, Nike ID is a service provided by sportswear company, NIKE that allows customers to personalise products to suit their individual taste by paying a reasonable additional charge to the standard price. Thus, the smartest, nimblest companies are moving away from less profitable generics and into more profitable distinct, personalised products and services. This shift is largely dictated by customer demands (and buyer power) in the social era of today. Similarly, social media conversations on platforms like Twitter and Facebook, for example retweets and 'likes' give credibility to companies and plays a major role in perception of a brand or product a company provides. Companies that have recognised the industry dynamics in buyer power in the social era have sought to actively engage in social media conversations with customers or the public at large. This truly makes the company 'customer centric' and they benefit in getting direct feedback from customers on the validity for their products making them socially meaningful (Merchant, 2012). Constant conversations also allow companies to test ideas quickly and learn immediately what the market responds to and adapt on the fly to what works, thus improves the bottom line. More so, the cost of engaging through the social media conversation is very minimal. The social era rewards the gazelles – the companies that are fast, fluid, and flexible especially in dynamic environments.

In addition to implications for companies and competitive rivalry, threat of new entrants, threat of substitutes, and buyer power as discussed, digitisation and ICT advancements have impacted on supplier power. Access to more information through the internet both in terms of reducing information asymmetry between companies and suppliers, and access to a wider pool of suppliers mean that companies are better informed and with more choices from global suppliers, thus potentially reducing the bargaining power of suppliers. On the flip side, suppliers have more knowledge about companies and their business strategies and can use that information to their advantage to strengthen their bargaining position. They are also aware of other suppliers to form collaborations and pool resources together. Advancements in ICT have helped to streamline buyer-seller processes and improve the transparency of overall business relationships for mutual benefits. This can be seen in the implementation of Enterprise Resource Planning (ERP) system. The system has vastly improved business processes and allows buyers and sellers to share real-time information on production planning and make more efficient plans accordingly (Mohapatra, 2012). Again, this demonstrates that collaboration enabled by continuous advancements in ICT,

rather than competition, is a somewhat underexplored concept in the traditional Porter's competitive forces model.

The Industry Approach of Porter's Five Forces Model

The 'outside-in' industry approach of Porter's model has been a critique presented by the resource-based view scholarship (Barney, 1991). A focus on the influence that industry factors have in determining firm competitive advantage and rents, and with little accounting for the role of firm's heterogeneous resources and competences and internal managerial actions to impact on firm performance, has been a main criticism of the five forces model. It is said to have led many companies to adopt a harsh, and to an extent unthinking, approach to business success, epitomised by Jack Welsh when he was CEO of GE: 'We will run only businesses that are number one or two in their markets (quoted in Kay, 1993: 339). Therefore, if businesses are not, or do not have the potential to become leaders in their field, they are sold off or closed down (Koch, 1995). The thinking suggested that size and market leadership in industry were the ultimate source of competitive advantage and profits without giving much attention to unique resources and competences that can be orchestrated within firms. A related limitation of Porter's model is that the analysis does not sufficiently take into account macro level or PESTEL factors which severely impact on industry forces, for example government deregulation previously discussed (Conklin and Tapp, 2000). The focus on industry in Porter's model and lack of integration of macro and firm level factors also attracts a criticism of being an incomplete holistic strategic framework (Rivard et al., 2006).

Arguably the most central theme in the criticism of Porter's five forces framework is that it provides a static view or snap-shots of an industry and does not accommodate the 'time dimension' (Thyrlby, 1998). The use of the model as a basis to formulate firm's competitive strategy becomes problematic in markets characterised by high dynamism because the basis of competitive advantage can be eroded quickly as industry and environmental conditions change rapidly over time. However, supporters argue that the model still provides useful strategic insights. Johnson et al. (2008) state that the framework is a 'useful starting point for strategic analysis even when profit criteria may not apply' (2008: 60). It is vital that good strategy incorporates knowledge about the industry in which a company operates in and Porter's model is a useful tool to provide that and is particularly useful when used alongside other complementary strategy models and frameworks. Moreover, despite its limitations, the core tenet of the model that companies operate in a network of buyers, suppliers, competitors, substitutes and new market entrants remain valid. This is the basis for the competition-based economy which is well articulated in Porter's model (Johnson et al, 2008). In this light, strategic management scholars have sought to build on and address the limitations of the model and create a more holistic

framework that is more suited to the 'New Economy' characterised by a global, dynamic market environment today. Indeed, this has been one of the main aspirations of the dynamic capabilities scholarship.

The dynamic capabilities approach has become perhaps the most vibrant of these new approaches (Wilden, 2016). First, as an extension of the resource-based view, it deals with firm level factors. Second, it emphasizes a host of evolving macroeconomic factors that impact on the business ecosystem including globalisation and deregulation and at the same time, articulates the major role technology and innovation play in enabling firms to refresh their resource stock over time to respond to, or shape the dynamism of the environment through sensing, seizing and reconfiguring abilities, so as to sustain competitive advantage. These contributions are well articulated in the dynamic capabilities approach. As with any emerging field particularly one that only gained prominence within the last two decades (Kurtamollaiev, 2017), there is room to flesh out the details of the dynamic capabilities paradigm and refine some of the inconsistencies within its propositions. This is a primarily focus of this thesis and some of the inconsistences in the scholarship will be addressed.

2.4   THE STRATEGIC CONFLICT APPROACH

The origins of the strategic conflict approach to business strategy can be traced to Carl Shapiro's 1989 article titled, 'The Theory of Business Strategy'. This approach draws from insights in game theory, and with the belief that by influencing the behaviour and actions of rival firms and thus the market environment - including the beliefs and perceptions of customers and of rivals, firms can manipulate the market environment in a way to increase their profits. To be effective these strategic moves will bear a cost and be irreversible otherwise they will have no effect. An example of a strategic move is strategic signalling to influence competitor's behaviour, such as predatory pricing (Kreps and Wilson, 1982a, 1982b) and limit pricing (Milgrom and Roberts, 1982a, 1982b). While some applications of this game theory approach to strategic actions, e.g. predatory pricing and patent races, have found useful relevance in practical business behaviour rationalising these observed behaviours into testable game-theoretic models is a terribly complex challenge and has subjective elements. Teece et al. (1997) argue that this game-theoretic approach can be effective when firms do not have deep-seated competitive advantage or competitive positions are more delicately balanced, as with Coca Cola and Pepsi Co, and the population of relevant competitors and the identity of their strategic alternatives can be readily discerned. While such circumstances may be present in certain industries they are rare in fast changing environments.

Critics of the approach suggest that the possession of competitive advantage by a firm, say cost leadership, is more responsible for competitive fortunes than the moves and countermoves of

their rivals. In other words, when there are gross asymmetries in competitive advantage between firms, the stronger competitor will most certainly achieve greater rents even if disadvantaged by some information asymmetries. For example, if a new firm with tremendous cost advantage enters the market it can outperform incumbent firms and no amount of gaming by the incumbent firms will reverse that outcome. This illustrates the point that perhaps a more successful way for firms to compete in the marketplace is through a process involving the development, accumulating, deploying and protecting of idiosyncratic resources and capabilities as opposed to relying on sophisticated plays and counter plays. Critics of the strategic conflict approach also argue that the approach tends to focus practitioners on product market positioning rather than on the development of unique assets which make possible superior product market positions (Dierickx and Cool, 1989). Giving priority to Machiavellian tricks and managers' ability to 'play the game' could distract managers from seeking to build more enduring sources of competitive advantage which is ultimately responsible for a firm's growth and success. In a similar way, Brandenburger and Nalebuff (1996) argue that the entrepreneurial side of strategy, that is, the question of how firms create and protect new rent streams is not dealt with by the game-theoretical approach.

However, despite these criticisms, the strategic conflict approach does serve some meaningful purpose. When competitors are closely matched then strategic conflict is of interest to competitive outcomes. Also, when used alongside other approaches it can provide some powerful insights that are useful in strategic management. One of such approaches that can be used in tandem with strategic conflict is the resource-based view perspective which will be dealt with in the next section.

2.5   THE RESOURCE BASED VIEW OF A FIRM

2.5.1   THE ORIGINS OF RESOURCE BASED VIEW OF A FIRM

In contrast to the strategic conflict approach, which argues that firms can outperform their rivals by engaging in strategic actions such as product market positioning and raising prices to deter new entrants to the market, the resource-based view sees firm's superior systems and structures as being responsible for their success in a given market. That is, competitive advantage lies 'upstream' of product markets and where firms accrue economic rents or profits because they possess idiosyncratic and difficult-to-imitate resources which allows firms to have markedly lower costs or offer markedly higher quality or product performance. The most prevalent resource-based approach in strategic management is the resource-based view of a firm (RBV) developed by Wernerfelt (1984) and made popular by Barney (1990).

The resource-based approach can be traced to earlier pre-analytic strategy literature in the works by Penrose (1959). Similarly, a leading text of the 1960s (Learned et al., 1969: 11) noted that 'the capability of an organization is its demonstrated and potential ability to accomplish against the opposition of circumstance or competition, whatever it sets out to do. Every organization has actual and potential strengths and weaknesses; it is important to try to determine what they are and to distinguish one from the other.' Learned et al. (1969) proposed that the real determinant of a company's success and its future developments lies in its ability to create or acquire 'a competence that is truly distinctive' and this feat is based on what resources the firm can muster. A firm's resources allow it to take advantage of the opportunities it confronts but the same resources place a constraint on firm behaviour and one should not assume that management 'can rise to any occasion' as they are constrained by their resource limitations. The central theme is recognition of the importance of firm-specific factors and resources in explaining firm performance.

2.5.2 THE THEORY OF RBV AND CONTRIBUTIONS TO STRATEGIC MANAGEMENT

The most significant origin of the resource-based view of a firm can be found in the insights into the resource perspective of a firm provided by Penrose (1959) in her theory of the growth of the firm. Penrose (1959) state that firms can be conceptualized as bundles of resources, that those resources are heterogeneously distributed across firms, and that resource differences persist over time. The author argued that the resource stock of firms can allow firms to achieve competitive advantage and that advantage might be sustained over time. Indeed, there are many number of scholarly publications that demonstrate the link between Penrose's work and resource-based view, for example, Augier and Teece, 2007; Kor and Mahoney, 2004; Lockett, 2005; Lockett and Thompson, 2004; Pitelis, 2007. Lockett (2005: 85) statement that Penrose considered firms as 'administrative organisations that are collections of heterogeneous productive resources that have been historically determined' demonstrates an undisputed link between Penrose's work and RBV. Despite her ground-breaking ideas, the conceptual framework of what is today known in strategic management as 'the resource-based view of the firm' (RBV) was only developed by Wernerfelt in 1984 and subsequently made popular by Barney (1991). Many authors, including (Barney, 2001a,b; Barney et al., 2001; Day and Wensley, 1988; Dierickx and Cool, 1989; Eisenhardt and Martin, 2000; Mahoney and Pandian, 1992; Nelson and Winter, 1982; Priem and Butler 2001a,b; Winter, 2002) have made significant contributions towards the development of the framework. The RBV is an influential theoretical framework for understanding how competitive advantage within firms is achieved and how that advantage might be sustained over time (Barney, 1991; Nelson, 1991; Penrose, 1959; Peteraf, 1993; Prahalad and Hamel, 1990; Schumpeter, 1934; Teece, Pisano, and Shuen, 1997; Wernerfelt, 1984). The framework focuses on the internal

composition of a firm's resources and so it is different from and a complement to the traditional emphasis of strategy on industry structure and strategic positioning or conflict within that structure, as the determinants of competitive advantage (Henderson and Cockburn, 1994; Porter, 1979).

RBV theory is built on a fundamental assumption that firms are heterogeneous with respect to their resources and capabilities or endowments and that this resource differences persist over time, primarily because the resources are imperfectly mobile (Amit and Schoemaker, 1993; Mahoney and Pandian, 1992; Penrose, 1959; Wernerfelt, 1984). The theory argues that when firms possess such resources that are simultaneously valuable, rare, imperfectly inimitable, and imperfectly substitutable or non-substitutable (i.e. VRIN attributes), they can achieve sustainable competitive advantage by developing value-creating strategies that are not easily duplicated by competitors (Barney, 1991, 1995; Peteraf, 1993; Wernerfelt, 1984, 1995). The particular resources a firm possess enable or restrict the choice of markets it may enter, and the levels of profits it may expect (Wernerfelt, 1988). However, possession of superior resources may not be enough to succeed and firms need to turn resource advantage into capability advantage by developing distinctive capabilities to make better use of its resource (Penrose, 1959). More so, firm's resource endowments are said to be 'sticky' at least in the short run, because firms are to some extent stuck with the resources they have got and may have to live with what they lack. This stickiness arises for a number of reasons. First, the process of developing new competences from resources is complex, costly and takes time to achieve so firms cannot achieve this at their free will (Dierickx and Cool, 1989) For this reason, firms are restricted by their current resource portfolios and even future resources and competences are very often built on existing ones. In other words, such resources create a path dependence and future resource possibilities are often restricted based on firm's past decisions and choices and the paths previously taken. Secondly, some assets such as tacit know-how (Teece, 1976, 1980) and reputation or brand name (Dierickx and Cool, 1989) are not readily tradeable or transferred in markets even if firms are willing to pay to acquire them. Thirdly, Barney (1986) pointed out that even in situations where assets can be purchased, unless a firm experiences good fortune or possesses superior information, or both, the price it pays for an asset in a competitive market will fully equate the economic rent (profit it can generate) from asset and this defeats the purpose of purchasing that asset.

The RBV perspective makes contributions to the strategy process by theorising that firms use their heterogeneous and sticky resource bundles to develop strategies for exploiting these firm-specific assets they possess. The logic in the process they engage in is that the firms first, identify their unique resources, then decide in which markets those resources can yield the highest economic rents and finally, decide whether the rents from those assets are most effectively utilized by

either integrating into related market(s), selling the relevant intermediate output to related firms, or selling the assets themselves to a firm in related businesses (Teece, 1980, 1982). The strategy process in this approach is conceptually different from that of the competitive forces approach which posits that the strategy steps firms follow to be; pick an industry based on its structural attractiveness, then devise an entry strategy based on assumptions (understandings) of competitors' rational strategies and finally, if not already possessed, acquire or develop the required assets needed to compete in the market. The inherent assumption in the competitive forces approach is that the processing of identifying and developing the requisite assets is not problematic and also, that assets can be bought if not owned. This is at odds with the RBV perspective.

One of the main contribution of RBV theory is that it explicates how firms could generate wealth from their unique resources through vertical integration and diversification strategies (Penrose, 1959; Williamson, 1975; Teece, 1980, 1982, 1986a, 1986b; Wernerfelt, 1984). When these resources and their related activities have complementarities, their potential to create sustained competitive advantage is further enhanced through diversification (Collis and Montgomery, 1995, 1998; Milgrom, Qian, and Roberts, 1991; Milgrom and Roberts, 1990; Porter, 1996). Furthermore, an implication of the RBV perspective is that it invites considerations of managerial strategies for developing new capabilities (Wernerfelt, 1984). Indeed, if control over scare resources is the source of economic profits, then it follows that issues such as skill acquisition, the management of knowledge and know-how and learning become fundamental strategic issues.

2.5.3 LIMITATIONS OF RESOURCED-BASED VIEW AND CRITICISMS OF THE APPROACH IN STRATEGIC MANAGEMENT

Despite the insights provided by RBV theory and the contributions to strategic management, the validity of RBV as a framework in organizational theory has been questioned in many aspects (Barney, 2001a; Conner 1991; Eisenhardt and Martin, 2000; Priem and Butler 2001a,b) such as the definitions, the linkages to market dynamism and the mechanisms of transforming resource advantage into competitive advantage through the building of capabilities and competences.

It is argued that RBV and its associated terminologies such as resources, processes and capabilities lack clear definitions (Thomas and Pollock, 1999). For example, Priem and Butler (2001a,b) state that scholars in the field of RBV mainly paraphrase Barney's (1991: 101) statements: firm resources are 'all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness'. There appears to be no clear distinction between resources and capabilities. Another related criticism can be traced to

Barney's (1991: 106) statement that firms gain competitive advantage when 'implementing a value creating strategy not simultaneously being implemented by any current or potential competitors'. Eisenhardt and Martin (2000) argue that Barney's (1991) definition suggests that VRIN resources that provide competitive advantage are identified by observing superior performance and then attributing that performance to the unique resources that the firm appears to possess – this makes the definition of the RBV tautological.

The RBV theory explains how firms are able to earn economic profits in equilibrium and, as such, it is essentially a static view (Barney, 2001a,b; Priem and Butler, 2001; Lockett et al., 2009). This brings into question the key assumption of RBV, that is, the persistently heterogeneous resources of the firm and the achieving of rents resulting from the absence of competition in either acquiring or developing complementary resources (Mahoney and Pandian 1992) – this does not hold true in the context of volatile, unpredictable environments. In other words, the RBV does not inform of how future VRIN resources could be acquired or how the current stock of VRIN resources can be refreshed in changing environments as well as the effect of market dynamism and firm evolution on resources over time.

The RBV is also criticised for being limited in approach because it fails to articulate mechanisms that explain how resources are transformed to competitive advantage (Mosakowski and McKelvey, 1997; Priem and Butler, 2001a,b; Williamson, 1999). Firms enjoy short-term rents through value-creating diversification strategies that cannot be easily duplicated by competitors (Barney, 1991; Nelson, 1991). Traditional theory of diversification is based on excess capacity of resources arising from the uneven speed of operations at all units (Gorecki, 1975; Penrose 1959; Teece, 1982). Firms are able to put to use the excess capacity of their resources by diversifying into other industries in the same category of their existing industry (Lemelin, 1982), and may also enter industries that are related to their primary activities (MacDonald, 1985; Stewart et al., 1984). By so doing, firms grow in the paths set by their resources and capabilities in creating product markets. Despite this emphasis on exploiting excess resource capacity by diversification, the RBV perspective does not explicate how resources create competitive advantage, that is, mechanisms to explain how resources can be deployed to create product markets. Indeed, RBV holds an implicit assumption of homogeneous and immobile product markets featuring unchanging demands (between a firm's current industry category and the category/industries it diversifies into) and consequently, the role of product markets is underdeveloped in RBV theory (Priem and Butler 2001a,b).

2.5.4 COMPLIMENTS OF RBV AND THE EMERGENCE OF DYNAMIC CAPABILITIES VIEW (DCV)

The RBV remains one of the most dominant approaches in strategic management and it has expanded the body of knowledge of determinants of differential firm performance and enhanced the understanding of strategic management as a whole (Mahoney and Pandian 1992; Priem and Butler 2001a,b) Despite the shortcomings of the framework, notably its static view of the firm's competitive advantage, it is complementary to leading theoretical frameworks in strategic management which also focus both on firm's internal strengths and weaknesses, as well as their external opportunities and threats (Andrews, 1971; Ansoff, 1965; Learned et al., 1969). As a framework used in strategic analysis, the use of the resource-based view perspective alongside the traditional emphasis on industry structure which emphasize external competitive forces (Porter 1980), provides a more holistic understanding of the determinants of competitive advantage for firms.

In an attempt to address the limitations of the RBV especially with regards to how firms could create valuable resource bundles or how the current stock of VRIN resources can be refreshed in the changing environments, there has been an emergence and growth of a paradigm in strategic management called, the dynamic capabilities view (DCV) of a firm or perspective. This perspective is argued to be an extension of the RBV; it shares similar underlying assumptions (Barney, 2001b) and it helps us understand how a firm's resource stock evolves over time in response to the dynamism of the environment so as to sustain competitive advantage. There have been significant contributions to strategic management by the dynamic capabilities perspective but this has not been without its own challenges and a scrutiny about its relevance and conceptualization. What is without doubt is that the DCV has injected new vigour into empirical research in the last couple of decades and enhanced our understanding of the sources of sustainable competitive advantage for firms in line with changes in the competitive environment. The next chapter of the thesis, chapter three will cover the dynamic capabilities view in strategic management in detail. The next section will discuss the analytical approach to strategic management.

SECTION THREE: THE ANALYTICAL (PROCESS) APPROACH TO STRATEGIC MANAGEMENT

The prescriptive stream or content approach to strategy discussed in the previous section has its origins in the long-range planning initiatives, which has origins in the 1940s and 1950s, and went on to dominate strategy practice in the 1960s and 1970s. This viewed strategy as an economic-rational process particularly useful to market share and profit maximisation (Ansoff, 1965; Porter, 1980) and the exploitation of industry positioning (Porter, 1980). In this stream, strategy formation and implementation are seen as a planned, deliberate, controlled endeavour with the

use of models and frameworks such as Porter's Five Forces and the RBV framework to understand strategic issues and implement an organization's strategy. The Analytical stream or process approach to strategy, which began to appear in the 1970s, on the other hand, is more interested in understanding how organizations formulate strategy rather than prescribing how they should formulate it. This section will discuss the analytical approach to strategy.

2.6 THE ANALYTICAL (PROCESS) APPROACH TO STRATEGY

The Analytical stream or process approach to strategy argues that strategy is the outcome of complex social and political processes and activities that organizations engage in (Hamel and Prahaland, 1989; Miles and Snow, 1978; Mintzberg et al, 2009; Petigrew, 1980; Quinn, 1980a). That is, strategy is not a process, but an outcome of a process. More so, it proposes that, the day-to-day stream of decisions regarding the development of an organization's capabilities that determines its strategic direction, rather than the reverse (Mintzberg, 1994, et al., 2009). It argues, for example, that in the real world, strategy-making is ad hoc and instinctive and not structured and planned, and that the concept of 'strategic planning' is largely irrelevant. Thus, strategy is rather 'emergent' than 'deliberate' based on intended strategy.

The analytical stream of strategy is therefore interested how strategy emerges in organizations, what individuals and managers do and how they carry out organizational activities. It also includes social interactions as well as how organizational structure, systems, technology, and even culture shape the strategic options an organization can pursue. The approach seeks to dispel the myth that an organizational strategy is based solely on rational senior managers or a top management team who make decisions using models and tools based on careful analysis of all available information. This analytical approach to strategy has grown over the past few decades, especially amongst strategy scholars who are interested in the practical aspects of strategy. For example, the strategy-as-practice and the microfoundations approach to strategic management are disciplinary fields within this approach. Having looked at the prescriptive approach to strategy, this section will discuss the analytical stream of strategy and its contribution to strategic management. It will begin with an overview of the learning school, strategy-as-practice approach then go on to cover the microfoundations approach in details as it forms part of the theoretical focus on the research undertaken in this work.

2.6.1 THE LEARNING SCHOOL IN STRATEGIC MANAGEMENT

What is regarded as the learning school in strategic management began to emerge due to a frustration with the prescriptive approach to strategy (Mintzberg, 1988). The learning school argued that the traditional approach to strategy formation was at odds with what happened in reality in organisations – the real world is too complex and uncertain to allow strategies to be

prescribed all at once as clear plans and vision, crystal ball-like. Rather, strategies must emerge incrementally as an organisation 'learns' and adapts (Mintzberg et al., 1998: 6). In this regard, the learning school views strategy formation as an emergent process and so its focus is not about prescribing ideal, rational strategic behaviour but on how strategies get made and emerge. It sought to explore issues surrounding; who really is the architect of strategy and where in the organisation does strategy formation take place? How rational, planned and organised can the process really be? How do strategies emerge as people acting both individually and collectively make sense of and learn about unfolding situations as well as their organisation's capability to respond? (Mintzberg et al, 1988). These issues are still relevant to strategy scholars today.

The origins of the learning school can be attributed to Charles Lindblom's (1959) article "The science of 'Muddling Through'" where he suggested that policy making is not an orderly, controlled process but a messy one where policy makers attempt to adjust to a world that is too big and complex for them to manage methodologically. In the article he challenged the notion of 'rational management' which did not reflect the reality of the world of business and government and in a subsequent work, he introduced the concept of disjointed incrementalism where "policy making is typically a never-ending process of successive steps in which continual nibbling is a substitute for a good bite" (1968: 25-26). The central argument is that policymakers and strategists develop strategies incrementally as they wrestle with the realities of an overwhelming, complex world. Notably, James Quinn (1980a, b) built on Lindblom's idea of incrementalism but differed on his view of disjointedness. He argued that in business organisations, managers coordinated organisations towards a final strategy in a logical manner, constantly integrating the intertwined incremental processes of strategy formation and strategy implementation which is the core of strategic management i.e. logical incrementalism. Over the past decades, scholars have continued to contribute to the learning school. Prominent works that fall within the scope of the learning school include, evolutionary theory (Nelson and Winter, 1982), emergent strategy (Mintzberg and McHugh, 1985) and dynamic capabilities (Teece et al., 1997; Eisenhardt and Martin, 2000).

The learning school has informed strategic management in a number of significant ways. First, due to the complex and uncertain external environment, coupled with the fact that knowledge required for effective strategy is often diffused across the organisation, deliberate control is unachievable. Therefore, strategy making requires a process of learning and adaptation over time, thus strategy formation and implementation are inseparable. Second, the process of learning in organisations requires both individual learning by leaders and collective learning because there are many potential strategists in an organisation (i.e. actors across organisations engaging in strategic acts) who can contribute learning and knowledge to strategy formation and

implementation. Third, that the learning process occurs in an emergent fashion within both structured and unstructured activities and events where any individuals involved gain useful strategic learning experiences. Thereafter, patterns of successful streams of experiences in organisations may manifest as emergent strategies which may then be later formalised as deliberate strategies.

Overall, the central contribution of the learning school is that it brings reality to strategy formation by accounting for the dynamic and unpredictable environment that is largely ignored in the prescriptive approach, through its focus on what organisations actually do. The strategy-as-practice approach in strategic management builds on this central tenet of the learning school but seeks to offer its own unique contributions.

2.6.2 STRATEGY-AS-PRACTICE APPROACH IN STRATEGIC MANAGEMENT

The strategy as practice (s-a-p) approach in strategic management seeks to provide an understanding of, and the bridge between what people actually do in organizations and organizational strategies. In this regard, it defines strategy 'as a situated, socially accomplished activity, while strategizing comprises those actions, interactions and negotiations of multiple actors and situated practices that they draw upon in accomplishing that activity' (Jarzabkowski et al., 2007: 7-8). Similar to the learning school, the s-a-p field of research arose in part from an increasing dissatisfaction with conventional, prescriptive strategy approaches where strategy theory is based on a variant analysis of firm or industry-level effects upon firm performance. Johnson et al (2003; 2007) state that even though people do strategy in organizations, conventional strategy theory seems to be devoid of human actors and their actions, even those that claim to examine the internal dynamics of a firm such as the resource-based view. However, a more critical appraisal of scholarship would recognise that the learning school when exploring what actually happens in organisations, does recognise the role of individuals as central to strategy formation and implementation in organisations e.g. in individual learning. In fact, Mintzberg et al (1998: 208) stated that 'strategic initiatives are taken by whoever has the capacity and the resources to be able to learn… successful initiatives create streams of experiences that can converge into patterns that become emergent strategies.' In a related example, Burgelman (1986) concluded that strategic initiatives often emerge deep in organisation's hierarchy and are then championed by middle-level managers who seek authorization of top management. What these examples show is that individuals and their actions have not been entirely absent in strategic thought, not least within the learning school scholarship.

Nonetheless, s-a-p research has sought to break from the traditional economics-based dominance of strategy research and introduce a broader social constructivist shift in strategic management. It

seeks to achieve this by introducing wider aspects of organizational theory and bringing human actors and interactions, which shape strategy, into the centre stage of strategy research through a practice perspective. Arguably, it is in this adoption of a strong practice lens that it diverges significantly from the learning school and offers the potential to make its own most unique contributions. Although the learning school explores what actually happens in organisation, its approach is based largely on descriptive research (Mintzberg et al., 1998) while a practice perspective provides a much deeper and richer insights into human actors, including their intentions and their interactions. It proposes that such an approach can contribute to the study of social complexity and causal ambiguity in the resource-based view, unpacking the dynamism in dynamic capabilities theory (Ambrosini et al., 2007; Jarzabkowski, 2005; Johnson et al., 2003; Regner, 2008) and explaining the practice that constitutes strategy process (Johnson et al., 2003).

Specifically, the primary contributions of the s-a-p approach in strategic management is in advancing scholarly understanding of strategy in terms of how practitioners (the people who do the work of strategy); practices (the social, symbolic and material tools through which strategy work is done); and praxis (the flow of activity in which strategy is accomplished) shape an organization's strategy (Jarzabkowski, 2005; et al., 2007; Johnson et al., 2007; Whittington 2006a). In addition, what sets it apart from traditional process research is its view of agency, its focus on the production and reproduction of strategic action, rather than seeking to explain strategic change and firm performance, and its perspective on strategy at multiple levels of action and interaction, rather than at the level of the firm (Jarzabkowski, 2005; 2008; Johnson et al., 2003; et al., 2007; Whittington, 2007). It is interesting to note that this appreciation of the multiple levels of action and interaction at which strategy takes places in organizations is also a core tenet of the microfoundations approach in strategic management. Broadly speaking, s-a-p provides valuable insights beyond studying organizational practices and embeds strategizing activities in the wider practices of societies (Whittington 2006b; 2007).

The microfoundations approach in strategic management has strong similarities with the s-a-p approach, notably the same interest in the role of actors, human interactions, social practices, and the multi-level orientation in which strategy work occurs in organizations. Significantly, the microfoundations approach not only strongly features within the dynamic capabilities research domain which is the core focus of this thesis, it continues to be an emerging theme in dynamic capabilities research. The next section will build on these discussions and discuss microfoundational thinking in strategic management.

2.7 WHAT ARE MICROFOUNDATIONS? WHAT ARE THE BENEFITS OF MICROFOUNDATION RESEARCH IN STRATEGIC MANAGEMENT

2.7.1 MICROFOUNDATIONS IN STRATEGY RESEARCH

In the extant organizational, management and strategy literature there are now frequent calls for microfoundations but there is little consensus on what microfoundations are and what they are not. The notion of "microfoundations" was arguably first applied in the context of strategy by Lippman and Rumelt (2003a) and it has grown ever since with more scholars echoing the calls for a microfoundational approach (Felin and Foss, 2005; Gavetti, 2005; Teece, 2007). According to Felin, Foss & Ployhart, (2015) the main motivation for the microfoundation research agenda in strategy is to unpack macro-level constructs such as capabilities in terms of the actions and interactions of lower level organizational members, understand how firm-level performance emerge from the interaction of these members, and how relations between macro entities such as firm's strategy and performance are shaped by micro actions and interactions. Microfoundation research seeks to connect higher-level concepts such as routines and capabilities to lower levels entities, for example to understand how individuals and their interactions in organizations produce the capabilities that lead to performance or how routines are created from such individual action and interaction.

2.7.2 THE EMERGENCE OF MICROFOUNDATIONS IN STRATEGY

The logics supporting a microfoundational approach are many. The notion of microfoundations is traditionally linked to notions of 'reduction' and 'decomposition' in science and 'methodological individualism' in the philosophy of social science. Although the concept dates back more than a century, it gained prominence in the 1960s, when economists sought a way to link micro-and macro-economics (noted in Janssen, 1993). The origins of microfoundations in strategy research can be traced to works by Lippman and Rumelt (2003a), Foss (2003), Felin and Foss (2005) and Teece (2007) even though shortcomings in arguments of some key macro constructs in strategic management had previously appeared in the literature. This is can be seen in the heavily cited paper, Grant (1996: 112) who provocatively argued for "dispensing with the concept of *organizational knowledge* in favour of emphasizing the role of the individual in creating and storing knowledge". Similarly, Coff (1997, 1999) took issue with the notion of firm-level competitive advantage, arguing that ultimately all value creation resides in individual actions. Such views are reminiscent for the emergence of the early calls for microfoundational thinking which argued that strategy and organization theory was replete with firm-level explanations of outcomes such as competitive advantage, performance and innovation with very little attention to entities at lower levels of analysis, notably, individuals and their interactions, and how these

accounted for firm-level outcomes. If strategic management is fundamentally concerned with understanding why some firms outperform rivals, why some firms grow and thrive whilst others falter and ultimately, the sources of firm heterogeneity, then these differences in firms would lie within firms and in the individuals and their interactions that drive firm-level outcomes. It is also difficult to make prescriptions for managers on how to develop and improve firm level factors like dynamic capabilities and routines if their underlying constituents are more or less black-boxed and not well understood. Microfoundations scholars stress that the thinking is not a philosophical one, rather that extant macro constructs and causal links were not well grounded and that a microfoundations approach bridges the divide between the micro-macro divide in management research.

Reduction

Reduction is often seen as a hallmark of scientific inquiry and scholars engage in reduction when they seek to explain a particular phenomenon in terms of more fundamental phenomena. Microfoundations, as a form of 'reduction', is a mechanism-based approach to explanation which finds roots in the long debate in philosophy and sociology regarding whether individuals or collectives should have explanatory primacy in social theory (e.g. Coleman, 1964; Lazarsfield and Menzel, 1970; Popper, 1957). Proponents of microfoundations argue that the approach demonstrates causality by accounting for how interacting entities that carry out interrelated activities (e.g. routines) produce the phenomenon of interest (Craver, 2007: 5). Uncovering causality through 'reduced form' explanation e.g. on the basis of observational data, though challenging, can provide valuable insights so long as the social scientist recognises its inherent limitations. In fact, several works on micro-level entities such as individuals, processes, and structures, have played a central role in management theory and work on the behavioural theory of the firm, and these have contributed to our macro-level understanding of explanations of organizational heterogeneity (Cyert and March, 1963; March and Simon, 1958; Felin and Foss, 2009).

Macro-Micro Link

More specifically, Coleman (1990: 3-4) suggest that that macro-level explanation, that is, an explanation of macro phenomena in terms of other macro phenomena, cannot discriminate between the many potential alternative lower-level explanations of macro-level behaviour because of the fundamental problem of unobserved mechanisms. If much of strategy thinking seeks to explain differential firm performance in firm-level heterogeneity (i.e. differences in routines and capabilities), then heterogeneity may really be located at the individual level, and firm-level heterogeneity can thus be an epiphenomenon. This is evident in why firms attempt to

select and recruit *specific individuals with specific skills* into particular firms (Schneider, 1987; Felin and Hesterly, 2007). Advocates for a microfoundations approach support the argument that 'organizations are made up of individuals, and there is no organization without individuals' (Felin and Foss, 2005: 441) so the individual-level analysis might be the most appropriate level for any firm analysis.

Coleman further suggests that since micro-level mechanisms are the proximate causes of macro phenomena, it would appear logical to *intervene* at the micro level, which is another reason to properly identify microfoundations. For example, managers cannot directly intervene on the level of, for example, capabilities. However, managers can *influence* capabilities, for example, by hiring key individuals who possess the required skills and knowledge (here the micro-level is directly involved) or by altering overall recruitment policies, reward systems, etc – that is, firm processes and systems. Individuals, processes and systems, and their interactions are core components of the microfoundational approach which need to be unpacked as 'specifically, there are no conceivable causal mechanisms in the social world that operate *sorely* on the macro-level' (Abell et al., 2008: 491).

Another more controversial reason for adopting a microfoundational approach is the argument by Coleman that explanations that involve the micro level are more stable, fundamental, and general than macro level explanations. This view is however supported by the 'methodological individualism' argument that explanation of firm level macro phenomena might ultimately find source in explanatory mechanisms that involve individual action and interaction i.e. micro entities, and thus with casual mechanism, strategic management should fundamentally be concerned with how intentional human actions and interactions produce strategic phenomena (Abell et al., 2008). Ultimately, microfoundations have been credited with yielding fundamental new insights to strategy research.

2.7.3   DEFINITION OF MICROFOUNDATIONS AND WHAT CONSTITUTES MICROFOUNDATIONS

In recent years, numerous strategy literatures have claimed to be microfoundational in nature as seen in topics on routines (Cohen, 2012; Winter, 2013), performance (Eisenhardt et al., 2010), knowledge processes (Reinholt, Pedersen & Foss, 2011), absorptive capacity (Lewin et al., 2011) ambidexterity (Rogan & Mors, 2014), innovation (Grigoriou & Rothaermel, 2014), dynamic capabilities (Argote & Ren, 2012; Helfat & Peteraf, 2015; Teece, 2007), social capital (Gooderham, Minbaeva & Pedersen, 2011), RBV (Foss, 2011), and organizational capabilities (Kemper, Schilke, & Brettel, 2013). There has also been complementary works in such research streams as behavioural strategy (Powell et al., 2011) and the human capital and strategy literature (e.g.

Ployhart & Moliterno, 2011). These share a similar increased emphasis on theoretically accounting for explanatory mechanisms and causal articulations of empirical as well as theoretical work, where such articulation often involves causal relations at levels lower than those of the focal phenomenon that required explanation. So, what exactly are microfoundations and what constitutes microfoundations research?

Many microfoundations articles do not define the term and microfoundations appear to mean different things to different people. According to Felin, Foss and Ployhart (2015), microfoundations is fundamentally an analytical levels argument, and not necessarily an argument about individuals. Some scholars e.g. Teece (2007) side with the analytical level description while others e.g. Felin and Hesterley (2007) very strongly make individuals the primacy explanatory focus in management research. Similarly, Argote and Ingram note that there has been progress in studying knowledge as the basis of competitive advantage, '…it has been at the level of identifying consistencies in organization's knowledge development path and *almost never at the level of human interactions that are the primary sources of knowledge and knowledge transfer*' (2000: 156; emphasis added). This focus on the role of the individual is a central theme in many microfoundational work.

Fundamentally though, microfoundations are generally about locating (theoretically and empirically) the proximate causes of a phenomenon (that is, the explanation of an outcome) at levels of analysis lower than the phenomenon itself. In this light, Felin, Foss, Heimeriks and Madsen (2012: 9) define microfoundations as;

'a theoretical explanation, supported by empirical examination, of a phenomenon located at analytical level N at time *t* (Nt). In the simplest sense, a baseline microfoundation for level Nt lies at level N-1 at time t-1, where the time dimension reflects a temporal ordering of relationships with phenomena at level N-1 predating phenomena at level N. Constituent actors, processes, and/or structures, at level N-1t-1 may interact, or operate alone, to influence phenomena at level Nt. Moreover, actors, processes, and/or structures at level N-1t-1 also may *moderate* or *mediate* influences of phenomena located at level Nt or at higher levels (e.g., N+1t+1 to N+nt+n).

Significantly, this definition discusses levels and does not correlate microfoundations to a reduction to individuals as associated with 'methodological individualism' (Agassi, 1960). However, as previously noted many microfoundational works have focused on individuals and have tried to measure at this level, in addition to the firm level.

Multilevel theory does not give privileged attention to any particular level. Microfoundations on the other hand, argues that one level, that is the micro-level holds explanatory primacy and that higher-level phenomena e.g. at firm level are derived ones. This does not go on to imply that

higher level phenomena may not exert a causal influence on lower level phenomena or that macro constructs are not significant to strategy research. For example, constructs such as value creation and performance which are firm level constructs more or less define the strategy field and that level is an appropriate level of focus on analysis in itself. Where microfoundations thinking takes issue with macro-management theory is that macro scholars usually develop firm-level constructs with often unclear or weak underlying foundations and then attempt to make direct causal relations between macro variables (for example, arguments that capabilities automatically lead to performance), where, in fact, the real causal relations reside in lower level entities and interactions. Most firm-level constructs e.g. routines and capabilities are embedded and developed by individuals and their interactions, therefore their impact on firm-level outcomes most involve actions and interactions that involve individuals.

2.7.4   CRITICISM OF MICROFOUNDATIONS APPROACH

Despite the large acceptance of the microfoundations approach in strategy and the successful application of the thinking to research evident by several ongoing published articles, the approach has not escaped criticism in some quarters (e.g. Vromen, 2010; Winter, 2012; Barney and Felin, 2013; Felin, Foss and Ployhart, 2015). A major skeptic is renowned strategy scholar, Sidney Winter and in his work, Winter (2013) argues that he sees similarities between microfoundational thinking and work in economics which has unsuccessfully sought to link microeconomic foundations to macroeconomic theory. Also, on the issue of 'reductionism' within microfoundations and the debate of individualism versus holism in social sciences, Winter sees value in grounding macro concepts such as routines and capabilities on more fundamental foundations, however it is the irreducibility argument and the role of individualist theories versus holistic theories in microfoundational thinking that creates very strong concerns in scholarship. Similarly, Kincaid (1996: 142) makes an argument about irreducibility: ' [W]holes are, of course, composed of or exhausted by their parts and do not act independently of them; … nonetheless, theories at the level of the whole can be confirmed and can explain at that level, without a full accounting of the underlying details; … theories at the level of the whole may have only a messy relationship to how micro-level theories divide up the world, thus making macro-level theories irreducible.' Anchoring Winter's view, Kincaid adds that "searching for lower-level accounts can be informative as a complement to, but not as a substitute for, more macro investigations and that reduction is not the only route to the ideal of a unified science" (1996: 142). This view contrasts sharply with the earlier discussed arguments by microfoundations proponents who indeed criticise sorely macro level investigations and rather, call for deeper analysis into lower-levels. Barney and Felin (2013) provide a middle ground for these opposing views by stating that "analysis should be fundamentally concerned with how individual-level factors aggregate to the

collective level" and such analysis could produce insightful theories of the collective or the organization (theories of group interaction that relate to collective actions, routines etc) that appropriately connect individual actions and micro-levels (theories of the individual) to macro, firm-level constructs (theories at the strategic firm level) such as competitive advantage and performance.

Some of the main criticisms of the microfoundations approach can be summarised in these counter arguments to the approach; First, that there is no organization without social relations therefore, no conceivable causal mechanisms in the social world operate sorely on the micro-level of the individual alone. Second, and related to the first, explanations of firm-level phenomena such as routines and capabilities must be grounded in explanatory mechanisms that involve social relations as well as individuals. Third, if an emphasis on causal mechanism is to hold this implies that we should also be concerned with how intentional human action and interaction are themselves caused, that is, the role of agency (Hodgson, 2012). Fourth, that individuals in organizations are situated in a reality that involves individuals, processes, structures and an interaction with the external environment in the entire business ecosystem. In other words, individuals and organisational factors shape the business ecosystem in as much as they are influenced by it, therefore it is implausible to cleanly separate each component as one does not exist without the other. In supporting this argument, Hodgson (2012) quoting Friedrich Hayek (1967: 70-71), states 'The overall order of actions in a group is… more than the totality of regularities observable in the actions of individuals and cannot be wholly reduced to them… each other in a particular manner… [and] the existence of those relations which are essential for the existence of the whole cannot be accounted for wholly by the interactions of the parts but only by their interaction with an outside world…' This calls for a more collective, social science approach that involves a multiple-layered ontology which also takes into considerations processes that emerge through time (Winter, 2012). If microfoundational thinking is to receive even greater acceptance in strategy research and make further impactful contributions it must address these concerns about multi-level connections within both analysis and theory development, and also include a social collective perspective in its analysis of individuals and organizations. This multi-level approach is one of the main challenges this PhD research seeks to address.

2.7.5   MICROFOUNDATIONS RESEARCH: A CONCISE REVIEW OF PRESENT AND FUTURE

Microfoundations is not a distinct theoretical or empirical approach. In fact, in the words of Foss and Pedersen (2013: 7) 'Microfoundations are not a theory or a church, but a huge tent'. It covers a wide array of research heuristics that call attention to inter-firm mechanisms and emphasizes the explanatory primacy of the micro-level, especially in its relation to macro-level entities. In doing so it can help overcome the persistent micro-macro divide in management research (Buckley, Hamdani, Klotz and Valcea, 2011). Also, since the microfoundations perspective largely seeks to open up macro-level constructs located in diverse forms, this opens up the perspective to varied disciplinary underpinnings as well as interdisciplinary contributions, and as such imposes almost no restrictions on theorizing. Papers on microfoundations are as numerous as they are diverse in subject and approach, with some papers generally seen as classics. For example, Grant (1996) broke with conventional wisdom by *not* starting analysis from macro concepts of organizational knowledge and capabilities, rather the work sought to open up those constructs by their makeup and parts. Lippman and Rumelt (2003a,b) quite strongly demonstrated flaws in the traditional thinking concerning macro concepts such as firm-level profits and proffered a way to understand value creation at the resource level. Teece (2007) in a highly cited paper which argues that microfoundations of dynamic capabilities are located in organizational processes that allows the firm to sense and seize opportunities and maintain competitiveness by enhancing, combining and reconfiguring the firm's resource base. Foss and Foss (2005) discussed individual property right in organizations as a fundamental unit of analysis as it is individuals that possess property rights and seek to maximise the value of the rights they hold. By this basic conceptualization, the paper provides new insights in value creation. Employee mobility is a significant microfoundational issue because it shines a light on the central question of whether competitive heterogeneity is primarily located at the firm-level or at the level of the individual. In this regard, Aime, Johnson, Ridge, and Hill (2010) find that key employees are strongly linked to a firm's competitive advantage and they "challenge the traditional argument that socially complex routines create sustainable competitive advantages because they are not easily imitated and do not rely on any single individual. Instead, we show that routines are stable to the loss of key employees but the advantages derived from them are not" (Aime, Johnson, Ridge, and Hill, 2010: 75). Other similar literature on the role of key employees have focused on upper echelons and top management teams in aspects of top management team characteristics, roles, decision making, managerial cognition (Helfat and Peteraf, 2015), diversity (Nielsen, 2010) and social-psychological dynamics (Finkelstein & Hambrick, 1996). For example, Bouquet and Birkinshaw apply bounded rationality tradition in their study of formation of global strategies, use the attention-based theory of the firm to argue that the "international attention" of the firm's upper echelons link the firm's (international) operating environment and its internal organization. On the link between individuals and competitive advantage, Lippman and Rumelt (2003b) questions how human

capital gets deployed to superior uses. The papers aforementioned are a snippet of microfoundations research articles in an attempt to demonstrate the wide range of approaches and subjects that can be regarded as microfoundational.

2.7.6 CHALLENGES AND OPPORTUNITIES IN MICROFOUNDATIONS APROACH TO RESEARCH

Despite these successes in microfoundational work, the major challenge to the microfoundations research agenda is probably empirical. As noted by Floyd and Sputtek (2011:15), "empirical work in the microfoundations area is still relatively scarce". This could be explained by the fact that empirical microfoundational work requires data gathering on at least two levels, which is often difficult (time-consuming and costly), and, perhaps, that knowledge of relevant empirical methodology (i.e. multi-level analysis) is not adequately ingrained within the research community (Foss and Pedersen, 2013). Strategic management is very much concerned with providing practical advice to managers on strategy issues and if research in microfoundations is to contribute in this aspect, it is vital that such research is productive of new empirically corroborated insights.

The empirical challenges to microfoundations research have provided interesting research opportunities. It is argued that key aspects of microfoundations are not best researched using traditional regression-based methodologies and cross-sectional datasets and even hierarchical linear models (HLM) do not adequately model complex interactions between firm levels which result in higher-level performance outcomes. Microfoundations is primarily about understanding behaviours and their interactions which give rise to higher-level outcomes, and the traditionally favoured methodologies in the strategy field are not well suited for capturing behaviours, interactions and how these give rise to inter and intra-level outcomes. Simulation approaches are useful for understanding bottom-up emergent processes while experimental approaches are suited for understanding top-down effects, (Turner and Makhija, 2012). Small N approaches on the other hand may not lend themselves to immediate generalization, although researchers are in any case open to question how generalizable a given causation, emerging from case-study research is. The benefit of small N research is that they powerfully enable the study of peculiar contexts or 'outliners' and 'extremes' such as exceptional performance or valuable key employees i.e. star talent. In any case, strategy research is very much interested in the subject of outliners – successful firms are outliners, and small N case studies can help us better understand such outliners. We can thus, conclude that the microfoundations thinking does not just provide a new, albeit broad set of heuristics for theory development, but it also has the potential to shape the methods we adopt in strategy research which can in turn lead to novel insights.

A review of the plethora of microfoundations articles will go way beyond the scope of the work of this thesis and will not provide any meaningful contribution towards the empirical work to be covered. Rather, having provided a summary of what microfoundations are all about, its contributions and challenges, the thesis will go on to discuss some key microfoundations work in the area of dynamic capabilities and routines which are the empirical focus of this thesis. The discussions will demonstrate the rationale behind the identified research gap addressed in the PhD study.

2.8 CONCLUSION

This chapter has discussed legacy contributions as well as the content and process approaches to strategic management. It has demonstrated that the various streams of strategy have drawn on the theoretical works in the legacy literature. The chapter also articulated the central arguments of the various approaches, their contributions to strategic management scholarship and their limitations. In this regard, the chapter made the case for the emergence of the dynamic capabilities view to address these shortcomings and its potential to make unique contributions to strategic management. It proceeded to focus in detail on the more recent and growing microfoundational approach in strategic management as this represents the research approach adopted in this thesis. There has been increasing calls for a microfoundational approach in management research and several arguments made to support a microfoundational thinking. One of the main arguments being that macro concepts in strategy such as competitive advantage and performance which exist in organizations are rooted in lower-level entities. Therefore, the best way to understand these macro phenomena is to unpack their micro-level constituents. This allows the potential to elucidate the sources of firm heterogeneity and also provide context-specific advice to practitioners on how to build and improve these firm level outcomes. In this regard, microfoundations scholars have called for more empirical, qualitative case study research in order to overcome some of the challenges of the approach. The next chapter will build on the theoretical work presented in this chapter to discuss the dynamic capabilities view (DCV) in strategic management in detail. The chapter will cover the origins and historical antecedents of dynamic capabilities and present a review of the literature in dynamic capabilities field. The purpose towards the thesis to identify future directions in the field and research gaps which inform the research questions and objectives.

CHAPTER 3: DYNAMIC CAPABILITIES AND STRATEGIC MANAGEMENT

3.1   INTRODUCTION

The precious chapter on Paradigms of Strategic Management discussed the approaches to strategy and the emergence of the dynamic capabilities view as a complement of the resource-based view in strategic management. It also highlighted the growing microfoundational thinking in strategy research. This chapter on Dynamic Capabilities and Strategic Management is focused on delving deeper into the dynamic capabilities view (DCV) from its origins to present scholarship. The goal of this chapter towards the thesis is to critique the literature on dynamic capabilities to identify future directions for the field and highlight current research gaps. This is necessary in order to develop the research questions and objectives of this work that are grounded in extant dynamic capabilities literature and with the potential to make novel contributions to scholarship. The chapter begins on historical antecedents of DCV, progresses to theories and concepts in DCV, and critique of literature on dynamic capabilities. It concludes by summarise key insights from the chapter and positioning the contributions of the chapter towards the next chapter on The Microfoundations of Dynamic Capabilities and Routines.

3.1.2   ORIGINS AND HISTORICAL ANTECEDENTS OF DYNAMIC CAPABILITIES VIEW

Strategic management is fundamentally about how firms achieve and sustain competitive advantage – ultimately about achieving firm survival and growth (Wilden et al., 2016). This is even more pertinent in rapidly changing environments where once valuable wealth-creating VRIN resources which are a source of competitive advantage, could become obsolete (Teece et al., 1997). Since the 1990s, relentless competition aided by increased globalization has driven firms constantly to adapt, renew, re-configure and re-create their resources and capabilities in line with the competitive environment. For instance, global competition in high-technology industries such as semiconductors and software has necessitated the need for a more appropriate paradigm to better understand how competitive advantage is achieved and maintained. Some companies in those industries such as IBM and Philips appear to have adopted a 'resource-based strategy' of accumulating valuable technology assets. However, this strategy has proved not to be sufficient to support sustainable competitive advantage (Teece et al., 1997). Winners in the global marketplace have been firms that can demonstrate timely responsiveness and rapid and flexible product innovation, coupled with the management capability to effectively coordinate and redeploy internal and external competences. Not surprisingly, industry observers have remarked that companies can accumulate a large stock of valuable technology assets and still not have useful capabilities.

In Schumpeterian innovation-based competition, performance rivalry, increasing returns, and the 'creative destruction' of existing competences, the strategic challenge facing innovative firms is to identify and develop difficult-to-imitate internal and external competences required to produce valuable products and services. This supports the notion that competitive advantage requires both the exploitation of internal and external firm-specific capabilities while developing new ones (Penrose, 1959). Strategic theory is replete with analyses of firm-level strategies for sustaining and safeguarding extant competitive advantage but has performed less well with respect to explaining how firms develop new capabilities to build competitive advantage in regimes of rapid change. This challenge in strategic management captures the notion of dynamic capabilities.

The concept of dynamic capabilities draws from a wide range of theoretical perspectives including, but not limited to evolutionary economics. The approach builds on the work of Schumpeter (1934) on processes of creative destruction and innovation-based competition, Penrose's (1959) insights on organizational resources, Cyert and March's (1963) work on the behavioural aspects of firms, Williamson (1975, 1985) on markets and hierarchies and assets specificity, and Teece (1982) and Rumelt (1984) on the role of firm-specific assets and isolating mechanisms. Other theoretical underpinnings to the approach are earlier work on distinctive competence (Learned et al., 1969; Selznick, 1957), organizational routines (Nelson and Winter, 1982), architectural knowledge (Henderson and Clark, 1990), core competence (Prahalad and Hamel, 1990), core capability and rigidity (Leonard-Barton 1992), combinative capability (Kogut and Zander, 1992) and architectural competence (Henderson and Cockburn, 1994). The concept has inarguably drawn wisdom from a long history of a wide range of work into firms and strategy theory.

Teece et al.'s (1990) working paper is generally regarded as the first contribution developing explicitly the notion of dynamic capabilities. The authors work in this paper was precipitated by their realization that once successful firms were struggling or failing as their environments changed; they were unable to adapt successfully (Harreld et al., 2007). The authors stated, 'our view of the firm is something richer than the standard resource-based view … it is not only the bundle of resources that matter, but the mechanisms by which firms learn and accumulate new skills and capabilities, and the forces that limit the rate and direction of this process' (Teece et al., 1990: 11). In the subsequent publication in 1994, Teece and Pisano argued that the RBV was limited in providing explanations as to how successful firms demonstrated 'timely responsiveness and rapid and flexible product innovation, along with the management capacity to effectively coordinate and redeploy internal and external competences' (Teece and Pisano, 1994: 537). Also, it was argued that as the external environment changes, strategic management plays a vital role in 'adapting, integrating and reconfiguring internal and external organisational skills, resources

and functional competences towards the changing environment' (1994: 537). In their subsequent work, Teece et al., (1997) argued how dynamic capabilities could specifically overcome the limitations of RBV and dynamic capabilities was defined as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (1997: 516). This is widely recognised as the first definition of the concept in literature.

Although Teece and Pisano are generally regarded as the founding authors of the dynamic capabilities perspective, their work builds most specifically on Nelson and Winter's (1982) *An Evolutionary Theory of Economic Change*, which elaborates on the role of routines and how they shape and constrain the ways in which firms grow and cope with changing environments. Significantly, in their exploration of the sources of firm competitive advantage, both Teece et al. (1997) and Nelson and Winter (1982) emphasis an efficiency approach to firm performance rather a privileged market position approach which is the cornerstone of Porter's (1980) theory of competitive advantage. Competitive advantage, they argue, stems from internal factors of a firm and their alignment to the external environment rather than external or industry factors. This brings to the fore the importance of path dependency effects on internal factors, and the need to adapt a firm's resources to enable the firm to change and evolve. Nascent work on dynamic capabilities seeks to build a better theory of firm performance as well as inform managerial practice.

3.2   EMPIRICAL STUDIES INTO DYNAMIC CAPABILITIES AND RESULTING DEFINITIONS

The dynamic capability view (DCV) has become one of the most vibrant topics in the field of strategic management and has even been referred to as 'the new touchstone firm-based performance-focused theory' (Arend and Bromiley, 2009: 75). Since the concept first appeared in literature (Teece et al., 1990), several hundred research publications have expanded on the approach with considerable theoretical and methodological variety. The seminar papers on dynamic capabilities (Eisenhardt and Martin, 2000; Helfat, 1997; Teece et al., 1997; Zollo and Winter, 2002) are among the highest cited in the broader domain of strategic management publications (Furrer et al., 2008). These studies and other research publications have advanced our understanding of DCV, providing definitions about the concept and some consensus about what the theory entails but this has not been without some contradictions. Example of some empirical studies pertinent to dynamic capabilities have focused on aspects such as the internal and external integration of knowledge in a healthcare firm (Petroni, 1998), dynamic learning in telecommunications firm (Majumdar, 1999), capability possession, development and upgrading in international expansion (Luo, 2000), continuous transformation of organizational forms in Yahoo!

And Excite (Rindova and Kotha, 2001), strategic evolution (Salvato, 2003) and knowledge creation, absorption, integration and reconfiguration in a Danish hearing-aid manufacturing firm (Verona and Ravasi, 2003). These studies have offered their own definitions of dynamic capabilities which often are adaptations of Teece et al's (1997) original definition. A few notably examples of the definitions of Dynamic Capabilities are as follows;

Dynamic capabilities are 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments' (Teece et al., 1997: 516).

'A dynamic capability is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness' (Zollo and Winter, 2002: 340). Zollo and Winter (2002) also argue that dynamic capabilities emerge from the co-evolution of tacit experience accumulation processes with explicit knowledge articulation and codification activities at organizations.

Dynamic capabilities 'are those that operate to extend, modify or create ordinary capabilities' (Winter, 2003: 991).

They are 'the abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by its principal decision-maker' (Zahra et al., 2006: 918).

Dynamic capabilities are 'a firm's behavioural orientation constantly to integrate, renew and recreate its resources and capabilities and, most importantly, upgrade and reconstruct its core capabilities in response to the changing environment to attain and sustain competitive advantage' (Wang and Ahmed, 2007: 35).

They are 'the capacity of an organization to purposefully create, extend or modify its resource base' (Helfat et al., 2007: 1).

By listing and taking a critical view of these definitions, we can identify that there is a general consensus about what constitutes the dynamic capabilities construct and what does not. There appears to be agreement amongst scholars that dynamic capabilities are organisational processes in the most general sense and that their role is to alter the firm's resource portfolio. Also, that dynamic capabilities are built rather than bought in the market (Makadok, 2001), are path dependent (Zollo and Winter, 2002) and are embedded within a firm's structure and systems (Eisenhardt and Martin, 2000).

Similarly, these definitions tell us what dynamic capabilities are *not*. Winter (2003), Helfat et al., (2007) and Schreyogg and Kliesch-Eber (2007) stress that a dynamic capability is not an ad hoc problem-solving event or a spontaneous reaction. That is to say that it must be a patterned and repeatable endeavour. Likewise, Zollo and Winter (2002: 340) argue that dynamic capabilities are

persistent and that 'an organization that adapts in a creative but disjointed way to a succession of crisis is not exercising a dynamic capability'. Secondly, Zahra et al's (2006) and Helfat et al's (2007) definitions also clearly point out that luck does not constitute a dynamic capability and the use of dynamic capabilities is intentional and deliberate. Thirdly, while dynamic capabilities are associated with strategic change, they are not a synonym for it – dynamic capabilities are about one type of change which is the intentional change of the resource base. Strategic change or resource creation or renewal are not necessarily dynamic capabilities. These changes in organisations may occur through emergent processes that have not been intentionally deployed by managers (Mintzberg and McHugh 1985), or they could result from ad hoc interventions (Winter, 2003) or as a result of luck (Barney, 1991).

Despite these coherences on aspects of dynamic capabilities, there exist several inconsistences and contradictions about the construct and its usefulness in strategic management by strategy scholars.

3.3   THEORY AND CONCEPTS OF THE DYNAMIC CAPABILITIES PERSPECTIVE

3.3.1   THE IMPORTANCE OF PATHS AND DEPENDENCIES

A major limitation of microeconomic theory is a failure to recognise the role of path dependencies in organisations. In rational actor theory, firms have an infinite number of technology choices and markets they can enter and decisions are simply made on the basis of value maximisation criteria. As such, firms can respond to market or external factor changes by moving technologies or input in and out of markets; only in the short run are movements irreversible and movement decisions do not constrain future choices i.e. 'bygones are bygones'. Organisational theory is at odds with that logic because the evidence proffered by organisational reality is not consistent with this view (Zollo and Winter, 2002). The future possibilities available to a firm are dependent on its current position and the paths travelled and crucially, the current position is often shaped by the path travelled. That is, 'bygones are rarely bygones' and that 'history matters' (Teece, 1997). Thus, a firm's past investments and its history of embedded routines constrains its future behaviour. This is because the future know-how or 'intellect' of a firm is based on and built from its past learning and such learning tends to be local (Winter, 2012). In other words, a firm learns from its previous activities which are often a process of trial, feedback and evaluation. The future paths and opportunities open to a firm are based on its past and current local learning environment (Winter, 2013). Another relevance of path dependencies can be noticed in the concept of first mover advantages i.e. when firm have taken a first mover path in a market. Firms can exploit their prior positioning in markets through scale economies and learning (Rosenburg, 1982) and also take

advantage of their increasing returns to compete passively because switching costs for customers may favour the incumbent firm. It is noted however, that in certain conditions, for example in regimes for rapid technology change, new and superior products can yield switching benefits and challenge incumbents such that first move advantage disappears. This could be a relevant and interesting area for exploration within the arena of dynamic capabilities.

3.3.2 HIERARCHY OF CAPABILITIES AND COMPONENT FACTORS OF DYNAMIC CAPABILITIES

Dynamic capabilities are considered to be different from firm capabilities and a number of authors have sought to conceptualise the relationship between the two constructs and develop a topology or component factors of capabilities.

Collis (1994) states that there are four categories of capabilities. The first 'are those that reflect an ability to perform the basic functional activities of the firm' (1994: 145). These are generally the firm's resources. The second category are responsible for dynamic improvements to the activities of the firm. The third is difficult to differentiate from the second category as it is also related to dynamic improvements, it is mainly about the ability 'to recognise the intrinsic value of other resources or to develop novel strategies before competitors' (Collis 1994: 145). Both Collis's second and third categories of capabilities are dynamic capabilities based on Teece et al., (1997) definitions as they deal with the acquisition, renewal and modification of a firm's resource bundles. The fourth category is the 'higher order' or 'meta-capabilities' and it relates to learning-to-learn capabilities. This is an on-going capability to renew the capability that renews the capability, and the deployment of these meta-capabilities is what ensures that firms outperform their rivals.

According to Winter (2003) zero-level capabilities, referred to as ordinary or operational capabilities are those which firms deploy to earn a living in the present. In comparison to Collis (1994), these are first level categories which are the extant resource base of a firm. In Winter (2003) categorisation, the next level are the first-level capabilities which modify and change zero-level capabilities; these are dynamic capabilities. Like Collis (1994) he also argues that there are higher capabilities which operate on first-level capabilities. In doing so, both Collis (1994) and Winter (2003) builds on Teece et al. (1997) conceptualisation to discern three main levels of capability.

Wang and Ahmed (2007) define dynamic capabilities as 'a firm's behavioural orientation constantly to integrate, reconfigure, renew and recreate its resources and capabilities and, most importantly, upgrade and reconstruct its core competences in response to the changing environment to attain and sustain competitive advantage' (2007: 35). For them, dynamic

capabilities are not simply processes but are embedded in processes and they conceptualise a hierarchical order of firm resources and capabilities. Capabilities are a firm's capacity to deploy resource configurations and these includes both explicit processes and tacit elements (e.g. know-how) embedded in the processes – they are often firm-specific and are developed over time through complex combinations of firm's resources (Amit and Schoemaker, 1993). Resources form the elementary building blocks of a firm and the basis for firm capabilities. They are the 'zero-order' element of the hierarchy. Capabilities are 'first-order' and they often lead to improved performance when firms successfully deploy resources in pursuit of a specific goal. Core capabilities are 'second order' and represent a group of firm's resources and capabilities that are strategically important to its competitive advantage at a certain point in line with a firm's strategic direction. However, core capabilities can become 'core rigidities' if and when the environment changes (Leonard-Barton, 1992), resulting in a condition where firms become ever better at an ever less relevant set of processes (Tallman, 2003; Teece et al., 1997). Dynamic capabilities represent the 'third order' hierarchy and they emphasize a firm's constant strive for renewal, reconfiguration and re-creation of resources, capabilities and core capabilities to suit environment change. Wang and Ahmed (2007) assert similar to Collis (1994), that dynamic capabilities govern the rate of change of capabilities. Hence, they argue that dynamic capabilities are the 'supreme' organizational capabilities that are determinants of long-term firm performance, rather than simply a 'subset' of the capabilities. Building from extant literature, the authors identify three component factors of dynamic capabilities that are linked together, namely adaptive capacity, absorptive capacity and innovative capacity.

Adaptive capacity, defined as a firm's ability to identify and capitalise on emerging market opportunities (Chakravarthy, 1982; Hooley et al., 1992; Miles and Snow, 1978).

Absorptive capability which Cohen and Levinthal (1990: 128) refer to as 'the ability of a firm to recognise the value of new, external information, assimilate it, and apply it to commercial ends… the ability to evaluate and utilise outside knowledge is largely a function of the level of prior knowledge'.

Innovative capacity refers to a firm's ability to develop new products and/or markets, through aligning strategic innovation orientation with innovative behaviours and processes (Wang and Ahmed, 2004).

3.3.3 EXAMPLES OF DYNAMIC CAPABILITIES

Based on definitions and categorization of dynamic capabilities by different scholars, there is a general consensus that dynamic capabilities largely involve firm processes and activities. There are different types of dynamic capabilities, either used to integrate resources, reconfigure

resources, creates new resources or even to shred resources. Thus, questions have been raised in studies as to whether dynamic capabilities operate singly, whether and how they can operate in combination, and which dynamic capabilities might be more suitable, depending on each particular firm or situation it faces. Eisenhardt and Martin (2000) argue that dynamic capabilities, while often described in abstract terms, 'actually consist of identifiable and specific routines' (2000: 1107) and examples are plentiful in management literature. Such examples of dynamic capabilities include acquisitions and product innovation, as they lead to the renewal and reconfiguration of a firm's resources. In this regard, there are several empirical studies which have provided concrete examples of dynamic capabilities in reality and have sought to explain how specific dynamic capabilities are used. Several empirical studies include:

In a case study of the US petroleum industry, Helfat (1997) argued that R&D was a dynamic capability. She demonstrated that R&D activities were enhanced to deal with changes in market prices and investigated the role of complementary assets in supporting R&D goals. Karim and Mitchell (2000) examined firm's acquisition processes as a dynamic capability and explained that acquisitions are a way for firms to reconfigure their resource bundle and modify their resource base to meet new demands in the market environment. In the study of high technology firms, Danneels (2002) concluded that product innovation is a dynamic capability as it leads to organizational renewal over time. Importantly, the work demonstrated that new product development lead to renewal of firm-level competences and skills and not only to the growth of a firm's portfolio of products. Karim's (2006) research showed that organizational structure reconfiguration was a dynamic capability because reconfiguring business units allowed firms to recombine their resources and adapt to environmental changes. Moliterno and Wiersema (2007) in their study of professional baseball franchises argued that resource divestment was a dynamic capability. Their scholarly argument was centred on the 'human resource divestment' dynamic capability and suggested that managers' judgement, perception and the 'contextual feedback in the form of firm performances relative to aspirations' (2007: 1085) were vital to the deployment of this capability.

It is interesting that these examples would suggest that dynamic capabilities are common, well recognised activities that firms engage in (i.e. best practices) and this supports the theory that dynamic capabilities exhibit commonalities across firms (Eisenhardt and Martin, 2000). However, Eisenhardt and Martin (2000) further argue that dynamic capabilities are idiosyncratic in their details and path dependent in their emergence, hence accounts for dissimilarities and differential firm performance. Eisenhardt and Martin (2000: 1108) emphasize, 'just as there are better ways to hit a golf ball or ski a mogul field, there are more or less effective ways to execute particular dynamic capabilities' and as such, dynamic capabilities may not necessarily have the intended

effect or a successful outcome. This outcome could be as a result of the uncertainty of predicting the impact of a dynamic capability on the resource base and also the uncertainties in the external environment.

For Helfat et al. (2007) and Teece (2007), the heterogeneity between firm's dynamic capabilities could lie in the managerial and organizational processes that underpin and enable the deployment of dynamic capabilities; referred to in Teece (2007) as microfoundations of dynamic capabilities. An example of this is search i.e. identifying opportunities and threats in the external environment, or the ability to anticipate or sense changing customer needs, technological opportunities and competitive developments (Augier and Teece, 2007; Teece, 2007). The topic of microfoundations of dynamic capabilities and the arguments that support it will be dealt with in more detail later in this work.

3.3.4 THE ROLE OF DYNAMIC CAPABILITIES IN FIRM COMPETITIVE ADVANTAGE

One of the fundamental questions regarding the importance of dynamic capabilities to firms is its impact on firm's competitive advantage and performance. The divergent views (Cepeda and Vera, 2007) on this matter which is found in literature have been grouped together.

A main proponent of view that there is an explicit link between dynamic capabilities and advantage is (Teece et al., 1997). Griffith and Harvey (2006: 597) share this view as evident in the statement that 'a global dynamic capability is the creation of difficult-to-imitate combinations of resources […] that can provide a firm competitive advantage'. In agreement is Lee et al.'s (2002: 734) assertion that 'dynamic capabilities are conceived as a source of sustainable advantage in Schumpeterian regimes of rapid change'. However, critics of these definitions that attribute a direct link, say that these definitions are tautological and this is evident in Cepeda and Vera's (2007: 427) statement, using a similar criticism of RBV in Priem and Butler (2001), 'if the firm has a dynamic capability, it must perform well, and if the firm is performing well, it should have a dynamic capability'.

For Zott (2003: 98), the link between dynamic capabilities and competitive advantage is indirect; 'dynamic capabilities are indirectly linked with firm performance by aiming at changing a firm's bundle of resources, operational routines, and competences, which in turn affects economic performance'. In the same light, Bowman and Ambrosini (2003), in line with the RBV, hold the view that VRIN resources are directly linked to economic profits, but since dynamic capabilities impact on resources and are one step removed from economic profits generation, their effect is indirect.

Helfat et al. (2007) separate the notion of dynamic capabilities and performance and argue that 'dynamic capabilities do not necessarily lead to competitive advantage' (2007: 140). Dynamic capabilities may alter a firm's resource stock however such alteration may not necessarily be valuable as it may not create any VRIN resources. In that scenario, the newly created resource portfolio may either only give competitive parity or it may be of no use in that particular market. The impact of dynamic capabilities on firm performance, according to the author, can be measured by what she termed, *evolutionary fitness* and *technical fitness*. Evolutionary fitness 'refers to how well the capability enables the firm to make a living by creating, extending, or modifying its resource base' (1997: 7) and technical fitness is 'how effectively a capability performs its intended function' (1997: 7). Technical fitness along with market demand and competition determines evolutionary fitness which is where competitive advantage lies – technical fitness only does not guarantee evolutionary fitness hence the need to disconnect dynamic capabilities directly from competitive advantage.

For some authors who see no direct link between dynamic capabilities and competitive advantage, they go on to further suggest that dynamic capabilities do not have to be firm specific. Eisenhardt and Martin (2000: 1106) argue that the 'functionality of dynamic capabilities can be duplicated across firms, their value for competitive advantage lies in the resource configurations that they create, not in the [dynamic] capabilities themselves' and 'while dynamic capabilities are certainly idiosyncratic in their details, the equally striking observation is that specific dynamic capabilities also exhibit common features' (2000: 1108). They suggest that dynamic capabilities are homogenous, equifinal, fungible and substitutable, and they resemble the traditional conception of routines – they have significant commonalities across firms. Others works have supported this view of the presence of industry dynamic capabilities. Smart et al. (2007) for example argued that there was some evidence of network level dynamic capabilities in the biotech industry. More so, the practice-based view (PBV) of strategy scholarship contributes to this discussion with the view that competitive advantage or differential firm performance could lie in how these industry dynamic capabilities or best practices are implemented in firms and that particular benefits can be enhanced if best practices align with firm-specific routines (Bromiley and Rau, 2014).

Based on insights into the link between dynamic capabilities and performance, Ambrosini and Bowman (2009) conclude that four possible outcomes could exist from the deployment of dynamic capabilities. First, they can lead to superior firm performance if the resulting resource base has VRIN attributes which allows rents to be sustained. Second, they can create temporary advantage as suggested by Rindova and Kotha (2001: 1275) that in 'hypercompetitive environments, competitive advantage is transient rather than sustainable'. Third, dynamic

capabilities may only put firms on an equal playing field with rivals if their effect on the resource base simply allows the firm to operate in the industry rather than to outperform competitors. Fourthly, the deployment of dynamic capabilities may bring about a negative outcome if the new resource bundle is irrelevant to the market.

3.3.5 THE BURDEN OF DYNAMIC CAPABILITIES

Dynamic capabilities are about creating future resource bundles and so their impact cannot be seen in the present, rather are assessed some time in future after they have been deployed. For this reason, they are often vulnerable to short-term pressures to reduce costs as they might not be viewed as a priority in a firm's current competitive life. Zollo and Winter (2002) and Winter (2003) argue that sustaining dynamic capabilities in a firm is expensive, and that an ad hoc approach may be more frugal: 'dynamic capabilities typically involve long-term commitments to specialized resources… by contrast, the cost of ad-hoc problem solving largely disappear if there is no problem to solve'. (Winter 2003: 993). However, this view is not shared by scholars who do not see ad-hoc problem solving or one-off activities as dynamic capabilities, rather view dynamic capabilities as patterned, repetitive activities which require significant firm investment to develop and maintain. As such, it is important that firms persist with sustained commitment to dynamic capability efforts as rewards are often in the long run and managers would do well not to pull the plug on investments at the first signs of the need for cost-cutting pressures or competitive challenges.

Lavie (2006) and Pablo et al. (2007) highlight the cost of dynamic capabilities in that it involves substantial cognitive, managerial and operational costs and that deploying dynamic capabilities take up significant levels of time and energy from committed managers. There is also the opportunity cost to manager's engagement in dynamic capabilities as it is a distraction to their everyday function of running and managing the firm in 'business as usual'.

Similarly, dynamic capabilities require managers to sense or anticipate changes in the external environment in order to respond by altering their resource base. It is vital that managers do not misread environmental changes otherwise they could deploy inappropriate dynamic capabilities. For example, a change in the competitive landscape may get a response of firm consolidation and a focus on core products thereby reducing a firm's brand portfolio. The appropriate response might have been to sustain or even grow the brand portfolio and to leverage brand development capabilities. By misconceiving the competitive environment and deploying dynamic capabilities that do not maintain or enhance performance, the burden of dynamic capabilities becomes twofold: the firm bears the cost of the dynamic capabilities as well as the negative consequences of their deployment (Zahra et al., 2006). This again emphasizes the argument regarding

competitive advantage and dynamic capabilities and although they 'are developed in order to realize strategic advantages, their development does not ensure organizational success' (Zahra et al., 2006: 926). Importantly, there are arguments for the development and deployment of dynamic capabilities as well as factors that affect dynamic capabilities.

3.4 CONTRADICTIONS IN DYNAMIC CAPABILITIES RESEARCH AND LITERATURE

There are contradictions about dynamic capabilities in a number of areas;

3.4.1 DEFINITIONS AND CONSTITUENTS OF DYNAMIC CAPABILITIES

It is necessary to look at what the term 'dynamic capabilities' entails which consists of two words, 'dynamic' and 'capabilities'. First recapping RBV, capabilities are either processes that put resources to use or they are resources in the general sense, as Barney (1991) argues that capabilities are a type of resource. A dynamic capability is not a capability in the RBV sense, it is not a resource. While firms utilize their valuable resource base to earn a living in the present (Winter, 2003), dynamic capabilities are processes that alter that resource base for future orientation. Capabilities of today remain 'static' if no dynamic capabilities are deployed to alter them. The 'dynamism' is about how the resource base is altered in a dynamic environment by the deployment of dynamic capabilities. Sometimes 'dynamic' is said to refer to environmental dynamism, however this is incorrect because dynamic capabilities can operate in relatively stable environment (Eisenhardt and Martin, 2000). It is now widely accepted in literature that 'dynamic' refers to the change in the resource base in the renewal of resources (Zahra et al., 2006).

An evaluation of the definitions of dynamic capabilities listed in this work and those commonly seen in literature shows that there is a general consensus that dynamic capabilities are firm processes or pattern of activities that are used to modify its resource stock. The divergent views relate more to questions regarding what constitutes these processes and in what environmental conditions do dynamic capabilities exist. Take for example the definitions by the two most prominent scholars in the field. Teece et al. (1997: 515) define dynamic capabilities as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments'. We can note two key things about this definition. First, it is safe to conclude that the word 'ability' in this definition would encompass a firm's behaviour, including the perceptions and cognition of its managers, as well as the processes or activities that the firm uses in order to integrate, build, and configure competences. Second, that dynamic capabilities are needed in rapidly changing environments. Eisenhardt and Martin (2000: 1107) on the other hand define dynamic capabilities as 'the firm's processes that use resources – specifically the

processes to integrate, reconfigure, gain and release resources – to match and even create market change' and 'the organizational and strategic routines by which firms achieve new resources and configurations as markets emerge, collide, split, evolve, and die. This suggests that dynamic capabilities are simply processes and repeated activities or routines. So, are dynamic capabilities processes or do they include a firm's behaviour or predisposition to change and adaptation as well as managerial cognition? In addition, what is the distinction between dynamic capabilities and processes?

Several empirical studies pertinent to dynamic capabilities do not clarify the concept either. Rather, they usually describe how firm evolution occurs over time based on illuminating case studies. The nature of environment or market dynamism requiring dynamic capabilities is also well debated. Eisenhardt and Martin (2000) argue that dynamic capabilities exist in two market types; in high-velocity markets where changes are non-linear and less predictable and dynamic capabilities involves rapidly creating situation-specific new knowledge, and in moderately dynamic markets or relatively stable environments in which changes happen frequently but follow predictable linear paths and dynamic capabilities is heavily reliant on firm's existing knowledge, where designs of processes and activities typically follows a problem-solving approach. Teece et al. (1997) and many other scholars do not share this view that dynamic capabilities are relevant in relatively stable environments. This remains a source of contradiction in dynamic capabilities literature.

3.4.2   THE LINK BETWEEN DYNAMIC CAPABILITIES AND FIRM PERFORMANCE

There are divergent views about the links between dynamic capabilities and competitive advantage or firm performance as discussed earlier. Some authors argue that dynamic capabilities directly contribute to firm performance whereas others state that there is an indirect link; dynamic capabilities transform the resource base of a firm and the resultant valuable resource base provides competitive advantage, hence the indirect link. For others, there is no apparent connect between dynamic capabilities and firm performance since dynamic capabilities exhibit commonalities across firms and any competitive advantages achieved lie in the idiosyncratic details of how they exist or manifest in individual firms. It is significant that arguably, the two most prominent works in the field of dynamic capabilities have different views about the significance of dynamic capabilities to firm competitive advantage. Teece et al. (1997) contends that dynamic capabilities allow firms to build competitive advantage in regimes of rapid change. This is also reaffirmed in their discussion about dynamic capabilities, 'they see competitive advantage stemming from high-performing routines operating inside the firm, shaped by processes and positions' (1997: 528). In contrast, Eisenhardt and Martin (2000: 1117) argue that dynamic capabilities cannot be a source of sustained competitive advantage; the only way they

can be a source of competitive advantage is if they are applied 'sooner, more astutely, and fortuitously' than competition to create resource configurations. They conclude that dynamic capabilities are just another type of capability and become irrelevant over time. Other scholars have wielded into the debate, for example Wang and Ahmed (2007: 36) make the proposition that 'Dynamic capabilities are conducive to long-term firm performance, but the relationship is an indirect one mediated by capability development which, in turn, is mediated by firm strategy; dynamic capabilities are more likely to lead to better firm performance when particular capabilities are developed in line with the firm's strategic choice'. These examples demonstrate the different views of scholars in the field.

3.4.3 METHODOLOGICAL CHALLENGES

By 2007 a review of the work in the field of dynamic capabilities by Newbert (2007) showed that despite the growing attention and validity of the framework to strategic management, empirical studies of dynamic capabilities remain largely outnumbered by theoretical and conceptual studies. It is noteworthy to point out that arguably the most influential dynamic capabilities papers, those by Teece et al. (1997) and Eisenhardt and Martin (2000), use illustrative examples from data that, while pertinent, were not collected purposely to understand dynamic capabilities. Most articles following these papers were conceptual rather than empirical and there might be a number of reasons for less empirical studies. First, theoretical work only started with Teece et al. (1997) and traditionally, research starts with first theory development, then hypothesis or proposition development, followed by empirical testing, then finally managerial prescriptions are developed. Secondly, a setback for empirical evidence might be because the construct has been poorly conceptualised and presented, such that it is difficult for researchers to know what to look for. Thirdly, challenges for empirical studies might be because it is a concept 'which has thus far proven largely resistant to observation and measurement' (Kraatz and Zajac, 2001: 653). This can be explained by the fact that quantitative studies in the field far outnumber qualitative studies.

Quantitative studies are most often statistically rich and help to advance theory through the inference of common trends but it might be a challenge to collect any longitudinal data via historical sources or structured surveys (Danneels, 2007). Also, quantitative methods are suited to capturing and describing tangible, visible aspects of a phenomenon, for example broad organizational practices, however they do not provide detailed insights into the micro aspects of how dynamic capabilities emerge, are deployed or perform. When investigating heterogeneity across firms and for evidence of idiosyncratic and intangible phenomena, quantitative methods might be inappropriate and a qualitative attention to detail or a plurality of methods could prove more useful.

Qualitative, longitudinal case studies are likely to be more appropriate for understanding nuances embedded in resource creation and renewal processes. Such studies allow fine-grained investigations to collect rich contextualized fieldwork data which are context-specific and firm-specific and provide a deeper understanding of how resources are created and renewed in practice. However, these studies are typically time consuming, costly, require significant access to firms e.g. consistent field observations, and demanding analysis. Danneels' (2008: 536) stressed that 'notwithstanding its current popularity, the notion of dynamic capabilities is abstract and intractable' and this may remain true unless there is an increase in the number of field investigations.

But some authors have questioned the relevance of individual case study research and argue that such research reveal firm- or industry-specific processes which lack generalization; rather they call for commonalities of dynamic capabilities across firms. It is argued that the commonalities are identifiable and measurable (Eisenhardt and Martin, 2000) and are critical for the development of the dynamic capabilities concept. First, common features make up the component factors of the dynamic capabilities construct and can be adopted by future studies to ascertain the relationship between dynamic capabilities and other organizational parameters. Second, the common features of dynamic capabilities could provide insights into how firms transform resource advantage to marketplace advantage at a general level, rather than in the firm-specific context, and hence can be adopted as a framework to reveal firm's transformational mechanisms in general. Third, it would allow dynamic capabilities to address a limitation of the RBV of being primarily theoretical and devoid of meaningful implications for practitioners (Priem and Butler 2001a,b), by providing common guidance for firms which firm-specific processes of dynamic capabilities identified in empirical studies do not provide. It is suggested that when the component factors of dynamic capabilities are identified, they can be used to develop actionable prescriptions (Eccles and Nohria, 1992; Mosakowski, 1998) or practical tools and techniques for managers to employ in order to improve firm performance (Priem and Butler 2001a,b).

As can be seen in the foregoing paragraphs, the field of dynamic capabilities is strewn with contradictions and divergent views about the very nature of the construct, its contributions to strategic management and the practical relevance for actionable firm performance.

Since the review of empirical work in Daneels (2007) and the commentary by Danneels (2008), there has been a significant rise in the number of empirical studies in dynamic capabilities as researchers have heeded the calls to address several shortcomings, namely; clarify the theoretical underpinnings of the construct, longitudinal case study context-specific research, and to provide practical or managerial prescriptions. Many of these studies have adopted both quantitative and qualitative research methods and a combination of methods. These studies have helped bridged

numerous research gaps and advanced scholarly understanding of the dynamic capability construct. However, despite these significant contributions, there remains several unanswered questions regarding the phenomenon as is expected of a growing research field which emerged only in the past two or three decades.

3.5 GROWING RESEARCH IN DYNAMIC CAPABILITIES – KEY PAPERS, TRADITIONS, CORE CLUSTERS OF RESEARCH AND EMERGING TRENDS

Over the past few decades, the dynamic capability view has become one of the most vibrant approaches to strategic management such that it has even been referred to as 'the new touchstone firm-based performance-based theory' (Arend and Bromiley, 2009: 75), with the field widely viewed as a distinct domain within strategic management. The fast-growing number of publications on dynamic capabilities and the considerable theoretical and methodological variety within the field highlight fundamental disagreements with regards to its scope, the usefulness of the DCV, and also a lack of consensual concepts that allow comparisons of empirical studies that advance the theoretical understanding of dynamic capabilities. In recent years, there have been several qualitative and quantitative reviews and assessments in the extant literature to offer some useful insights into how the research field is evolving and also to proffer suggestions as to how the many challenges might be tackled.

3.5.1 DUAL SPHERE OF THEORETICAL INFLUENCE ON DYNAMIC CAPABILITIES RESEARCH BY TWO SEMINAR PAPERS

In an attempt to investigate the extent to which published theoretical work has influenced the development of dynamic capabilities research domain, Peteraf et al. (2013) undertook a unique historiograph analysis (Garfield, 2004) based on citation relationships among those papers that the authors regarded as constitute the domain's knowledge core. The focus on the knowledge core allowed for an identification of the patterns of influence that are most critical for shaping the development path of the dynamic capabilities construct. The historiograph analysis of the most influential contributions to the body of research on dynamic capabilities (its knowledge core) looks at the most cited papers, based on the assumption that the citation counts are a valid measure of prominence and influence (Garfield, 1979; Ramos-Rodriguez and Ruiz-Navarro, 2004). In order to perform the analysis, a listing was derived of management articles published on dynamic capabilities from 1990 (the date when Teece et al.'s 1997 seminar article was first available as a working paper). An initial list provided 592 articles then the most influential papers published prior to 2009, with citation scores higher than the average score of the panel i.e. 27 citations (based on the citation relationship), were identified which yielded 61 leading articles

from which a historiograph was developed. Table 1 shows the most cited papers in the dynamic capabilities research domain from 1990 – 2013.

The findings from the historiography demonstrate the existence of a dual sphere of influence within top-cited research on dynamic capabilities. Two seminar papers, Teece et al (1997) and Eisenhardt and Martin (2000) with a combined total of over 2,300 citations as of November 2012 surpass all other articles in terms of their influence and recognition. No other paper approaches the per-year within-group citation counts of these two thereby confirming the two papers as the most influential papers on dynamic capabilities and they play a seminar role in shaping the development of the dynamic capabilities research domain. Apart from the fact that the Teece et al (1997)'s within-group citation count greatly exceeds that of Eisenhardt and Martin (2000), the author-based citation analysis using Pathfinder analysis provided insights into the foundational structure of the dynamic capabilities research domain in terms of its social construction by scholars as well as the construct's development path. The striking finding from the structural network is that the DC field is sharply divided forming two separate communities of authorship. There exists a dense cluster of scholarship associated with Teece's work and a more loosely connected group linked to Eisenhardt's. In addition, the two communities of scholarship seem to differ significantly in their worldview, which may account for the different but coexisting social construction of the dynamic capabilities construct. Interestingly, the authors found in each group are distinguished both by their training and disciplinary orientation. For example, it is noted that 50 percent of the authors linked to Teece have advanced degrees in economics, compared with only 9 percent of those linked to Eisenhardt. In contrast, 22 percent of the Eisenhardt cluster has a background in organizational theory, science, or behaviour, compared with 0 percent in the cluster surrounding Teece. Also, 19 percent of the Eisenhardt group has a background in information systems, while none of those linked to Teece do. There are also differences between the two groups with regards to their research interests. The authors linked to Teece have research work with stronger interests in technology, firm performance, and strategy, while those connected to Eisenhardt are generally more interested in internal organizational challenges, processes, and information systems. The fact that there are two separate communities of scholars contributing to the development of an important strategic concept and engaging in separate research focus may not in itself be alarming since the strategy field is multidisciplinary in nature. What is significant is the lack of apparent integration or crossover between the two fields of knowledge underpinning dynamic capabilities and this suggests that the two communities may be socially constructing dynamic capabilities independent of one another, without regard for whether the two different views of the framework's core are mutually consistent. As the field of dynamic capabilities grows and research evolves, it is vital that these inconsistences in theoretical

foundations are reconciled and the DC construct is built on coherent foundations, if DC is to fulfil its potential as the new touchstone theory of strategic management.

The author-based citation analysis performed in the work noted above made significant contributions in examining the structure of the knowledge pool in the dynamic capabilities research domain as well as in investigating the way the research field has evolved while tracing its path of development (e.g., Culnan, O'Reilly, and Chatman, 1990). Importantly, it has also shed light on uncovered hidden patterns of influence and knowledge diffusion across the scholarly communities contributing to the development of the dynamic capabilities field. This is particularly necessary in the continual development of any credible research arena.

Table 1. The most cited papers in the dynamic capabilities research domain, 1990 – 2013 (Source: Peteraf et al., 2013)

Paper	Total Citations	Paper	Total Citations
Teece et al. (1997)	1,721	King and Tucci (2002)	49
Eisenhardt and Martin (2000)	671	Williams (1992)	49
Zahra and George (2002)	358	Ireland, Hitt, and Sirmon (2003)	45
Zollo and Winter (2002)	320	Agarwal et al. (2004)	44
Dyer and Nobeoka (2000)	288	Jarzabkowski (2004)	44
Amit and Zott (2001)	206	Uhlenbruck, Meyer, and Hitt (2003)	44
Helfat and Peteraf (2003)	148	Rai, Patnayakuni, and Seth (2006)	43
Makadok (2001)	141	Vohora, Wright, and Lockett (2004)	43
Benner and Tushman (2003)	139	Adner and Helfat (2003)	43
Winter (2003)	137	Jacobides and Winter (2005)	42
Sambamurthy, Bharadwaj, and Glower (2003)	130	Malhotra, Gosain, and El Sawy (2005)	42
Teece (2007)	128	Becker (2004)	42
Wright, Dunford, and Snell (2001)	103	Javenpaa and Leidner (1998)	42
Melville, Kraemer, and Gurbaxani (2004)	101	Rosenbloom (2000)	40
Danneels (2002)	97	Zollo and Singh (2004)	39
Wade and Hulland (2004)	91	Zhu (2004)	39
Zhu and Kraemer (2002)	91	Tushman and Murmann (1998)	38
Hitt et al. (2001)	76	Jansen, Van den Bosch, and Volberda (2005)	35
Knight and Cavusgil (2004)	72	Miller (2003)	34
Rindova and Kotha (2001)	72	Zahra, Sapienza, and Davidsson (2006)	33
Teece (2000)	68	Lockett and Wright (2005)	32
Aragon-Correa and Sharma (2003)	64	Luo (2002)	32
Galunic and Eisenhardt (2001)	64	Rugman and Verbeke (2002)	30
Carpenter, Sanders, and Gregersen (2001)	63	Bhatt and Grover (2005)	29
Barua et al. (2004)	62	Newbert (2007)	28
Zott (2003)	55	Colbert (2004)	28
Dutton et al. (1997)	53	Helfat (1997)	27
Subramaniam and Youndt (2005)	51	Garud and Kumaraswamy (2005)	27
Madhok (2002)	50	Vassolo, Anand, and Folta (2004)	27
Helfat (2000)	50	Ahuja and Katila (2004)	27
Wheeler (2002)	49	--	--

3.5.2 QUANTITATIVE REVIEW OF DYNAMIC CAPABILITIES RESEARCH

There have been a number of useful qualitative reviews in of dynamic capabilities research (Ambrosini and Bowman, 2009; Arend and Bromiley, 2009; Barreto, 2010; Easterby-Smith et al., 2009; Helfat and Peteraf, 2009; Helfat and Winter, 2011; Wang and Ahmed, 2007; Zahra et al., 2006). These reviews have traced the origins of the DCV thinking, highlighted definitions, discussed the makeup of the construct, collated key empirical findings and identified theoretical inconsistencies as well as empirical challenges. These single-expert reviews are invaluable for

assessing the state of an adolescent field and pointing directions for its future development. However, such qualitative reviews tend to suffer from general problems of subjectivity and hence are inherently biased since they often reflect the views of the reviewers who are deeply involved in the topic (Vogel and Guttel, 2013). Another problem is that relevant published articles on DC proliferate at rates that increasingly exceed the information-processing capacity of individual reviewers. This is evident in the notable differences between the various views of how the DCV is to be understood, how it might be applied and its contributions to strategic management. Arend and Bromiley (2009) have concluded that because of its vague or inconsistent theoretical foundations, the DCV approach is at a disadvantage compared with other approaches in strategic management. They also criticize the fact that the DCV approach underutilizes organization theory in general and concepts of organizational change, such as 'absorptive capacity', 'organizational learning' and 'change management', in particular. In contrast, Helfat and Peteraf (2009) respond by arguing that terminological and conceptual differences illustrate the complexity of the dynamic capability construct, which requires multiply theoretical underpinnings. They further argue that the continuing exploration of fundamental issues and the lack of empirical validation are expected in a field that is still fairly new in theory and research terms.

Structured quantitative reviews of the extant literature on dynamic capabilities have substantiated and complemented qualitative literature reviews in a number of ways even though they may suffer from a lack of fine-grained, individual insight that a qualitative approach might offer. First, quantitative reviews can help to explore the scope of DC in the broader field of strategic management. Second, to identify the current research schools and perspectives as well as trends within DC. Third, to highlight hitherto unaddressed issues and unconnected subfields within DCV. Fourth, to address some of the critiques of qualitative reviews of DC e.g. scholar biases and help cross-validate their findings and assessments.

In a quantitative bibliometric review of DCV by Vogel and Guttel (2013), the authors applied the method of bibliographic coupling (Kessler 1963), which compliments the widespread co-citation technique (e.g. Di Stefano et al., 2010) thereby shifting attention from traditions to trends in the scientific literature. Another benefit of this quantitative approach is that it examines the thematic expansion of the DCV by analysing the diffusion process over time, instead of merely taking a snapshot. The bibliographic coupling analysis of 1,152 articles in the work revealed several distinct yet interrelated subfields of DCV research that has evolved dynamically over time. The resource RBV and organizational learning were dominant within DCV in the earlier stages of its evolution. Recent literature though indicates that the field is shifting towards a more integrated core cluster research agenda which the authors called, strategic learning and change. This core stream focuses on learning capabilities and relates them to firm performance thereby linking aspects of

organization theory and strategic management. Hence, in the course of DCV's evolution, the RBV has made a 'learning turn', while organizational learning has performed a 'strategic turn' (Vogel and Guttel, 2013: 427). Alongside the integration of DCV research into a core cluster, there is also a parallel process of differentiation within the overall field thereby creating several peripheral clusters of research such as ambidexterity, microfoundations and acquisitions. Both trends of integration and differentiation point to the growing influence of DCV as a distinct approach to strategic management, however DCV still lacks consensual concepts that allow comparisons of empirical studies and advance the theoretical understanding of dynamic capabilities.

An insightful look into Vogel and Guttel (2013) illustrates how DC research trends have evolved over time. In the data and method applied in the review, the authors applied a comparative approach to the analysis of the data to show an exponential growth in the profileration of publications on dynamic capabilities since the first journal article in 1994 – the number of publications has approximately doubled within the last three years covering the review period (i.e. from 2009 to 2011). To account fully for this trend, a comparative approach was adopted which divided the data into two roughly equal parts. An analysis was run only on the first half made up of 560 articles published between 1994 and 2008, then the remaining 592 of the total 1,152 articles were added and the procedure repeated for the whole-time series from 1994 to 2011. By comparing the results, the work was able to demonstrate how DC research has evolved over time and how recent publications have shaped the directions in which DC research is evolving. The results of the bibliographic network from 1994 – 2008 showed that DC research was dominated by two large clusters namely learning and innovation, and RBV, and also two smaller subgroups peripherally attached namely, vertical scope and alliances. The learning and innovation group covers a wide body of literature that builds on diverse theoretical foundations e.g. on evolutionary economics (Nelson and Winter, 1982), behavioural theory (Cyert and March, 1963) and the knowledge-based view (Kogut and Zander, 1992); the tensions between exploration and exploitation (Benner and Tushman, 2003; Raisch and Birkinshaw ,2008; radical innovation capabilities within established firms (O'Connor, 2008; O'Connor and DeMartino, 2006); capabilities expansion based on existing knowledge (Cattani 2005, 2006, 2008; Nerker and Roberts, 2004); and emerging R&D capabilities (Nerkar and Roberts, 2004; Tzabbar et al., 2008). There also contain publications on firm acquisitions and reconfiguration of capabilities (Barkema and Schijven, 2008; Zollo and Singh, 2004) and a smaller group of publications on microfoundations of dynamic capabilities, particularly on the cognitive skills of individuals (Gavetti, 2005; Kaplan, 2008; Teece, 2007). The RBV cluster is made up of publications where resource-based theory stands out as the predominant theoretical perspective. One group of work within this cluster make 'affirmative' references to the original versions of RBV theory and

dynamic capabilities are referred to only *en passant*. Such articles include reviews of the state-of-the-art of RBV research (Armstrong and Shimizu, 2007; Newbert, 2008; Wade and Hulland, 2004), calls for the extension and operationalization of RBV (Colbert, 2004; De Toni and Tonchia, 2003; Newbert et al., 2008), or apply the perspective particularly to IT capabilities (Hulland et al., 2004; Soto-Acosta and Merono-Cerdan, 2008).

However, there is a parallel group within the RBV cluster that have comparatively 'negative' connotations in reference to RBV. These articles argue for the 'dynamization' of RBV (Helfat 2000; Helfat and Peteraf, 2003) and go further to stress the differences rather than the common ground between DC and the RBV. For example, the RBV is criticized for failing to address the negative effects of assets and capabilities on firm rents (Arend, 2004), for not shedding light on the process of resource creation (Bowman and Collier, 2006) or for disregarding resources in the interfirm domain (Lavie 2006a; Mathews, 2003; Zander and Zander, 2005). Earlier works on dynamic capabilities (Eisenhardt and Martin, 2000; Teece et al., 1997) sought to overcome the static approach of RBV and open this perspective to other streams of literature, in particular to evolutionary economics (Nelson and Winter, 1982) and behavioural theory (Cyert and March, 1963) – interestingly, both theories also play a central role in the theoretical foundation of papers in the 'learning and innovation' cluster. This cluster also includes long-standing research in marketing that has incorporated new insights from DC (Jarratt, 2008; Morgan et al., 2003).

The vertical scope cluster is representative of work that focuses on vertical integration and strategic outsourcing (Holcomb and Hitt, 2007; Jacobides, 2008; Jacobides and Winter, 2005) which also raise general questions about organizational boundaries (Santos and Eisenhardt, 2005). In addition, references to transaction cost economics (TCE) are prominent and while RBV and TCE have traditionally been regarded as opposite theories of the firm, they converge, to some extent, under the capability-based view (Mahok, 2002). The significant argument here is that dynamic capabilities are vital sources of capability heterogeneity between firms because learning curves are assumed to bring about change in a firm's competences (Jacobides, 2008). The fourth cluster of research, alliances covers mostly publications on alliance capabilities (Heimericks and Duysters, 2007; Rothaermel and Deeds, 2006) and alliance learning (Kale and Singh, 2007). Alliance performance effects increase when firms leverage their alliance experiences and translate them into stronger alliances or network capabilities (Heimeriks and Duysters, 2007; Walter et al., 2006). These studies demonstrate that alliance capabilities are built through various learning mechanisms such as the internalization, integration and institutionalization of alliance know-how with the effectiveness of these mechanisms depending on among other factors, on the type of the alliance (Rothaermel and Deeds, 2006). Table 2 shows the bibliographic network result with four clusters in DCV research.

Table 2. Bibliographic network, 1994-2008: factor analysis and network metrics (Source: Vogel and Guttel, 2013)

No.	Symbol	Label	Docs.	Factor analysis		Network analysis	
				Eigenvalue	Variance (%)	Cohesion	Density
1	Δ	Learning and Innovation	41	49.682	41.402	1.489	0.179
2	O	RBV	49	43.552	36.294	1.713	0.243
3	◊	Vertical scope	8	11.241	9.368	2.420	0.576
4	□	Alliances	7	7.117	5.931	2.055	0.333

The amalgamated bibliographic network analysis from 1994-2011, shows how DC research has evolved since its inception and more particularly, most recent trends. Integrating the most recently published documents on dynamic capabilities into the analysis yielded a network of one large cluster, called Strategic learning and change, and five much smaller clusters, namely technological innovation and adaptation, vertical scope, microfoundations and acquisitions, ambidexterity and alliances (as shown in Table 3). The strategic learning and change group contains almost half of the articles previously under the RBV cluster as such this group shows a similarly strong focus on the strategic management of firm resources to achieve competitive advantage and profits. However, the research emphasis in this group, shaped by more recent publications, has shifted to learning capabilities with relation to firm performance. For example, they emphasize knowledge assets that are leveraged into human capital and organizational capabilities through learning mechanisms (Clougherty and Moliterno, 2010; Moustaghfir, 2009). Significantly, the increasingly dynamic view of capabilities within this cluster contributes to the dynamization of the RBV, which many authors called for, thereby directing the field towards issues of strategic learning and change. Other core DC research present in this cluster includes work that seek to conceptualize, operationalize and measure dynamic capabilities (Kim and Mahoney, 2010; Pavlou and El Sawy, 2011).

The technological innovation and adaptation cluster is made up largely of articles found under the previous 'learning and innovation' cluster. The research here is dominant by issues of innovation capabilities and strategic responses by large firms in specific industries. For example, on the role of capabilities on how firms decide when and how to adopt emerging technologies (Anand et al., 2010). Other contributions by this research group highlight that strategic responses to technological change may be influenced by managerial cognition (Eggers and Kaplan, 2009). The vertical scope subgroup builds on the same 'vertical scope' in the previous bibliographic network analysis as there are only three new publications in this subfield. In this consistent cluster, the

economic analyses of vertical integration and strategic outsourcing remain the core research theme. The next cluster microfoundations and acquisitions, consists of two distinct but interrelated subgroups namely, microfoundations of DC and knowledge-based view of corporate acquisitions. The microfoundations research trace dynamic capabilities back to routines, processes and social interactions that are rooted in the intentional behaviour of individuals (Felin and Foss, 2009). These works seek to bridge the 'micro-macro' divide in management research by attempting to identify the constituents of capabilities and how they relate across the individual and collective levels (Lewin et al., 2011; Salvato and Rerup, 2011; Schilke and Goerzen, 2010). The second subgroup deals largely with the knowledge-based view of corporate acquisitions (Zollo, 2009; Zollo and Reuer, 2010). For example, they provide insights into integration capabilities and learning mechanisms that enable post-acquisition knowledge spill-overs.

Similarly, the ambidexterity cluster is largely made up of discussions that characterized the subfield of 'learning and innovation' except that here most of all the included publications have been very recent as such a particularly vibrant subfield of DC. Topics include the balance of flexibility and efficiency (Eisenhardt et al., 2010), stability and change (Farjoun, 2010), incremental and radical innovation (Tushman et al., 2010), and exploration and exploitation (Lavie et al., 2010). Contributions from these have provided useful insights into the antecedents and consequences of ambidextrous learning, for example suggestions that factors that increase ambidexterity include integration mechanisms at top management teams (Jansen et at., 2009), intellectual capital architectures (Kang and Snell, 2009), total quality management (Luzon and Pasola, 2011), organizational design (Tushman et al., 2010), executive leadership (Martin, 2010) and managerial cognition (Eisenhardt et al., 2010). There are strong similarities and links between the publications in the 'ambidexterity' and 'technological innovation and adaptation' clusters.

The last and smallest cluster, alliances, is made up of a variety of publications. However, the central theme in the articles focuses on alliances. Several studies deal with learning from alliance partners, and thus primarily address the question of what enables firms to source knowledge beyond their own boundaries and what enables or constrains such processes. Research has shown that the performance effects of external sourcing depends on what kind of experience a firm has gained from previous alliances (Hoang and Rothaermel, 2010) and how this is integrated with internal sourcing strategies within the firm boundary (Rothaermel and Alexandre, 2009). The concept of absorptive capacity is prominent in this cluster as it relates strongly with learning across organizational boundaries.

Table 3. Bibliometric network, 1994-2011: factor analysis and network metrics (Source: Vogel and Guttel, 2013)

No.	Symbol	Label	Docs.	Factor analysis		Network analysis	
				Eigenvalue	Variance (%)	Cohesion	Density
1	◻	Strategic learning and change	55	50.636	36.961	0.342	0.127
2	●	Tech. innovation & adaptation	24	16.191	11.819	1.741	0.138
3	◊	Vertical scope	9	13.266	9.683	2.127	0.222
4	☉	Microfoundations & acquisition	15	10.514	7.675	1.790	0.191
5	Δ	Ambidexterity	15	10.011	7.308	2.386	0.238
6	□	Alliances	10	9.374	6.842	0.633	0.289

The analysis of the proliferation of research publications on dynamic capabilities demonstrates an evolution of trends on DC, novel insights into strategic management as well as highlighting research challenges in the field. For example, DC has integrated theoretical aspects of evolutionary economics, behavioural theory and the knowledge-based view into core issues of strategic management. The bibliometric analysis identified a learning turn in the strategy literature and in particular, shows that in most recent publications from 2009 behavioural aspects increasingly underpin strategic topics in DC. Similarly, the analysis shows a strategic turn in the literature on learning in the DC field that corresponds directly to the learning turn with links between learning and firm performance featuring prominently in those streams of research which both tend to merge. In the general sense, the review confirms the analysis of Di Stefano et al. (2010), who found that behavioural theory (Cyert and March, 1963) and evolutionary economics (Nelson and Winter, 1982) form the theoretical underpinning of both streams hence facilitates their integration. In addition, the results of the analysis demonstrate clearly that the DCV is no longer a by-product of the RBV. Instead the identity of the DCV builds mainly on the argument that firms need to govern processes of learning and change, which DC research explores, in order to adapt their resources and capabilities to novel situations and thus keep pace with environmental changes. Importantly, the review also highlighted outstanding DC research issues and directions for future research. The 'microfoundations and acquisitions' cluster has a low level of coherence, which indicates that the cluster is still at an early stage of development. This supports the call by Arend and Bromiley (2009: 86) for a stronger foundation of DC concepts in organization theory. It is argued that a stronger foundation would crystallise DC and ensure that empirical studies are assessed and compared in a structured manner which in turn could provide a better understanding of the generic microfoundations of dynamic capabilities. This would also

help to elucidate the field's central theoretical concepts and identity by drawing on (a) the interaction between top-management cognition, (b) strategic decision-making and (c) routines and practices for reconfiguring the firm's resource base. In this regard, the current state of DCV research would benefit in particular from qualitative research and case studies that elucidate the micro-mechanisms of routines, practices or decision-making activities, thereby advancing the theoretical understanding of dynamic capabilities.

To conclude this section on the literature critique of the bibliometric data on current dynamic capabilities research, the thesis provides its main contributions towards the research questions and objectives;

1. The bibliometric review highlights that the microfoundations research domain remains at an infancy and would benefit from a deeper exploration of generic microfoundations of dynamic capabilities. This can be achieved by investigating microfoundations in specific contexts through empirical studies, as is the case of this PhD research in investigating capability renewal and reconfiguration in the IT security industry.

2. Related to (1) above, it emphasizes the value qualitative case study research can contribute to dynamic capability scholarship by advancing our understanding of micro-mechanisms that underpin dynamic capabilities such as routines, which are best studied through qualitative case study research suited to understanding social phenomena. Structure is identified as a microfoundation of routines and capabilities (Felin et al, 2012) and this thesis seeks to investigate how structure enables or constrains dynamic capabilities in organisations.

3. Building on empirical case study research specified in (1) and (2) above allows dynamic capability scholarship to provide more recommendations for managerial practice. The thesis aims to provide practical managerial advice on processes and activities that help to build and sustain dynamic capabilities in firms.

The next section will discuss an alternative qualitative review of the state of dynamic capabilities research. There are specific benefits that qualitative reviews provide which complement quantitative reviews. For example, expert-opinion qualitative reviews highlight topics that empirical and theoretical research does not investigate sufficiently. Such topics include the interplay between dynamic and operational capabilities, the theoretical discrepancies regarding the different constituent of dynamic capabilities (i.e. routines vs. simple rules) and the influence of market dynamism on the nature of dynamic capabilities. Nevertheless, more conceptual work is needed in order to advance our overall understanding of dynamic capabilities, deepen research within the various subfields and to establish how the rich and diverse strands of DC research interrelate in many aspects.

3.5.3 AN ALTERNATIVE REVIEW OF DYNAMIC CAPABILITIES RESEARCH: VALIDATING THE EVOLUTIONARY TREND OF DYNAMIC CAPABILITIES VIEW

In a paper by Wilden et al., (2016) the authors provide a unique and comprehensive examination of DC literature that goes beyond past reviews by combining text-based analysis with surveys of, and interviews with, researchers in the field in order to examine the evolution of DC in written literature and identify missing research themes. The systematic and novel approach adopted goes beyond existing reviews of the field (e.g., Barreto, 2010b; Di Stefano et al., 2010; Vogel and Guttel, 2013) by not only looking at previous research, but by also looking forward in a collaborative fashion by surveying and querying authors to better assess the evolution and future direction of the field. The methodology adopted involves three inter-related stages: First (1), a systematic review of all major articles published (133 articles examined which were published in 12 leading management journals from 1997 - 2015) to reveal prevalent themes and contradictions in DC scholarship. Second (2), authors of these examined articles were surveyed directly to capture the evolution of the concept, missing and emerging research areas, and their definitions and meanings of a dynamic capability, and Third (3), structured discussions of (1) and (2) were held with authors who attended two leading management conferences – 2013 Academy of Management and the Strategic Management Society conferences. In short, the analysis of DC research performed based on the process of textual analysis and data mining, author surveys, and author discussions produced very significant findings. The findings from the work were categorized around (1) past and persistent themes; (2) emerging themes; and (3) hypothesized or future-shaping themes. Table 4 shows the evolution trend of dynamic capabilities themes.

In the past and persistent themes group, several themes that were significant in the early development of DC research has either disappeared from view or are no longer central to the core discussions over time. For example, competitive advantage was prominent in early DC scholarship, that is, discussions on how dynamic capabilities can be a basis of competitive advantage, exploring the sources of competitive advantage especially in turbulent environment as well as the direct link between DCs and performance. In this regard DCs were initially viewed as a primary capability impacting performance such as new product development, alliances and strategic decision making (Eisenhardt and Martin, 2000). Competitive advantage is still seen as a core and persistent theme in DC, however the focus has shifted from finding a dominant DC to investigate the processes underlying DCs that allow firms to adequately respond to or shape their environment. Similarly, today the role of technology and R&D is not considered a core component of the DC as scholars view them as conditioning factors in relation to firms, industries, markets and contexts in which firms are deployed – these contingencies are viewed as non-core. Also, earlier thinking viewed ambidexterity and the strategy of market exploration and exploitation as a

DC in itself, however much of this theme is now very much integrated into more persistent and emerging themes such as organizational routines and the enablers of DCs. Another important finding from the work is the view by scholars about the decline in the importance of environmental conditions and change in the DC. Teece (1997) particularly tied dynamic capabilities to fast-changing, uncertain markets while later research suggested that DCs existed in all environments (Helfat et al., 2007; Zollo and Winter, 2002). More recent research argues that what matters is the ability of latent DCs to be realized in the most appropriate circumstance which can be contingent on environmental turbulence (Protogerou et al., 2011; Wilden et al., 2013; Wilden and Gudergan, 2015). Overall, there is strong evidence that the core of the DCV is learning, resources, routines and performance (Danneels, 2008; Kale, 2010; Romme et al., 2010; Zollo and Winter, 2002) with several previous themes being either integrated into this core set of themes or being viewed as marginal and discarded. Learning, routines, resources and performance were identified as the most central and persistent themes investigated.

The emerging themes identified indicated a shift in focus in the current and future directions of DC research. Recent research has focused significantly on the processes and microfoundations underlying DCs and the enablers that take latent DCs and allow them to be realised in the most appropriate circumstance. For example, the role of how cognitive models underpin organizational routines has emerged as a growing and important theme. Importantly, evidence from the emerging themes indicates a much more intermediate and micro level approach to research on dynamic capabilities which is consistent with an increased interest in managerial, individual and group-level capabilities as complementary to firm level dynamic capabilities. A significant emerging conversation on dynamic capabilities is a shift in thinking about the nature of DCs from being mainly reactive to market dynamism towards a role for DCs in actively shaping and creating markets. This view is seen in (Pitelis and Teece, 2010: 1247), who emphasized the lack of work on "value creation through market and eco-system creation and co-creation", which was particularly important in fast-changing environments where entrepreneurial managers consistently create markets for their ideas as these markets may not or only vaguely exist or be imperfect. Some organizations respond to market dynamics (i.e. they are market-driven) while others seek to actively change i.e. shape or create new markets (i.e. market-driving) Day (2011). The emerging themes in DC can be summarised as (cognitive) processes, contingencies, microfoundations, enablers of dynamic capabilities and market creation. In order to advance the DC construct as a cornerstone strategic perspective within strategic management, the work concluded that four main issues require further development: (1) emphasis on the microfoundations of DCs and their relationship to performance; (2) an accounting for the multilevel nature of DCs and how the levels are interrelated; (3) clarification on confusions about DC definition, and (4) methodological

demands arising from the prior three issues, that is a smoothing of the disconnect between various conceptual developments, theoretical advancements and empirical investigations.

To conclude this section, the discussions demonstrate that the qualitative review of the evolving trends in dynamic capability research has complimented insights from the bibliometric critique achieved in the preceding section, and also contributes to the research questions and objectives of the PhD research in two significant ways;

1. It highlights the shift in focus in the current and emerging dynamic capability research towards microfoundations of dynamic capability, thus demonstrating its potential as a fertile ground for further exploration to generate new insights on dynamic capabilities. In this light, this study seeks to contribute to the microfoundations agenda by elucidating microfoundations of dynamic capabilities in the IT security industry.

2. It informs of an increased research focus in both intermediate (group) and micro level approaches to complement firm level dynamic capability research. In this regard, this research advances the multi-level approach by investigating the multi-level nature of dynamic capabilities in the IT security industry by integrating analysis at macro, meso and micro levels including analysis of individual actor, group/aggregate actor and firm level activities.

Table 4. The Evolution Trend of Dynamic Capability Themes (Source: Wilden et al., 2016)

	Theme	Tendency Over Time
Past themes	Alliancing	↓↓
	Competitive advantage	↓↓
	Technology	←←
	Ambidexterity	←←
Persistent themes	Learning	↔
	Resources	↔
	Performance	↔
	Routines	↑
Emerging themes	(Cognitive) processes	↑
	Contingencies	↑
	Microfoundations	↑↑
	Enablers of dynamic capabilities	↑↑
	Market creation	↑

Key: ↓↓ Declining strongly; ←← Becoming non-core; ↔ Plateauing; ↑ Increasing; ↑↑ Increasing strongly

3.6   CONCLUSION

The growing interest in the dynamic capabilities perspective in strategic management has been to compliment and address some of the limitations of the resource-based view, particularly regarding how firms refresh and adapt their resources and capabilities to either create or adapt to market conditions and environmental changes. Despite the vigour and scholarly advancement in dynamic capabilities research, there remain sources of contradictions, for example in definitions of the concepts and the relevance of dynamic capabilities to firm performance and competitive advantage. There has been increasing calls for more research to address these contradictions in the literature, especially qualitative empirical studies to supplement the dominant conceptual papers, if the dynamic capabilities perspective is to fulfil its potential as 'the new touchstone firm-based performance-based theory' in strategic management (Arend and Bromiley, 2009: 75).

A quantitative bibliometric view of dynamic capabilities literature by Vogel and Guttel (2013) has shown that current DC research is clustered around six main themes, namely; strategic learning and change, technological innovation & adaptation, vertical scope, microfoundations &

acquisitions, ambidexterity, and alliances. Similarly, a more recent literature review by Wilden et al., (2016) has highlighted (cognitive) processes, contingencies, microfoundations, enablers of dynamic capabilities, and market creation as emerging themes in the evolution trend of dynamic capabilities research. It is evident that microfoundations is regarded as a core aspect of DC scholarship which requires further exploration. Wilden et al., (2016) has emphasized that four main issues require further development in the dynamic capabilities construct, two of which are; microfoundations of dynamic capabilities and their relationship to performance, and accounting for the multilevel nature of dynamic capabilities and how the levels are interrelated. Significantly, these two aspects of dynamic capabilities research reflect two of the aims and objectives of this PhD study as discussed.

This chapter has covered the dynamic capabilities literature and identified the growing interest in microfoundations of dynamic capabilities in scholarship. The next chapter of this thesis will delve deeper into the microfoundations of dynamic capabilities as that represents the central theme of the research work.

CHAPTER 4: THE MICROFOUNDATIONS OF DYNAMIC CAPABILITIES AND ROUTINES

INTRODUCTION

The preceding chapter 3 on Dynamic Capabilities and Strategic Management critique the literature on dynamic capability scholarship and revealed a number of important insights that have informed this thesis. First, that the microfoundations of dynamic capabilities research agenda is an emerging and fertile domain within the field with calls for deeper exploration especially within specific contexts. Second, that there is a need for empirical multi-level qualitative case study research approach to connect analytical levels and inform managerial practice on dynamic capabilities. In this regard, this chapter connects to and builds on the contributions of chapter 3 in two meaningful ways. First, it focuses on the literature on microfoundations of dynamic capabilities and discusses important microfoundations theory and concepts that are relevant to the research themes and objectives of this study, for example individuals, routines and processes. Second, one of the research objectives of this study is to investigate the multi-level nature of dynamic capabilities in the IT security industry by exploring the macro, meso and micro levels. This chapter opens up the levels from a dynamic capability point of view by discussing theories of the individual, firm and group dynamics including transactive memory system (TMS) in groups, top management teams (TMTs), transactive memory system in TMTs, and managerial cognitive capability. This is important because the theoretical contribution on microfoundations of dynamic capabilities in this chapter provides the theoretical platform for discussions in the Findings and Discussions chapters later in this thesis. This ensures that the discussions are rooted in extant theory and the research contributions of this work are framed in dynamic capabilities theory. The outline of the chapter is as follows;

The microfoundations of dynamic capabilities – sensing, seizing and reconfiguring are discussed followed by the microfoundations of routines and capabilities. Transactive memory system as a microfoundation of dynamic capabilities is then covered leading on to discussions on top management teams and their transactive memory system as a microfoundation of dynamic capabilities.

4.1 THE MICROFOUNDATIONS OF DYNAMIC CAPABILITIES – SENSING, SEIZING AND RECONFIGURING

Teece's (2007) paper titled, 'Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance' is one of the most cited paper amongst scholarly contributions in the field of microfoundations of dynamic capabilities (Peteraf et al., 2013).

Building on his seminar paper, Teece et. al (1997) where the authors formally coined the dynamic capability construct and conceptualised the framework in academic literature, he argued that in rapidly changing environments characterised by fast-changing technology and global competition, "consumer needs, technological opportunities, and competitor activity are constantly in a state of flux" (Teece, 2007: 1322). As a result, opportunities are fleeting and uncertain, requiring firms to extend, build, and deploy resources and capabilities at a rapid clip. The dynamic capabilities construct describes how firms are able to achieve this – they enable business enterprises to create, deploy, and protect the intangible assets that support long-run business performance. The construct has been further advanced (Teece, 2007; 2012) to explain the mechanisms that enable firms to reconfigure resources and capabilities rapidly.

Teece's (2007) article draws on the social and behavioural sciences while incorporating aspects of evolutionary theorizing in economics, to specify the nature and what was termed, *microfoundations* of the capabilities necessary to sustain superior firm performance in rapidly changing environments. These microfoundations of dynamic capabilities broadly refer to, the distinct skills, processes, procedures, organizational structures, decision rules, and disciplines – which underpin enterprise-level sensing, seizing, and reconfiguring capabilities that are difficult to develop and deploy (Teece, 2007: 1321). An emphasis is placed on the variety of firm-level processes that can be used for sensing and seizing opportunities, and reconfiguring resources, as these form the microfoundations of dynamic capabilities. The framework advanced highlighted the distinctions in each of the processes as well as their underlying activities, for example, the distinction between sensing and seizing is particularly important, as each is seen as resting on different activities for "identification, development, co-development, and assessment of technological opportunities in relationship to customer needs (sensing)" versus "mobilization of resources to address needs and opportunities, and to capture value from doing so (seizing)" (Teece, 2014: 332). Reconfiguration makes up "the third leg of the dynamic capabilities triad [that] involves sustaining growth and profitability, by enhancing, combining, and reconfiguring the firm's organizational assets" (Helfat and Peteraf, 2015: 842). The framework developed has both theoretical and practical relevance; it provides scholars with a way to understand the foundations of long-run firm success but also offers practical prescriptions to managers to enable them outline relevant strategic considerations and the priorities they must exploit to enhance firm performance and escape the zero-profit tendency that occurs when operating in markets that experiences global competition. It argues that these mechanisms or microfoundations show that dynamic capabilities involve entrepreneurial managerial capitalism (Teece, 2007: 1347) as firms with strong dynamic capabilities are immensely entrepreneurial since they not only adapt to

business ecosystems, but also shape them through innovation and through collaboration with other firms and institutions.

Even though the microfoundations framework largely specifies firm-level processes for sensing, seizing, and reconfiguring, it draws on literature on entrepreneurship to emphasize that opportunity discovery and creation can originate from the cognitive and creative ('*right brain*') capacities of individuals. In fact, dynamic capabilities reside in large measure with the firm's top management team, but are impacted by the organizational processes, systems, and structures that the enterprise has created to manage its business in the past (Teece, 2007). For example, opportunities discovery may also be grounded in organizational processes, such as research and development activity which may impact on individual's ability to generate ideas or collaborate to create novel solutions. The ability to recognise opportunities depends in part on the individual's capabilities and extant knowledge and also in part on the knowledge and learning capacities of the organization to which the individual belongs. The ability to sense and/or shape opportunity is not uniformly distributed amongst individuals or firms and this may account for heterogeneity between firms. Firms can therefore create, maintain and sustain dynamic capabilities by establishing and promoting the requisite mechanisms such as a learning culture and processes that undergird dynamic capabilities, which in turn, create superior individual cognition and firm-level disposition relating to sensing, seizing and reconfiguring capacities.

More so, Teece (2007) argues that the requisite managerial services that underpin dynamic capabilities cannot be outsourced, hence, understanding and implementing the processes and structures that undergird dynamic capabilities is firm specific, and requires a deep knowledge of both the firm and the ecosystem in which the firm is situated. Therefore, the microfoundations of dynamic capabilities which relate to three classes of sensing, seizing, and reconfiguring, are in many ways context- specific and path-dependent, idiosyncratic to firms, and are developed over time. Successful firms need to build and utilise all three classes and since all three classes are unlikely to be found in individual managers, they must be represented within top management and it is imperative that top management operates well as a team (Teece, 2007). The dynamic capabilities construct, and the advanced microfoundations framework shown below, seek to provide an understanding of the traits, processes, and decision-making approaches that are valuable not only for firm's to gain competitive advantage in a favourable ecosystem, but to adopt new strategic considerations to ensure that opportunities are sensed, can be seized, and the firm can be reconfigured when the market and/or technology is transformed while the firm remains agile so as to continuously refresh the foundations of early success in order to sustain superior economic rents over time. Figure 2 shows an illustrative model of the microfoundations of dynamic capabilities. The next section will discuss the constituents of routines and capabilities.

Figure 2. An Illustrative Model of Microfoundations of Dynamic Capabilities (Teece, 2007; Helfat & Peteraf, 2015)

```
┌──────────────┐     ┌──────────────┐     ┌──────────────────┐
│   SENSING    │ ──▶ │   SEIZING    │ ──▶ │  RECONFIGURING   │
└──────────────┘     └──────────────┘     └──────────────────┘
```
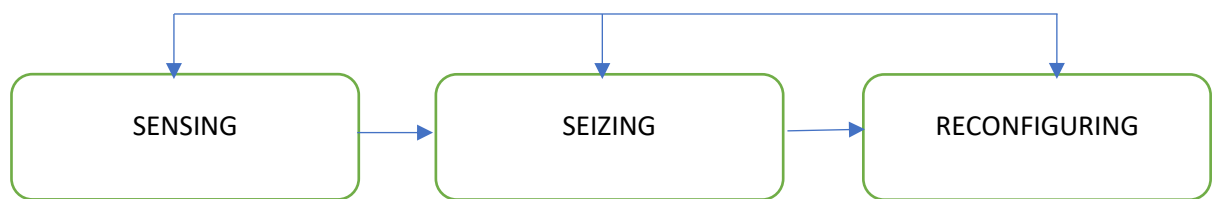
4.2   THE MICROFOUNDATIONS OF ROUTINES AND CABALITIES

4.2.1   THEORY OF ORGANIZATIONAL ROUTINES

Routines and capabilities are dominant constructs in a host of fields in management research because they hold explanatory mechanisms for several widely accepted theories. Since the concept was first introduced by Stene (1940), organizational routines have been regarded as the primary means by which organizations accomplish their functions – they are temporary structures that are often used as a way of accomplishing organizational work (March and Simon, 1958; Cyert and March, 1963; Thompson, 1967; Nelson and Winter, 1982). If routines and capabilities are central to the functioning of organizations, it is therefore not surprising that they have played a prominent role in the analysis of organizational and competitive heterogeneity. Despite the vast amount of interest in routines and capabilities, which has advanced our understanding of the constructs, scholars have argued that the underlying microfoundations or micro-level origins of these constructs have not received adequate attention.

As with any much-discussed construct, several definitions of the routines abound. The notion of routines as 'patterns' has been central to the concept from early on (Becker, 2001), recognising the regularity of it as temporary structures by which organizations recurrently accomplish things while Winter (1964: 263) defined a routine as 'pattern of behaviour that is followed repeatedly, but it is subject to change if conditions change'. This view of routines as patterns can also be seen in Nelson and Winter (1982: 14, 15 and 113), Heiner (1983: 334), Teece and Pisano (1994: 541 and 545), Cohen et al. (1996), Grant (1996: 115), Teece et al. (1997: 518) and Dyer and Singh (1998: 665), to mention but a few. There is now considerable agreement in the literature that routines can be defined as 'repetitive, recognizable patterns of independent actions, carried out by multiple actors' (Feldman and Pentland, 2003: 95). Importantly, routines are regarded as explicit and collective which involve multiple actors, rather than individual-level phenomena (Nelson and Winter, 1982: 107; Pentland, 2011): the emphasis is placed on the interactions rather than the individuals that are interacting (Felin and Hesterley, 2007).

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4.2.2 OSTENSIVE ASPECT AND PERFORMATIVE ASPECT OF ROUTINES

Despite the long and rich history in the routines literature, a more recently theorisation of routines conceptualise routines are being made up of two parts, an ostensive aspect and a performative aspect and makes a clear distinction between the two aspects (Feldman and Pentland, 2003). The ostensive aspect is the ideal or mental schematic form of the routine in the minds of individual actors – it is the abstract, generalised idea of the routine. The performative aspect on the other hand, consists of specific actions, by specific individuals, in specific places and times – it is the routine in practice. In other words, the ostensive aspect of the routine is the idea while the performative aspect is the enactment, and both are necessary to constitute what we understand as the routine. Routines involve the coordination of multiple actors and this ensures that the ostensive aspects of routines cannot be undifferentiated. This is because the social stock of knowledge about the routine will be unevenly distributed as individuals cannot know everything, and even if they had access to the same information, they might not interpret the information in the same way i.e. their mental schema of the routine will differ. More so, not every individual who engages in a routine has the same goal or is seeking the same result (Feldman, 1989). This introduces diversity and individual interest such that there is no single, objective routine but rather a variety of different perspective of what is involved. Simply put, it is unlikely that there is a single ostensive understanding but rather multiple structures of ostensive understanding.

In a similar vein, during the practice of routines i.e. the performative aspect of routines, the practices are carried out based on rules or expectations or standard operating procedures, but the particular course of action individuals choose are always, to some extent, novel (Feldman and Pentland, 2003: 95). Unreflective, habitual action is certainly possible, but even in highly constrained situations, actors engage in reflective self-monitoring in order to see what they are doing (Giddens, 1984). They interpret their actions in order to make sense of what they are doing and, though their choices of how to proceed appear automatic or mindless at times, there is always the possibility of resisting expectations and doing their free will (Giddens, 1984; Orlikowski, 2000). Even routines that have been engaged in by the same people many times might be adjusted to changing contexts. Importantly, these arguments clearly demonstrate that individual discretion, choice and agency are vital components of the performative aspect of routines.

4.2.3 A SOCIAL ONTOLOGY VIEW OF ROUTINES

The theoretical characterization of routines into ostensive and performative aspects discussed here has significant implications for our view of, and study of organizational routines.

First, it highlights the fundamental social aspects of routines as a collective phenomenon involving multiple individuals. Since routines are carried out by multiple actors who only have a partial, distributed knowledge of a routine, routines create organizational knowledge and 'binds' organizational knowledge at their 'joints' in a process that is socially constructed (Becker, 2004). Individuals perform different tasks within routines therefore their experiences and resulting learning are unique. Because actor's understanding and performance of routines is partial, idiosyncratic and distributed (Feldman and Pentland, 2008) and due to differences in actor's ostensive and performative aspects of routines it means a shared collective knowledge is socially constructed in organizations, for example during the process of knowledge articulation and codification to create artefacts. This ontology builds on the idea that routines, like other social phenomena, embody a duality of structure and agency (Giddens, 1984; Bourdieu, 1977; 1990). Routines consist of two related parts as stated previously; one part embodies the abstract understanding of the routine (multiple structures or ostensive understanding exists), while the other part refers to the actual performance of the routine by specific individuals, at specific times, in specific places (which introduces agency into routines). Agency involves the ability to remember the past, imagine the future, and respond to the present circumstances (Emirbrayers and Mische, 1998). Unlike traditional views of routines which emphasize structure (e.g. conceptualises the structure of routines as habits), this ontology introduces agency, and therefore brings social issues such as subjectivity and power which are vital components within the practice of routines in organizations, to the fore. This conceptualisation recognises both structure and agency in routines, a possibility which is minimised or excluded in the traditional theories of routines based on evolutionary theory. Thus, a social collective view of routines allows social theories and a social constructivist lens to be applied to the study of routines based on organizational theory and behaviour which provides new insights, particularly on the role of agency in organizational routines. For example, since multiple ostensive understanding exist, and actor's understanding of routines are partial and distributed, it might be interesting to explore how actors created shared understanding about routines (in the form of organizational knowledge) and legitimise or give meaning to their actions.

Second, the social ontology conceptualization of routines, allows social theories to be applied to the study of routines. For example, structuration theory proposes that structure is produced and reproduced through the actions taken by agents, and the actions taken are constrained and enabled by structure (Giddens, 1984). Adopting a structuration or practice theory perspective shows that the ostensive and performative aspects of routines are recursively linked as shown in

figure 3, with the performances creating (or informing) and recreating (or re-informing) the ostensive aspect and the ostensive aspect constraining and enabling the performances (Feldman and Pentland, 2003). Put differently, individuals performing routines (performance aspect) gain experience and resultant learning which informs their mental understanding of routines (ostensive aspect) which goes on to enhance the performance of routines by individuals in subsequent cycles of carrying out the routine. Thus, the ostensive aspect and performative aspect of routines occur in duality with one aspect constantly shaping the other in recursive action. Importantly, this shows that routines, by nature, are inherently generative systems and are sources of endogenous change. This view of routines is contrary to the traditional emphasis on the stability or rigidity of organizational routines by evolutionary theorists and economists. In fact, they argue that the very reason routines arise in organizations is that they are a way for organizations to 'capture' or 'fix' or 'store' organizational knowledge and capabilities because they are functional. That is, they minimise costs, increase managerial control, while legitimising the 'way things should be done' and preventing the organisation from reinventing activities every time they take place. As such, routines are associated with inertia and inflexibility. While routines can be a source of stability, inertia and inflexibility, they can also be an important source of flexibility and change (Feldman and Pentland, 2003). The conceptualization of routines into ostensive and performative aspects and thus, the logic that both aspects occur in duality with each constantly shaping the other demonstrates the inherent capability of routines to generate change, merely by its ongoing performance. This theoretical approach has advanced our understanding of the nature and attributes of organizational routines and provided opportunities to gain new insights about routines. For example, it might be potentially interesting to explore how a firm's organizational structure, systems and processes enable or constrain routine change.

Figure 3. Conceptualization of Ostensive aspect and Performative Aspect of Routines (Feldman & Pentland, 2003)
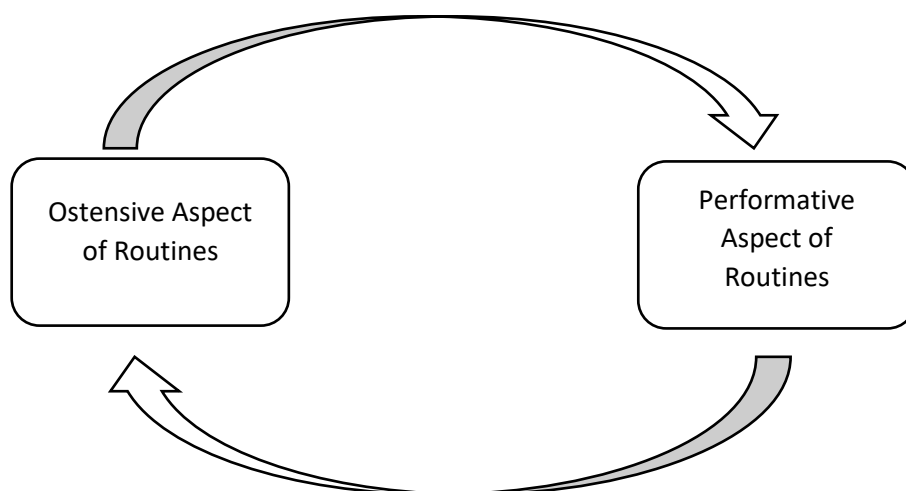
4.2.4 THE MICROFOUNDATIONS OF ROUTINES AND CAPABILITIES: INDIVIDUAL, PROCESSES AND STRUCTURE

Similar to routines, many definitions of capabilities can be found in literature. Winter (2000: 983; 2003: 991) define an organizational capability as 'a high level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type'. This makes factors such as learning, experience, resources and even routines, inputs to capabilities.

It is now widely accepted that routines are collective phenomena. A microfoundational approach focuses on collective phenomena that need unpacking, specifically the creation and development, and the reproduction and management of collective constructs such as routines and capabilities. Doing so advances our understanding of what drives differences in behaviour and performance of firms in a number of ways. First, it opens up the primary components underlying routines and capabilities. Second, understanding how these components interact, within or across categories, will inform of sources of differences in routines and capabilities. Third, clarifying these sources of heterogeneity will, in turn, allow us to understand how microfoundations contribute to heterogeneity among firms. Fourth, understanding how routines and capabilities are created, maintained, extended, leveraged, replicated, adapted, and even phased out (as noted in literature on dynamic resource-based view capability life cycle by Helfat and Peteraf, 2003) in terms of their constituent microfoundations has relevance to both management theory and general managerial practice.

It is difficult to specify exactly what constitutes microfoundations of routines and capabilities simply because of the considerable variations about the constructs themselves and these variations may have explanatory consequences. For example, are the microfoundations of ordinary capabilities the same as those of dynamic capabilities? Also, the microfoundations for routines and capabilities could refer to a number of conceptually different processes, such as the emergence, maintenance, replication or adaptation of routines and capabilities. Felin et al. (2012) cluster the microfoundations of routines and capabilities into three core categories; individuals, social processes and interactions, and structures. These categories do not operate in a vacuum, rather they relate in different interactions within an organization, for example, individuals and individuals, individuals and processes, etc, and such interactions within and among categories create an additional set of effects that contribute to the collective phenomena of routines and capabilities.

Individuals

The simplistic way to think about organizations is an aggregation of the individuals that compose them and the role of such individuals is important to understand routines and capabilities (Felin and Hesterley, 2007). Research has shown that individuals such as managers or 'star talents' greatly affect the behaviour and performance of organizations (e.g. Groysberg and Lee, 2009; Zucker and Darby, 1996) and by this fact, it is reasonable to argue that individuals in organizations form microfoundations of routines and capabilities. The attributes and skills of individuals are important.

Behavioural and psychological: These are aspects of individuals such as bounded rationality, cognition, and agency and are important fundamentals in understanding collective phenomena. Individuals have different beliefs, interest, and goals which inform and affect their choices and decisions which may have far reaching implications on organizational work far beyond their individual work or team. For example, the decision a manager makes on whether and how a routine is adapted could have significant implications for how the routine evolves our time and the performance effects of the overall capability. It is also widely accepted that the heterogeneity of individuals matters in terms of the human capital they bring to organizations (e.g. Mowday and Sutton, 1993; O'Reilly et al., 1991). This can be viewed in terms of individual characteristics (e.g. gender, IQ) and abilities. Differences in skills and abilities might be general in nature or more specifically related to developing, modifying, and enacting routines and capabilities.

Skills: A general skill might relate to engaging and working effectively with multiple actors (relational ability) in carrying out routines or an ability to integrate different elements such as knowledge or artefacts (integration ability) which might affect the outcome of a routine or capability. Individuals might also possess specific or unique skills with regards to creating, forecasting, or sensing, that may directly have bearings on the development and modification of routines and capabilities. From a knowledge-based view of a firm there are contradictory views about whether individuals play a vital role in organizational knowledge. Kogut and Zander (1992) and Spender (1996) argue that individual-level elements matter less than other factors in the study of routines and capabilities while other scholars e.g. Abell et al. (2008) and Grant (1996) view individual skills and abilities as central for understanding organization level outcomes. The key question then is, how are organization's routines and capabilities affected when individuals leave or enter the organization? Evidence suggests that employee mobility has significant and varying effects on organizations (Madsen et al., 2003; Rosenkopf and Almeida, 2003) leading some scholars to champion the role of individuals to organizations knowledge. It is argued that individual level attributes such as choices, agency, cognition, skills and abilities are central to understanding collective phenomena such as routines and capabilities.

Social Processes

Social processes and the interaction of individuals play an important role in understanding routines and capabilities. A simple definition of a process is that it is a sequence of interdependent events – this definition is similar to that of routines. Also, putting processes into action requires the intervention of individuals. Therefore, an understanding of interactions amongst individuals and processes in organizations helps to advance our understanding of how routines and capabilities emerge and evolve. There are different types of process-based routines based on their design and deployment and Becker (2005) characterised routines into a spectrum based on their propensity to change. Routines that follow strict, rigid underlying processes e.g. nuclear power station routines or medical procedures, may result in limited variation at the organizational level. On the other end of the spectrum are routines that allow for much managerial or actor discretion in the performance of the routine (performative aspect of routines) and such routines could exhibit variations over time, and thus heterogeneity within and among firms (e.g. Hoopes and Madsen, 2008). Another time of process-based routines are *ad hoc* problem solving, which diverges from the traditional 'highly-patterned' or 'repetitious' conception of routines (Winter, 2003: 991). Various researchers have studied variation in types of process-based routines and their impact on organizational outcomes. For example, Cohen and Bacdayan (1994) demonstrated using a lab experiment, that actors often store routines as procedure memories or knowledge (i.e. 'what to do') and this procedural memory could have negative implications for organizations when routines are changed – individuals have to 'reboot' their memories to store new knowledge associated with the new routine. This could have negative effects on organizational performance, at least in the short term. The methods of coordination and integration between individuals and processes fundamentally shape routines and capabilities. Both formal (e.g. rules, guidelines, standard operating procedures) and informal forms of coordination (e.g. accepted norms, values) determine sequences of interdependent activities and individual actions. For example, studies have demonstrated how formal processes support the integration of different organizational elements such as individuals, teams, or cross-functional knowledge resources and such integration efforts facilitate cooperation and coordination which influence organizational outcomes (Lawrence and Lorsch, 1967). This poses interesting microfoundation questions about how formal and informal processes may constrain or enable individual actions as they relate to routines and capabilities. To what extent do routines and capabilities benefit from being rigid versus flexible? What is the role of particular individuals within these routines?

The technology adopted by a firm could influence the type of interaction between individuals and processes and this can shape organizational outcomes. For example, it has been demonstrated

that the use of specific technologies structure social interaction among medical specialists (Barley, 1986) and positively influences organizational learning in financial services firms (e.g. Ashworth et al., 2006). Also, the concept of 'situated learning' suggests that problem-solving in organizations could be influenced by technology available and individual's interaction with technology in context. In addition to technology, ecology, that is, the multitude of materials that individuals interact with, influence organizational routines and capabilities in nuanced ways in which they enable or reinforce the behaviour of individuals. Pentland and Feldman (2008) demonstrated the limitations material artefacts could have in designing and executing organizational routines while Cacciatori (2012) illustrated how a system of artefacts shapes patterns of actions (routines) in a British engineering consulting firm.

Structure

Structure is viewed as a microfoundation of routines and capabilities because different forms of organizational structures specify the conditions that enable or constrain individual behaviour or collective action as well as establish the contexts for interactions, which ultimately shape routines and capabilities. Individuals in organizations often make decisions in the face of organizational constraints based on the established heuristics or rules that guide decision making in that organization. Some organizations might adopt a flexible structure and rule systems allowing for improvisation, with regards to its decision-making activities, whereas others might implement a more complex rule structure – these different approaches may affect how routines and capabilities are created and evolve in organizations. Research has shown that the degree of complexity of an organizational structure or form (for example, tall vs. flat; matrix, virtual matrix, network form, etc) influences various activities such as information processing, knowledge transfer, routine replication, and capability development. Flat organizational structures typically allow for autonomy and superior use of information held by individual members, but less effective coordination (Foss, 2003) and an organization's design creates barriers for effective knowledge sharing within the organization which could have negative effects on coordination and integration (Hoopes anf Postrel, 1999). Research on organizational structures has provided valuable insights on their effect on routines and capabilities, however there remain room for more exploration of this microfoundation. For example, what types of capabilities may benefit more from a structured or unstructured approach in their creation and development?

4.3 TRANSACTIVE MEMORY SYSTEM AS A MICROFOUNDATION OF DYNAMIC CAPABILITIES

It is widely accepted that the collective knowledge an organization possesses is vital to its competitive advantage and performance. The transactive memory system argument suggests that the nature and structure of that knowledge within organizations is an important building block for dynamic capabilities. Specifically, transactive memory serves as a microfoundation of dynamic capabilities in that it is an organizational system for collectively encoding, storing, and retrieving knowledge. It can facilitate the combinative integration and renovation of an organization's knowledge assets so as to integrate, build, and reconfigure internal and external competences to respond to rapidly changing environments (Teece et al., 1997: 516).

4.3.1 DEFINITION AND ROLE OF TRANSACTIVE MEMORY SYSTEMS

A transactive memory system is defined as a shared system that individuals in groups and organizations develop to collectively encode, store, and retrieve information or knowledge in different domains (Lewis and Herndon, 2011; Wegner, 1987). It simply refers to the knowledge of 'who knows what' in an organization. There are several studies that have shown that transactive memory in groups is linked to improved performance in a variety of activities such as consulting, product assembly, and software development (Faraj and Sproul, 2000; Liang et al., 1995). Three factors indicate the existence of transactive memory systems in organisations; First, knowledge or memory specialization (ability of group members to develop specialised and complementary expertise). Second, task credibility (ability of group members to trust each other's knowledge). Third, is task coordination (ability for group members to work seamlessly when performing a task). This collective knowledge of who knows what allows individuals to access more knowledge than they individually possess while at the same time helps to establish individual credibility and expertise status, which in turn, lead individuals to trust each other's expertise domain. This established transactive memory system has been founded to be beneficial in stable environments, but even more significant in environments experiencing rapid change. For example, work by Ren et al. (2006) demonstrated that transactive memory systems were more valuable in environments where problems changed, and knowledge became obsolete than when problems were stable. Similarly, Gino et al. (2010) showed that well-developed transactive memories were linked to creativity in groups where individuals with expertise are able to reconfigure their knowledge to develop new products and services. This shows that not only do transactive memory systems help a firm to develop effective zero-level capabilities to enable the firm to 'make a living' (Winter, 2003), transactive memory systems also provide a basis for dynamic capabilities that create new capabilities or reconfigure existing ones.

Apart from enabling a firm to update its resource base to adapt to the changing environment, transactive memory systems are also a source of sustainable competitive advantage through three characteristics: path dependency, tacitness and social complexity, and context dependency (Dierickx and Cool, 1989). The development of transactive memory systems in firms takes time through the learning of individuals, working together in a group and communicating, and the path pursued in these processes over time are recursive. This has led Itami and Roehl (1987) to argue that a transactive memory system is an invisible asset that is hard for firms to develop in a short period of time. Also, because transactive memory systems are developed as a result of social interactions between individuals, problem-solving by matching individuals to expertise, and coordination, it creates a system that is complex and socially embedded and this serves as a barrier to imitation as it becomes difficult for rivals to determine the specific source of competitive advantage.

Likewise, individuals in a group work within a certain context thereby creating a 'cospecialized asset' (Teece, 2007) and this specialization that occurs within teams creates a transactive memory system that is somewhat idiosyncratic to that particular team. For example, Huckman and Pisano (2006) demonstrated this fact when they showed that dramatic differences in the performance of surgeons occurred when they performed the same operation in different hospitals with different support teams. Wezel et al. (2006) also concluded that mobility of individuals across firms had the greatest effects when the whole team moved rather only individuals moved, hence reinforcing the value of the cospecialized asset situated in transactive memory systems. An individual who moves to another organization may create another transactive memory system with new co-workers however, the new transactive memory system may not be as relevant to accomplishing a required task due to the tacit nature of some knowledge in the old team which cannot be replicated. Transactive memory systems develop through learning between individuals in organizations and are specific to a particular context of an organization – difference organizations have different members with different expertise, learning and coordination, and so different transactive memory systems. This shows that transactive memory systems are idiosyncratic to organizations and satisfy the criteria for competitive advantage, that is, they are built or developed (Dierickx and Cool, 1989) inside the organization and are hard for competitors to imitate (Barney, 1986; Lippman and Rumelt, 1982).

The value of transactive memory systems is also highlighted when they are compared to routines. Even though routines are also carried out by multiple individuals, they are said to be less dependent on the skills and expertise of particular members than transactive memory systems. The processes or standard operating procedures for a routine e.g. a plant maintenance routine, is usually specified independent of the individuals who carry out the routine – indeed one of main

purpose of routines is that organizations are less affected by turnover when they have routines in place. By contrast, transactive memory systems depend more on the knowledge and skills of particular individuals in organizations and their effectiveness is negatively affected by turnover (Lewis et al., 2007; Moreland et al., 1998).

4.3.2 TRANSACTIVE MEMORY SYSTEMS AND DYNAMIC CAPABILITIES

Dynamic capabilities refer to a firm's ability to *build*, *integrate*, and *reconfigure* its knowledge assets to fit changing environments (Teece et al., 1997). Kogut and Zander (1992) link a firm's well-developed transactive memory system to its ability to enhance its dynamic capabilities by three primary functions: efficiency (the extent to which the capability can take advantage of the expertise knowledge present in the transactive memory system), scope (the breadth of expertise knowledge the firm can draw upon), and flexibility of integration (the extent to which a capability can access additional knowledge and reconfigure existing knowledge). Building new knowledge assets to respond to environmental changes requires timely access to information and astutely filtering information to identify trends in customer needs and marketplace responses (Teece, 2007). Transactive memory systems can aid this by identifying individuals with expertise in certain domains which then facilitate organizational filtering of information about new opportunities and direct the information to those who can decipher valuable insights. Also, as the firm explores new opportunities, the system helps to connect and coordinate individuals with complementary expertise and to combine the expertise in new ways to develop new products and services. Similarly, firms often develop new capabilities by reconfiguring existing knowledge assets so that it can exploit new opportunities that have been identified. This capability-development function is usually tasked to one or several teams e.g. product development team. Transactive memory systems facilitate the building and staffing of these teams by helping to identify individuals with required expertise. Exploration of ideas and experimentation in these teams e.g. prototyping, are social learning activities and collective use of expertise knowledge to create novel solutions. Importantly, transactive memory systems also help the coordination of these teams both internally and externally, by identifying expertise individuals who serve as boundary-spanners to the team's external activities and its access to knowledge repositories outside of the team. In the event that a firm is successful at pursuing new opportunities, the knowledge generated during the exploration process needs to be integrated into the firm's existing knowledge assets such as in routines and operations. Again, transactive memory system enables effective coordination among functional or business units and can support inter-group interaction through high levels of trust, timely information sharing and effective coordination.

As shown, a transactive memory system is regarded as a microfoundation of dynamic capability and can promote the development of such capabilities in an organization. Since the system is developed through learning and experience over time, it is idiosyncratic to a particular organization due to context and path dependency, is hard for rivals to imitate and it is a source of sustainable competitive advantage. Also, through a well-developed transactive memory system, firms are able to build, integrate, and reconfigure their knowledge assets in respond to changing environments.

4.4   TOP MANAGEMENT TEAMS AND THEIR TRANSACTIVE MEMORY SYSTEM: UPPER ECHELONS PERSPECTIVE AS A MICROFOUNDATION OF DYNAMIC CAPABILITIES

In strategic management, the study of managers in the upper echelon (Hambrick and Mason, 1984) and their impact on the organization has a long history, going back at least to *The Functions of the Executive* by Chester Bernard (1938). More recently, the resource-based view has highlighted the importance of managerial skills, particular those of the top management teams (Castanias and Helfat, 1991; Maritan, 2001). Various studies have provided empirical support for this focus on top management, showing that differences between CEOs account for nontrivial portion of the variance of firm performance, termed the "CEO effect" (e.g. Lieberson and O'Connor (1972), Weiner (1978), Thomas (1988), Quigley and Hambrick (2011). So, what role does firm's top management team play in an organization's dynamic capabilities?

4.4.1   WHERE DO FIRMS DYNAMIC CAPABILITIES RESIDE – IN INDIVIDUALS AND ROUTINES, GROUPS OR TOP MANAGEMENT TEAMS, OR IN ALL?

The literature on routines and capabilities as a microfoundation of dynamic capabilities discussed in the previous section, argues that several actors that engage in the routines and capabilities in organizations serve as microfoundations of dynamic capabilities. Similarly, the literature on transactive memory systems discussed above takes the view that the knowledge composition within groups of individuals in firms provide the basis of competitive advantage and serves as the building blocks of dynamic capabilities. While this holds true, some scholars while recognising the role of multiple actors and groups in organizations, have increasingly argued that the remit for building and sustaining dynamic capabilities in firm rest largely within the firm's top management team. For example, Adner and Helfat (2003) argued that some managers may have "dynamic managerial capabilities" with which to build, integrate, reconfigure, and competitively reposition organizational resources and capabilities, and the dynamic managerial capabilities depend to some degree on managerial cognition. Teece (2007) in presenting the microfoundations of

dynamic capabilities suggests a role for cognition in the "sensing," "seizing," and "reconfiguring" components of dynamic capabilities. Although Teece's (2007: 1319) primary concern is with "enterprise level sensing, seizing, and reconfiguring capabilities", he acknowledges that the cognition of top management team members contributes to the microfoundations of dynamic capabilities. In Teece's (2012) paper titled, Dynamic Capabilities: Routines versus Entrepreneurial Action, he is more particular about the role of individual executives in the dynamic capabilities framework. He emphasizes the need to delve into the characteristics of top managers (and entrepreneurs) and the processes they engage in to shape a firm's dynamic capabilities which are often context- or even enterprise-specific, by arguing that there is a critical role for top managers in both transforming the enterprise and shaping the ecosystem through *sui generis* strategic acts that may not stem from routines. Specifically, he argues that unlike ordinary capabilities, certain dynamic capabilities may be based on the skills and knowledge of one or few executives rather than on organizational routines. Capabilities and their underlying routines, on the other hand, are built on the collective learning of combination of several individual's skills, and the use of firm's special equipment/resources and such routines tend towards stability/inertia, though they adapt in certain conditions of environmental dynamism. That is not to say that particular routines cannot form the microfoundations of dynamic capabilities. In fact, the literature has identified several such routines. For example, Eisenhardt and Martin (2000) identified cross-functional R&D teams, new product development, technology/knowledge transfer routines, etc as important aspects of microfoundations. But the argument here is that dynamic capabilities often depends on top management, and on their entrepreneurial competences in order to continuously transform the enterprise to fit the changing environment or to create new markets thereby shaping the ecosystem – especially in capitalist economic systems. The precise argument is two-fold;

First, creative managerial and entrepreneurial acts e.g. creating new markets are by their nature, strategic and non-routine, even though there may be underlying principles that guide these acts. Firm-level dynamic capabilities consist of more than an aggregate of routines, for example, strategizing and asset orchestration (identifying new complimentary assets, acquiring and integrating them) can only be routinized to a certain degree because many such strategic actions and transformations may not happen very often in firms and the process may never be replicated. Some elements of dynamic capabilities may reside in organizations in the form of routines however the capability for evaluating and transforming firm's assets rests within top management (Teece, 2012). The marketplace for roles such as turnaround CEOs or other turnaround specialists would suggest that some companies do not possess these transformational routines, or perhaps that these capacities lie outside the firm because they are perceived as being needed only occasionally. In order words, higher-level dynamic capabilities reside partly in routines and partly

in 'something else'. The study of the corporate history of Apple and the role of former CEO Steve Jobs in the success of the company helps to illustrate this point. Jobs took on a hands-on, personal strategic role in innovation in Apple and in an interview (Burrows, 2004) he pointed out that product development at Apple was a combination of creativity and routines.

Apple's success can be attributed to Job's deep understanding of the market and an unflinching insistence on a simple user-interface and appealing design to create market leading products. This approach can be routinized to some degree i.e. into the firm's culture or 'the way we do things here', but there is no doubt that Apple and its customers benefitted from the creative and brilliant individual talents of Steve Jobs. The argument here is that a firm's dynamic capabilities are largely influenced by the individual talents or traits of the firm's top management either directly e.g. cognition, creativity, etc or indirectly, for example the leadership style or culture that they propagate throughout the organization.

Second, transformational or change capabilities which are strategic and needed to realign the firm's ordinary capabilities to match environment change, may not reside in organizations in the form of routines (evident by the marketplace for turnaround CEOs or specialists) as noted previously. The reason for this is that it would be prohibitively expensive for a company to develop and maintain full-scale transformational capacities inside the organization, especially in small and medium sized firms. Furthermore, it is often extremely difficult to routinize change beyond recognising shared principles that individuals may use as a guide when dealing with change. Dynamic capabilities deal with change, and any routines underlying firm's dynamic capabilities need to be tied to real-time knowledge creation and information so as to be relevant, and general enough to avoid overly relying on lessons of the past (Eisendhardt and Martin, 2000). Even in an environment not experiencing much change (i.e. rather stable environments), rules and standard operating procedures often require continuous re-evaluating in order to maintain superior performance. It is often challenging to routinize such activities partially, and quite impossible to do that for the entire activities. Moreover, entrepreneurial management, more specially, creating new markets to shape ecosystems has little to do with standardized analysis and optimisation of existing procedures, rather it is more about sensing the next big opportunity or challenge and how to address it – this does not very much involve routinized activities. While larger firms might capture some of these processes in routines, smaller firms often lack the organizational and technological slack to develop processes to repetitively evaluate potential opportunities.

The discussions about the role top management plays in a firm's dynamic capabilities demonstrates the respective roles of both routines and particular non-routine actions of top management teams, as they make up the microfoundations of dynamic capabilities. Individuals in

top management perform strategic and transformation acts that can hardly be considered entirely routine, as do roles of change consultants and transformational CEOs'. This therefore challenges the notion that dynamic capabilities can be reduced to firm-specific routines, at least in the manner that have been suggested in some literature (e.g. Eisendhardt and Martin, 2000; Feldman and Pentland, 2003; Zollo and Winter, 2002). The individual skills and traits of managers e.g. cognition and creativity, are vital to a firm's ability to sense and seize opportunities, and to reconfigure firms' internal and external competences to match the environment.

4.4.2 THE CHARACTERISTICS OF TOP MANAGEMENT TEAMS

Helfat and Peteraf's (2015) work on managerial cognitive capabilities and the microfoundations of dynamic capabilities builds on Teece's (2007) microfoundations of dynamic capabilities relating to sensing, seizing and reconfiguring, to delve into a deeper analytical level to explain for what accounts for individual's abilities to sense, seize and reconfigure. It also builds on Adner and Helfat's (2003) work on dynamic managerial capabilities which focused on the role of managerial cognition in strategic change and adaptation. Drawing on insights from research in a host of domains including cognitive psychology, social psychology, cognitive neuroscience and behavioural decision theory, Helfat and Peteraf (2015) sheds light on the vital role of manager's skills and cognition by discussing how the heterogeneity of cognitive capabilities may produce heterogeneity of dynamic managerial capabilities among top executives, and which may contribute to differential performance of firms under conditions of environmental change. This seems to suggest that cognition, knowledge, skills, and the individual composition of top management teams matter to firm performance and strategic outcomes. The vast literature on top management teams in aspects such as managerial cognition, diversity, transactive memory system, and upper echelons research in general, would support this assertion. This section would address two important issues; first, the heterogeneity of individual manager's characteristics and cognitive capabilities as they relate to sensing, seizing and reconfiguring firm resources/competences and second, how the combination of individual heterogeneity within top management teams creates a transactive memory system that serves a microfoundation of dynamic capabilities.

Managerial Cognitive Capability

Helfat and Peteraf (2015) focused on the cognitive capabilities of the individuals at the top of an organization. It sought to make the link between managerial capabilities and mental activities, and it defines the concept of "managerial cognitive capability" as 'the capability of an individual manager to perform one or more of the mental activities that comprise cognition.' (Helfat and Peteraf, 2015: 835). Individual managers differ in cognitive capability and this difference may be

reflected in a manager's role in a firm's dynamic capabilities. This difference in cognitive capabilities may stem from the mastering or intuitively practising certain activities over time, as well as the situations or contexts where individuals gain learning and experiences. Such intuitive practice can develop cognitive capabilities in areas such as attention or analytical skills. A notable everyday example is how individuals become more attentive to recognise patterns more quickly in word puzzle games the more they play them. Similarly, psychometric reasoning test takers develop stronger analytical skills as they engage in more practice. Research informs that individuals differ in these cognitive capabilities developed which is reinforced through practice and likely to improve through further practice. Therefore, individual habit formed in developing cognitive capabilities or 'path travelled' leads to path dependence effects which may account for differences in both potential and actual performance of cognitive activities between individuals.

A second source of cognitive capabilities differences is context related. This is because the context or domain in which individuals practice mental activities and gain experience shapes their cognitive capabilities. An example is the specific computer program in which software engineers perform reasoning during computer software bug trouble-shooting. Because the contexts in which individuals practice or gain learning experiences of these mental activities differs, there is likely to be heterogeneity in cognitive capabilities between individuals. Having identified practice and context as potential factors for heterogeneity in cognitive capabilities, Helfat and Peteraf (2015) go on elucidate how specific cognitive capabilities underpin the three classes of dynamic capabilities, that is, sensing opportunities, seizing opportunities, and reconfiguring and orchestrating firm assets (Teece, 2007). The cognitive capabilities identified were perception and attention, problem-solving and reasoning, language and communication, and social cognition. The discussions about the role of these cognitive capabilities resulting in heterogeneity were supported by a case study and quotes by Ted Turner, founder of cable TV channels such as CNN and TNT, who the authors regarded as a classic example of the "entrepreneurial" manager.

Perception and attention are significant underpinnings involved in sensing opportunities. The business environment is often characterised by complexity and fast change, and in such environments, the ability to sense opportunities before they fully materialise (Denrell, Fang, and Winter, 2003) is a vital component of dynamic capabilities and entrepreneurial activity. This includes scanning the environment to identify structural changes in the industry to recognise opportunities to create new markets but also to anticipate competitive threats and countermoves by competitors through sense-making activities. Perception of individuals about an emerging reality is affected by an individual's prior knowledge, expectations, values, context-specific knowledge and experience which aids pattern recognition, and perception in turn affect the ability to sense opportunities that are arising. This is relevant to the way individuals quickly

recognise emerging patterns in the environment and correctly interpret data in order take advantage of new market opportunities e.g. to develop new products, but also to respond astutely to threats. Attention is also vital when scanning the environment. Alertness and attentiveness can facilitate the detection and creation of new opportunities therefore they influence sensing capabilities. But individuals differ in their cognitive capabilities for attention and perception which are practice and context-dependent. These differences between managers in the cognitive capacity for perception and attention can affect how they accurately sense new opportunities and threats and such differences are further amplified by the path dependency effects of differences in context, practice and training. This can not only impact on firm's sensing capabilities, but it may in turn contribute to differences in long-term performance caused by possible early mover advantages gained from better sensing of new opportunities and threats (Helfat and Peteraf, 2015).

Furthermore, problem-solving and reasoning are factors of cognitive capabilities that strongly affect the ability to seize opportunities. Seizing opportunities and responding to threats often requires senior management to make sometimes irreversible strategic decisions and investments, for example to create a new business model, expansions into new markets for growth, mergers and acquisitions or to develop new capabilities. Good strategic decisions to seize opportunities are likely to depend on reasoning and problem-solving capabilities needed to articulate and assess profitable investment options as well as to create viable business models (Zott and Amit, 2007). The cognitive capabilities of problem-solving and reasoning differs across individuals and the differences in cognitive capabilities for reasoning and problem solving may explain the differences in investments, market expansion and business model decisions by firms which are made by top managers. These may have long lasting implications, and account for persistent differences in performance between organizations (Helfat and Peteraf, 2015).

Language and communication skills, and social cognition are important factors that shape cognitive capabilities vital for reconfiguring and orchestrating firm assets. Sensing and seizing new opportunities can lead to growth and profitability which can both be sustained by enhancing, combining, and reconfiguring the firm's resources and capabilities (Teece, 2007). Overcoming organizational resistance to change is often required when undergoing asset reconfiguration in firms. Success requires top managers to persuade organizational members to pivot to action or buy into a shared vision, and language and communication can be very useful tools in achieving this. Language and communication styles (including nonverbal communications such as facial expressions and gestures) are important to communicate a broad vision and to ensure that the whole organisation buys into overarching goals. This also serves to inspire employees, overcome resistance, encourage initiative and new ideas, and drive entrepreneurial growth (Baum, Locke,

and Kilpatrick, 1998; Wesley and Mintzberg, 1989). Studies in discourse analysis have shown that the powerful use of language and metaphors to create a strong shared organisational reality about the future by CEOs and top executives as well adept storytelling can facilitate strategic change in organizations towards common goals, in transferring knowledge, leading innovation, and gaining commitment to a strategic agenda (Conger, 1998). In addition, manager's social cognition skills are necessary during reconfiguration because they are helpful in building trust, loyalty and commitment in an organization. Management can foster needed cooperation in organisations by drawing on their social skills which are supported by social cognitive capabilities, for example demonstrating strong empathy to recognise others point of view which provides a platform to gain trust and positively nudge behaviour towards shared organisational outcomes. Social cognitive capabilities can also be useful for understanding and managing power relations which is vital for overcoming barriers to change (Macmillian and Guth, 1985) needed to successful reconfigure and orchestrate assets. Individuals differ in their language and communication skills and social cognitive capabilities. Because these managerial cognitive capabilities influence manager's ability for asset reconfiguration and orchestration, differences in these cognitive capabilities contribute to heterogeneity in the associated reconfiguration capabilities which in turn manifests in differences in firm performance (Helfat and Peteraf, 2015).

The discussions have shown that individuals have different cognitive capabilities which are likely to produce heterogeneity of dynamic managerial capabilities among top executives. Also, since some type of cognitive capabilities are more suited to certain dynamic capabilities than to others and are heterogeneously distributed among managers, then managers with superior capabilities for sensing, for example, may not necessarily have superior capabilities for reconfiguring. This therefore, has two important implications. First, that it is vital that top managers who lead firms or take strategic decisions possess the valuable dynamic managerial capabilities that relate to sensing and seizing opportunities, and reconfiguring assets. Second, that the composition of top management teams consists of individuals who complement each other's dynamic managerial capabilities since any one individual member may not possess all the superior capabilities that relate to sensing, seizing and reconfiguring. The nature of top management teams in terms of composition, and the coordination and relationship of individuals in the teams needed to successfully exploit their complementary skill-sets, is paramount to a firm's dynamic capabilities and performance. This is a central argument in the literature on transactive memory systems (TMS) and upper echelon perspective, that is, cognitive processes of TMTs have significant implications for organizational behaviour and performance (Hambrick and Mason, 1984).

4.4.3 COMPOSITION OF TOP MANAGEMENT TEAMS AND THEIR TRANSACTIVE MEMORY SYSTEM FOR DYNAMIC CAPABILITIES

Heavey and Simsek (2015) discusses transactive memory systems (TMS) in top management teams (TMT) and the link to firm performance, from an upper echelon perspective. It identified specialization (expertise), credibility (trust), and coordination as elements that one "would expect to observe in a group, if the group had developed TMS" (Lewis and Herndon, 2011: 1257). It is important to note that transactive memory does not exist due to the presence of a single element or by viewing each element in isolation. Rather, it is an emergent system of shared division of cognitive labour that concurrently gives rise to specialised knowledge among team members, mutual trust in the credibility of team member's knowledge, and coordinated processing of knowledge. By extension, a team's transactive memory is not traceable or reducible to what any one individual does (or does not), nor can it be found somewhere "between" individuals; rather, "it is a property of a group" (Wegner, 1987: 191). Upper echelon theory argues that top managers shape firm outcomes through the processes by which they scan and interpret their environment and then act upon those interpretations. This view draws strong similarities with arguments about dynamic managerial capabilities of top managers in sensing and seizing opportunities, and reconfiguring firm assets (i.e. microfoundations of dynamic capabilities). Therefore, applying an upper echelons perspective to transactive memory systems within top management teams could provide further insights into the microfoundations of dynamic capabilities. In addition, Heavey and Simsek (2015) suggest that specific attention to transactive memory in upper echelons setting is needed, not least for the practical reason that cognitive processes at this top management level result in the most salient consequences, positive or negative, for the entire organization.

The literature makes interesting contributions about the effects of top management teams in dynamic capabilities and the connectedness of the team to that environment. It argues that the value of a TMT's transactive memory is tied to how strongly members are connected to actors and institutions outside of the firm. It argues that the inner cognitive capabilities of transactive memory are complemented by boundary-spanning activities, especially the building of strong relationships outside of the TMT. The strong ties are a conduit for updating the expertise of the team (since strong ties are important for the transfer of knowledge), and maintaining the relevance and accuracy of knowledge within the team. Without strong links with employees, customers or clients, suppliers, and other actors and institutions, the contribution of a transactive memory system to a firm's ability to interpret, respond and/or shape its environment, and ultimately its performance, is significantly diminished (Heavey and Simsek, 2015). It is widely noted in upper echelon literature that top managers spend significant amount of time engaged in boundary spanning activities, and the value of their work is very much reliant on external network influences.

It is suggested that future research could examine the generative mechanisms that underlie the relationship between a TMT's transactive memory and firm performance. The findings suggest that transactive memory systems in TMTs would improve environmental scanning (*largely sensing*), strategic issue diagnosis (*largely seizing*), and strategic decision making (*largely reconfiguring*), however these findings require empirical confirmation, preferably in a longitudinal field research. A second research gap identified is to build insight into the development and emergence of transactive memory systems in TMTs, especially using qualitative studies of a longitudinal nature Heavey and Simsek (2015). Several studies have discussed the development of transactive memory in work teams, but research on transactive memory systems in TMTs is relatively few, and TMT might display additional patterns of development and emergence, as the particular context of TMTs can place significant demands on the development and maintenance of cognitive interdependency and network ties even if cognitive resources are adequate within the team (Heavey and Simsek, 2015). Top management teams can display a range of dysfunctions e.g. functional turf wars, especially in smaller firms where individuals in TMTs may not be responsible for distinct organizational functions and units, may not have clearly defined roles and may share functions. This has the potential to cause relational conflicts that could negatively affect the functioning of transactive memory or may even give rise to dysfunctional transactive memory (a sort of transactive "baggage" memory), for example the defeat of a favoured strategic initiative could leave dark spots in some members' transactive memory for many years. There is ample scope to further explore the productive (e.g., cognitive division of labour), unproductive (e.g., excessive reliance on others), and the destructive (e.g., baggage memory) transactive memory in TMTs.

4.4.4 MULTI-LEVEL ANALYSIS AND LEVELS OF MICROFOUNDATIONS IN RESEARCH

One of the research objectives of this work is to perform a multi-level analysis and uncover the multi-level nature of dynamic capabilities in the IT security industry. It is therefore necessary to provide a background to multi-level analysis in strategy research and how this research is relevant within that context. In strategic management scholarship, research is performed at several levels including at macro, meso and micro levels of analysis, and on different unit of analysis. Jarzabkowski and Spee (2009) illustrates different levels and units of analysis of research. Three levels of research analysis are identified which are macro, meso and micro levels. Micro level refers to research that explore strategy issues at the level of the individual actor within organisation. Such studies may seek to explain some specific phenomena which are proximal to the actors constructing it, therefore might be considered part of their macro interactions (e.g. Samra-Fredericks, 2003). Meso level deals with research that explores strategy issues at the organisational or sub-organisational level e.g. functions and units. Studies at this level may

investigate strategy process or a pattern of strategic actions (e.g. Balogun and Johnson, 2005). Macro level refers to research that explore strategy issues at the institutional level which typically explains activities and patterns of actions within a specific industry and the business environment (e.g. Lounsbury and Crumley, 2007). The business environment refers to the external influences that affects a firm's decisions and performance including factors that shape market competition within an industry (Grant and Jordon, 2013). Environmental influences can be political, economic, social and technological factors as well as the actions of governments, regulators, suppliers, competitors and customers that affect an industry.

Furthermore, there are also three units of analysis namely; individual actor within organization, aggregate actor within organisation, and extra-organisational (external) aggregate actor (Jarzabkowski and Spee, 2009). Analysis of individual actors within organisation investigates the individual practitioner, for example Rouleau (2005) looks at how what individuals do shapes organisation strategy. Analysis of aggregate actor within organisation covers practitioners as aggregate actors such as top management teams, middle managers or functions e.g. engineering or business development department. For example, Molly and Whittington (2005) investigated strategic decision making within groups when drawing upon the group's previous experiences in similar situations. Analysis of extra-organisational actors investigates actions in institutions e.g. governments and regulators, industries or sectors and the relationships with organisations. For example, Whittington et al. (2006) showed that regulatory and government pressures impacted upon an organisation and shaped its strategy workshop discussions.

Building on the categorisation of three levels of analysis (i.e. micro, meso and macro) and three units of analysis (i.e. individual actor, aggregate actor and extra-organisational actor), Jarzabkowski and Spee (2009) demonstrated a topology of nine domains of research as shown in figure 4. The usefulness of the topology can be seen in at least two important ways. First, it allows scholars to locate extant works (theoretical and empirical) within the topology to identify common research themes and approaches. Second, it provides a basis to identify under-researched domains which may represent possible areas for research and research gaps. For example, in domain F of aggregate actor and macro level, a possible research question might be: How do executive directors in retail companies take account of and attempt to influence the industry analyses that shape investment in that industry? (Jarzabkowski and Spee, 2009). With regards to this PhD research, a similar question that can be posed might be: How do firm's leaders in the IT security industry attempt to influence regulators to shape mandatory data privacy control requirements?

Multi-level theory development

Management research at different levels and units and analysis has been important in directing the field and advancing our scholarly understanding. Despite the contributions to the field, there has been increasing calls for multi-level analysis or aggregation of levels to address the macro-micro divide in strategic management research (Barney and Felin, 2013; Foss and Pedersen, 2016). Microfoundations scholars have stressed the potential of microfoundational work to address the macro-micro divide in scholarship. For example, Devinney (2013) in the special issue of the Academy of Management Perspectives devoted to the microfoundations of management, identified three theory levels (I-level, O-level and S-level) and called for bridging together of these levels. Since the overarching emphasis of a microfoundational approach is in the explanatory primacy of the micro-level especially in its relation to macro-level entities, it covers a wide array of subjects at several levels. This point is particularly relevant in the dynamic capabilities scholarship. I-Level theories refer to theories of the individual. An example of I-level theory in the microfoundations of dynamic capabilities literature is, theory of managerial cognitive capability where differences in managerial cognition underpinned their ability to sense and seize opportunities and reconfigure assets which accounts for heterogeneity across firms (Helfat and Peteraf, 2015). O-Level theories are theories of the collective or the organisation which include theories of group interaction and collective action. An example is theory of transactive memory system in top management teams where the creative dynamism within teams enables the generation of new knowledge which provides a source of competitive advantage (Heavey and Simsek, 2015). S-Level theories are theories at the strategic firm level including strategic action and reaction in relation to external stimuli e.g. industry competition and institutional factors. Teece (2007) theory of how firms sense and seize opportunities, and reconfigure competences to address changing the external environment, is an example of O-level theory. There have been increasing calls in microfoundations research for aggregation of the levels and 'analysis should fundamentally be concerned with how individual-level factors aggregate to the collective level and the firm level' (Devinney, 2013: 81). In fact, one of the main criticisms of the microfoundations approach is a lack of multi-level analysis and there has been calls for multi-level theory development to connect levels within particular contexts since dynamic capabilities are path dependent and context-specific (Barney and Felin, 2013, Foss and Lindenberg, 2013; Wilden et al, 2016; Kurtamollaiev, 2017). In this regard, one of the research aims of this PhD research is to address this call for multi-level analysis.

The PhD research seeks to overcome the challenge of multi-level analysis in two significant ways. First, by taking a practice-based view to research and investigating what happens as an organisation undergoes capability renewal and reconfiguration, it performs analysis at micro, meso and macro levels. Second, it performs empirical analysis at the three units of analysis which

are, individual actor within organisation (e.g. analysts), aggregate actor within organisation (e.g. top management team) and extra-organisational actor (e.g. clients). In doing so, it explores interesting issues about what goes on between and across these levels of analysis (Devinney, 2013). It therefore connects levels and engages in a multi-level analysis. Related to that, the PhD study attempts to address the criticism of fragmentation in dynamic capabilities literature (Vogel and Guttel, 2013; Kurtamollaiev, 2017) by incorporating several dominant I-level, O-level and S-level dynamic capabilities theories based on empirically collaborated insights.

Furthermore, microfoundations is defined in the literature as, 'a theoretical explanation, supported by empirical examination, of a phenomenon located at analytical level N at time (Nt). In the simplest sense, a baseline microfoundation for level Nt lies at level N-1 at time t-1, where the time dimension reflects a temporal ordering of relationships with phenomena at level N-1 predating phenomena level N. Constituent actors, processes, and/or structures, at level N-1t-1 may interact, or operate alone, to influence phenomena at level Nt. Moreover, actors, processes, and/or structures at level N-1t-1 also may *moderate or mediate* influences of phenomena located at level Nt or at higher levels (N+1t+1 to N+nt+n)' (Felin et al, 2012: 9). Such an encompassing definition on microfoundations as well as the fact that the purpose of a microfoundational approach is in the explanatory primacy of the micro-level especially in its relation to macro-level entities, it is a huge umbrella that includes a wide array of subjects at several levels. For example, Heavey and Simsek (2015) explored at group level by investigating transactive memory system in top management team while Helfat and Peteraf (2015) analysed at a much deeper level of individual managerial cognitive capability by investigating how the heterogeneity of cognitive capabilities may produce differences in dynamic managerial capabilities among top executive's ability to sense and seize opportunities and threats and reconfigure tangible and intangible assets. As microfoundations researchers have analysed at different levels, management scholars have argued that much consideration is given to the appropriate levels of analysis to ensure that it is suitable to the phenomenon under investigation, the aims of the study and the unit of analysis of the research (Foss and Lindenberg, 2013). This would help address the claim by critics of microfoundational thinking that the approach is little more than an ultimately meaningless reduction exercise (Devinney, 2013).

In the light of these discussions, the overarching aim of this PhD research is to apply the microfoundations of dynamic capabilities (sense, seize and reconfigure) to empirically investigate its impact on firm capability renewal and reconfiguration in the IT security industry. Dynamic capabilities are path dependent, context-specific, idiosyncratic in details across firms and are deployed to address changing external environments as firms engage with the business ecosystem (Teece et al., 1997; 2012). In this regard, the research work engages in a multi-level

study to understand the role played by the industry (macro level), the internal organisation (meso level) and individual actors within it (micro level) in sensing, seizing, and reconfiguring during capability renewal and reconfiguration. Similarly, the units of research are the individual actor within organisation, aggregate actor within organisation and extra-organisational aggregate actor as they relate to the macro, meso and micro levels. Therefore, these chosen levels for analysis for research are appropriate for the multi-level analysis study conducted and are justified by the research aim and phenomenon under investigation.

Figure 4. Topology of level of research and unit of research (Jarzabkoski and Spee, 2009)

Level of Analysis	Individual actor within organisation	Aggregate actor within organisation	Extra-organisational aggregate actor
macro	C	F	I
meso	B	E	H
micro	A	D	G

Unit of Analysis
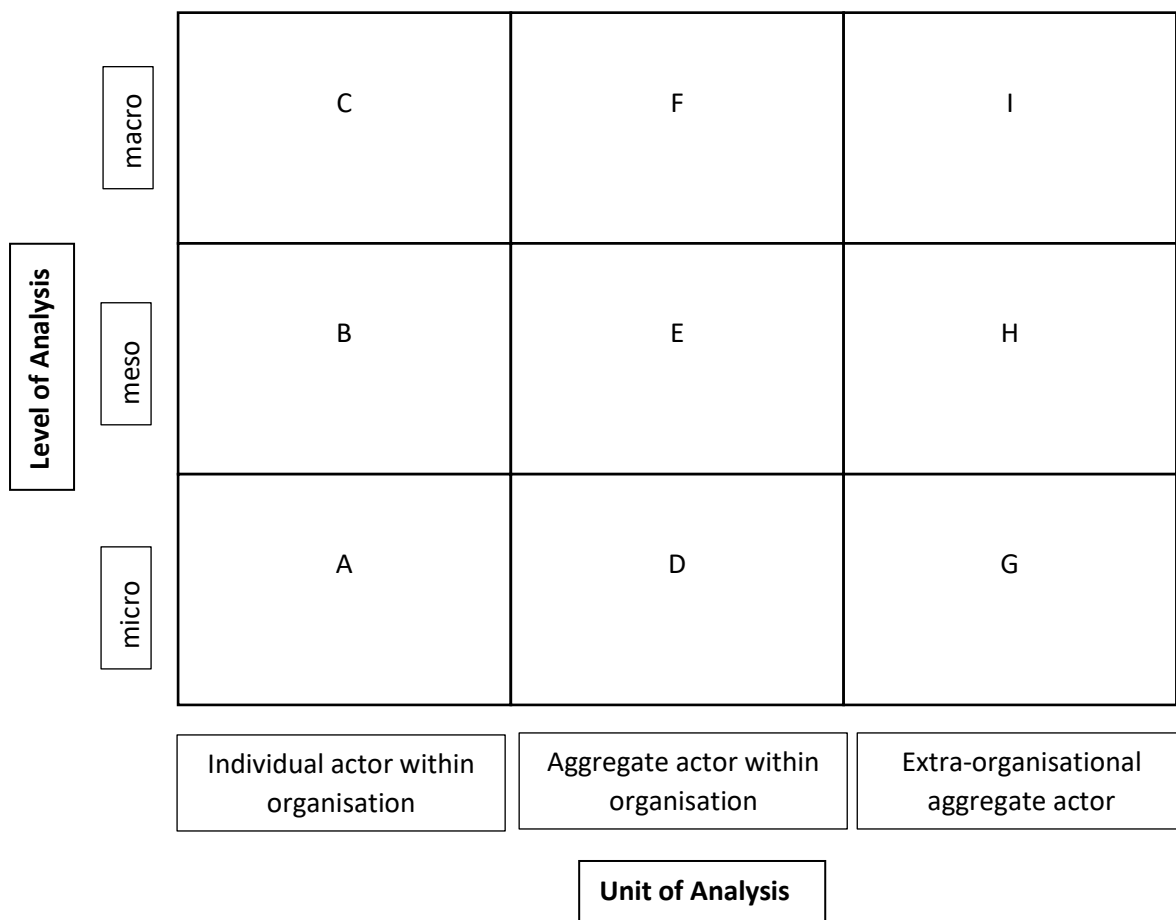
4.5   CONCLUSION

The theories covered at individual, group and firm, and industry levels highlight the multi-level theories of dynamic capabilities shown in figure 5. In fact, one of the main criticisms of the microfoundations approach is a lack of multi-level analysis to connect levels within specific contexts as discussed.

Industry Level

Firm and Group Level (teams *with transactive memory systems*)

Individual Level (individuals and routines)
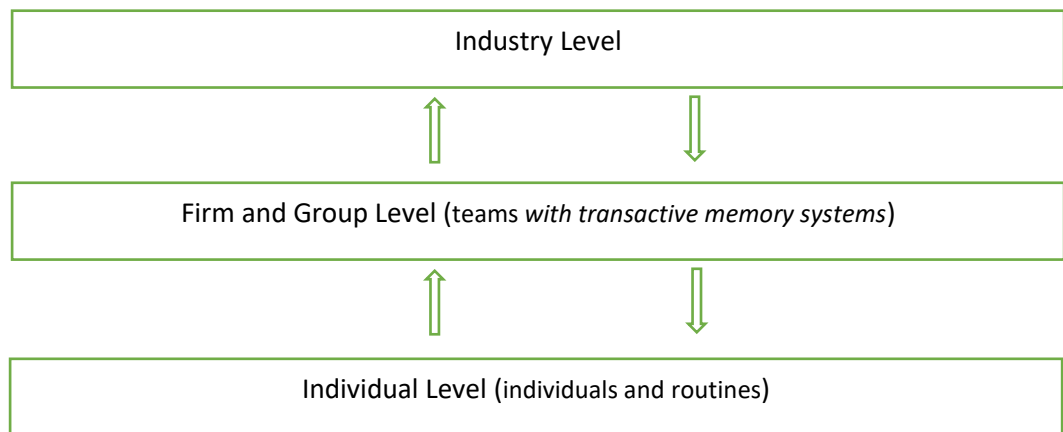
The chapter concludes by summarising key insights from the discussions and demonstrating their connection to the research questions and objectives of the study.

- Sensing, seizing, and reconfiguring are microfoundations of dynamic capabilities which enable superior firm performance in rapidly changing environment. It deals with firm-level processes as well as the cognitive capabilities of individuals and collective learning capabilities in organisations to respond to or shape the business ecosystem. The theory is the primary theoretical framework applied to investigate capability renewal and reconfiguration in the IT security industry in this work.

- A social ontology conceptualisation of routines as a collective phenomenon involving multiple individuals allows for a social constructivist lens to study subjective reality i.e. routines, thus is suited to a qualitative research methodology which will be expanded upon in the methodology chapter. In addition, ostensive and performative aspects of routines occurring in a duality creates a source of endogenous change in routines through creating new knowledge (ostensive) and practical learning (performative) by actors. The processes for developing new knowledge and learning capacity is a fundamental underpinning of dynamic capabilities which in turn is deployed to adapt routines and ordinary-level capabilities.

- Individuals, processes and structures are regarded as microfoundations of routines and capabilities because they influence change in routines in capabilities. This is relevant to the research agenda is this work which seeks to investigate the role of structure and processes in dynamic capabilities.

- Transactive memory system (TMS) which is developed as a result of social interactions between individuals is idiosyncratic to organisations. This collective knowledge in groups allows individuals to access more knowledge than they individually possess. As individuals bounce ideas of each other, that process stimulates new thinking, recombines knowledge or builds new knowledge used to astutely respond to environmental changes or develop new products and services that shape the business ecosystem. Furthermore, a firm's top management team (TMT) plays a crucial role in transforming the enterprise and shaping the ecosystem through entrepreneurial acts. Therefore, transactive memory system in TMTs is a vital microfoundation of dynamic capability. More so, the diversity of individuals in TMTs to provide complementary managerial cognitive capabilities in relation to sensing, seizing and reconfiguring, strengthens its TMS. The theory on TMS and TMT is relevant to the research agenda in exploring dynamic capabilities at the firm and group level, that is, at meso level.

The chapter has discussed relevant microfoundations of dynamic capabilities theories that relate to the individual, groups and firm, and the external environment and how they connect to the research objectives of this study. The next chapter is the research methodology chapter. It discusses the ontological and epistemological basis of the research. In addition, it presents alternative research methods, discusses the appropriate case study research methodology adopted in this work to address the research questions and explains the research setting in detail.

CHAPTER 5: RESEARCH METHODOLOGY

5.1 INTRODUCTION

This chapter will provide a link between chapters 1 -4 of the thesis, which deals with the literature review, and chapters 6-8 which deals with the research findings, discussions and conclusions. The chapter is divided into two sections. Section one will define the research questions and then discuss the ontological and epistemological issues related to the empirical focus of microfoundations of dynamic capabilities. Furthermore, it will present the research methodology including the Gioia methodology adopted to attempt to answer the research questions. The research methods will be outlined to demonstrate how the research data will be captured and analysed to arrive at findings that relate to the research questions in this PhD thesis. Section two will present the themes from the data analysis which consist of the data structure developed in this thesis as a result of applying the Gioia methodology adopted in the research.

5.1.2 OVERVIEW OF RESEARCH QUESTIONS

There were a number of research gaps which emerged from the literature review chapters. These research gaps precipitated the overall aim and objective of this research which is to empirically investigate the multi-level nature of microfoundations of dynamic capabilities within a particular industry context. A number of research questions that relate to the research aim have been developed which are summarised as follows:

- How do microfoundations of dynamic capabilities impact on capability renewal and reconfiguration in the IT security industry?
- What is the multi-level nature of microfoundations of dynamic capabilities in the IT security industry?
- What are the processes and activities that sustain or enable dynamic capabilities in firms?
- Does structure enable or constrain dynamic capabilities in organizations?

5.2 ONTOLOGICAL AND EPISTEMOLOGICAL BASIS OF RESEARCH

5.2.1 THEORETICAL OVERVIEW OF ONTOLOGY, EPISTEMOLOGY, RESEARCH METHODOLOGY AND RESEARCH METHOD

Ontology and epistemology are philosophical considerations that inform research methodologies and research methods. Ontology as the study of the nature of reality deals with positivism, social constructionism and interpretivism all which represent different views about how reality exists (Saunders, 2016). Positivism is the view that there is one objective reality, a reality which is singular and not affect by human consciousness. Social constructionism is the view that social

phenomena are created in the social contexts in which individuals and groups operate who create their own subjective realities. Interpretivism which is a form of constructivism, hold reality to be multiple and subjective which is based on interpretation and interaction (Berger and Luckman, 1966). Research is underpinned by these philosophical views which informs of the worldview in which the research paradigm is located, and this influences the research methodologies and research methods adopted in the research. This therefore emphasizes the need for 'research fit' between the research project, its objectives and research questions, and the philosophical framework, research methodology and research method used.

Research methodology and methods are influenced by our understanding of what constitutes knowledge and how knowledge is created. This is important because it determines the validity of any new knowledge advanced by research conducted. In this regard, epistemology relates to what constitutes knowledge and to the processes through which knowledge is created. It is the theory of knowledge reflected in the research methodology chosen (Quinlan, 2011: 100). Social science research provides various research methodologies to conduct research that align to different ontological and epistemological needs. For example, some methodologies require mainly quantitative data which is positivistic whereas others demand qualitative which is interpretivist or constructionist. Table 5 provides a list of research methodologies used in social research, with their purpose and strengths. The appropriateness of a chosen research methodology will depend on its fit to the research project as pointed out. In other words, research methodology refers to the strategy or research design used for conducting the research (Bryman, 2015).

In addition to research methodology, the research method which refers to the data gathering method used in research is important because the data is presented as evidence in order to establish the argument or hypothesis of the research (Quinlan, 2011). Every data collection method is designed to focus on, observe and record observations of some phenomenon. Table 6 shows a list of commonly used research methods. The choice of data collection method(s) used in research depends on the type of data required, by the population or sample population used, and by the methodology proposed for the research (Quinlan, 2011: 16). The fundamental philosophies support the research methodology which in turn supports the data collection methods. This means that the research methodology must fit with the fundamental philosophies of the research project, and the data collection methods must fit with the project's research methodology.

Table 5. Research methodologies used in business and social science research (Quinlan, 2011)

Research Methodology	Overview
Survey	Surveys usually in the form of questionnaires or scales, are often used for quantitative research or largely quantitative research with some qualitative element. They are particularly useful when the research population or population sample is large and a questionnaire and/or a scale is an effective way to engage with a large research population.
Case study	Case study research, either single or multiple, is an in-depth study of a bounded entity and it can use qualitative or quantitative data or a mixture of both. While case study research does not have the breadth in terms of numeric size or geographic spread of survey research, it is useful for an in-depth examination of a phenomenon under investigation.
Experimental design	Experimental design methodology is used when conducting experiments although true experiments are not commonly conducted in business research or social science research because of difficulties in controlling all the variables in the study of social phenomena. Experiments conducted in real-life settings are called field experiments.
Ethnography	Ethnography is used when carrying out an in-depth examination of a culture by performing observation in the field of the phenomenon under investigation – the researcher gets immersed in that culture. The methodology can draw on quantitative or qualitative data, or a mixture of both.
Action research	Action research is used to bring about change and improvement in the quality of an organisation or a performance of a group in an organisation, therefore it can be an effective approach to problem-solving. The methodology can draw on quantitative or qualitative data, or a mixture of both.
Grounded theory	This methodology is used when the specific aim of the research is to build theory from data especially when researching a phenomenon that is quite new so has very little or no literature written about it. The data analysis process involves open coding, selective coding and then theoretical coding, and the concluding chapter of the research/thesis is often theoretically very rich. The methodology can draw on quantitative or qualitative data, or a mixture of both.
Phenomenology	Phenomenology research methodology is used to examine lived experience by developing accounts from the perspective of those living the experience. It is regarded as one of the most qualitative methodologies in social science research.
Narrative research / Narrative analysis	This methodology requires the gathering and analysis of narratives or stories of personal experiences of those who have had the experience. Narrative analysis can be used to analyse textual data, in written or visual texts.
Historical research / Historical analysis	This methodology involves analysing the history of a given phenomenon. The subject of the research can be as varied as an industry, an organisation or a historical period of time. An exploration of recent history can also form part of historical research. Historical research can contribute to knowledge by illuminating issues in contemporary business studies.
Content analysis	Content analysis is used to analyse the context of any text, for example

	it can be used to calculate the frequency with which certain words, phrases, or ideas appear in a text. It can be useful in examining the nature and strength of communication in text form. The methodology can draw on quantitative or qualitative data, or a mixture of both.
Discourse analysis	Discourses can be in the form of written texts, spoken words or cultural artefacts and discourse analysis is a methodology used to identify and analysis discourses in the social world. It can be useful in examining how powerful discourses are used to create and shape particular realities in the social world.
Documentary analysis / Documentary research	This methodology is used to perform research on documents and it involves the systematic analysis of data contained in documents or data drawn from documents. Documents could include written documents, notes, books, policies, magazines, letters and records.
Archival research	Archival research is research carried out on the contents of archives. Different data collection methods are used in archival research depending on the data available in the archive, the requirements of the study, and the way in which the researcher engages with the archival material.
Textual analysis	Textual analysis is a methodology involving the analysis of any texts in order to obtain some interpretation of the meaning of the text based on the aim of the research. Texts can be books, documents, images, audio visuals, websites, clothes, décor, or layout of an organisation.

Table 6. Examples of Research Methods – Data collection methods (Quinlan, 2011)

Observation	Vignettes
Questionnaires	Life history
Interviews	Narrative
Focus groups	Diaries
Scales	Documents/Records/Archives
Projective techniques	Internet research
Images	

5.2.2 ONTOLOGICAL AND EPISTEMOLOGICAL BASIS OF THE RESEARCH

The thesis now draws on the theory of ontology, epistemology and methodology discussed to demonstrate and argue for the philosophical and methodological premise of the research in this thesis. Dynamic capabilities in organizations are social phenomenon because they deal with the sensing and seizing of opportunities and reconfiguring of firm assets, by *individuals* or *collective of individuals* which accounts for the firm-level ability to respond to or shape the external environment. Individuals have agency, make different choices, and are main objects of the study. They are different to physical phenomena which are an objective reality and related to positivism. A more subjective view of reality is concerned with how actors in the social world attach meaning to their actions and interpret the social context in which they operate (Benton and Craib, 2011). The challenge is to ascertain how meaning is "placed on the world" and "action is given

legitimacy" through dispensing of held assumptions and beliefs, instead identifying how social actors arrive at those beliefs and assumptions about their social context (Benton and Craib, 2011). Individuals in organizations are social actors with beliefs, values and cognitive frames which inform how they interpret their context in terms of sensing and seizing opportunities and threats, and reconfiguring assets. This also relates to how they create shared understanding of organizational constructs such as routines and capabilities. It is therefore argued that the research is situated within social constructivism. More so, the research also finds roots in interpretivism. The 'interpretivist' explanation of social phenomena based on Max Weber's Verstehen technique is rooted in the analysis of social action and involves the explanation of social actor's underlying motives and the meaning they attach to their actions (Parkin, 2002). An interpretivist approach views reality as subjective and socially constructed by actors as they interact and how they interpret their motives, actions and the reality they shape. Thus, it is more suited to qualitative techniques whereas a positivist social science approach which holds an objective logic of reality is heavily reliant of quantitative data methods.

Furthermore, epistemology is concerned with what constitutes knowledge and the process through which knowledge is created which provides validity for knowledge. In this regard, there are two main approaches in management studies when dealing with social phenomena, the general knowledge and contextual knowledge approaches (Aram and Salipante, 2003). To establish general knowledge, researchers seek to identify patterns present in the social phenomena that are measurable, quantifiable and generalizable, thus forming universal principles that predict the behaviour of social phenomena. The second approach relates to contextual knowledge which is dependent on both the context in which it is generated and the resulting interpretations of the social actors within that context (Aram and Salipante, 2003). Thompson et al. (2011) suggest that a quantifiable, generalizable approach using quantitative methods might be best suited by techniques such as structural equation modelling whereas a context-dependent, 'socially-constructed logic' may be appropriately studied using qualitative methods. Similarly, Tsoukas (1994) makes the distinction between knowledge that relates to abstract and generalizable principles about how, for instance, organizations behave, and knowledge with contextualism that is based on construction of narratives and accounts for the interpretation of specific situations. Contextualism here involves understanding the dynamic interplay within particular settings and episodes, and the valuable insights derived from such settings and are based on a nuanced, deep understanding of the subjective narratives of the social actors within those settings. It is therefore argued that this PhD research is aligned with a contextualist approach since it seeks to generate knowledge regarding a management phenomenon – dynamic capabilities – which exists within and is contingent on the dynamism between a specific firm, its

external environment and the interpretations of the social actors within that context. More so, dynamic capabilities, as presented in the literature review of this thesis, are context-specific and path dependent, therefore that provides further evidence to a contextualist approach in this study. These arguments show that the contextual nature of this PhD research and the subjective nature of knowledge generated means that the research is best suited to an interpretivist approach based on qualitative methods, mainly in-depth narratives of actors by interviews, and of observations of how reality is socially constructed as actors interact with one another (Tsoukas, 1994). This demonstrates the ontological and epistemological approach taken in the research as well as provides support for a 'fit' with a qualitative research methodology. Having discussed alternative research methodologies and research methods in the previous section, the next section will provide arguments to justify the case study research methodology chosen and the research methods of interviews and observations which were adopted in the research.

5.3   CASE STUDY RESEARCH APPROACH AND DESIGN

The case study research approach is a very popular and widely used research design in business research (Eisenhardt and Graebner, 2007) and some of the best-known studies in business and management research are based on this design. Lincoln (1985) argue that a wide variety of different entities can constitute a case, including organizations, societies or associations, cultures, incidents or events, a change process and projects, which allows researchers to engage in a collection of facts and interpret what is going on. Similarly, Quinlan (2011) states that research to be conducted in a bounded entity, in a specific space or place, in a particular incident, it may be possible to conduct the research using a case study methodology. In this methodology the researcher engages in an in-depth examination of a phenomenon of interest through an in-depth study of a bounded entity.

A case study is an in-depth inquiry into a topic or phenomenon within its real-life setting (Yin, 2014). Choosing the case to be studied and determining the boundaries of the study is a key factor in determining a case study (Flyberg, 2011). Once these are defined, the case study researcher sets out to understand the dynamics of the topic being studied within its setting or context (Eisendhardt 1989; Eisenhardt and Graebner, 2007) – 'understanding the dynamics of the topics' refers to the interactions between the subject of the case and its context. The fact that case study research takes place within real-life settings or contexts distinguishes it from other forms of research strategy, such as experimental and survey research. Case study research is often used when the boundaries between the phenomenon being studied and the context within which it is being studied are not always apparent (Yin, 2014). Therefore, an understanding of the context is fundamental to case study research. The importance of context in this research, that is,

the particular organizational setting, structures and processes that impact on dynamic capabilities, and related to that, the context-specific and path-dependent nature of dynamic capabilities, reinforces the rationale behind using a case study strategy. Case study research strategy has the capacity to generate insights from intensive and in-depth research into the study of a phenomenon in its real-life context, leading to rich, empirical descriptions and the development of theory (Eisenhardt 1989; Eisenhardt and Graebner 2007; Yin 2014).

In addition, Dubois and Gaddle (2002:554) argue that, "the interaction between a phenomenon and its context is best understood through in-depth case studies." Since the primary focus in this research is on the dynamics of dynamic capabilities within an organizational setting, the aforementioned statement by Dubois and Gaddle is further evidence to support the research strategy choice of case study research. An in-depth case inquiry can elucidate what is happening and why, and perhaps to understand the effects of the situation and the implication for action for both scholars and practitioners. From a more theoretical standpoint, the exploratory nature of this research, in that it is starting with extending preliminary constructs about the nature of dynamic capabilities within organizational settings, means that a case study approach, with its intense collection of rich data from multiple sources (Yin 2009), is appropriate to further build on these constructs. This construct development through case study research is enhanced in this research by the adoption of the Gioia methodology where constructs are complimented by processes and concepts identified through the method. The Gioia method enables a researcher to imbue an inductive study with 'qualitative' rigour while still retaining potential for generating new concepts and ideas for which case study research are best known (the theory and benefits of the method will be discussed). The contextual nature of case study research as in this research, leads to the creation of contextualised management knowledge (Tsoukas, 1994) rather than generalised knowledge which is seen as one of the limitations of the research approach.

Flyvberg (2011) discusses the paradox of case study research – case studies have been widely used and have made useful contributions in business and management research but have been criticised by some because of 'misunderstandings' about their ability to produce generalizable, reliable and theoretical contributions to knowledge. This is largely based on positivist criticism about using interpretive, qualitative research. However, such criticism is becoming less common as the value of qualitative and mixed methods research is being recognised much more widely, including the contributions of an interpretivist researcher (e.g. Buchanan 2012; Flyberg, 2011). Interpretivist researchers are more interested, at least initially, to develop rich detailed and nuanced descriptions and understanding of their case study research (Riddler et al., 2014), as is the case in this PhD study. More so, interpretivist researchers work inductively, analysing their data, identifying themes and patterns in these data, and then locating this in existing literature in

order to define, extend or generate theory (Ridder et al., 2014) – this is the approach adopted in this research by using the Gioia methodology which provides a clear link from data evidence to theory.

There is also the debate in case study research about using single case versus multiple cases research strategy. The rationale for using multiple cases focuses on whether the findings can be replicated across cases, either by literal replication or theoretical replication (Yin, 2014). While a multiple case study is likely to produce more evidence, the main purpose for the choice of the approach is to allow for replication. Conversely, a single case study may be selected purposely because of the nature of the case (i.e. it is typical, unique or critical), and/or also because it provides the researcher an opportunity to observe and analyse a phenomenon that few have done before (Saunders et al., 2016) – In this light, there has been rather limited empirical qualitative investigation of dynamic capabilities and research within information technology security context is an under-researched area, seen in published literature (Appendix one provides a summary table of key articles on dynamic capabilities). Furthermore, Strauss and Cobin, (1990) and Mason (1996) argue that a single case study approach - described as an in-depth analysis of a single case, can be adopted which is representative in some way of a research topic. This PhD research is a single case study and the decision choice is justified based on these criteria mentioned. First, the case is an organization which is typical of a management consultancy firm in the informational technology security industry. Second, the case study is an opportunity to observe the 'dynamic capabilities' phenomenon which so far has been very limitedly observed empirically, hence the call for more empirical investigations as highlighted in the literature review in this thesis. It is noted that an important aspect of using a single case study is a thorough defining of the actual case, therefore a complete description of the case will be provided in this section.

Another important consideration is whether a single case study approach is suitable for the nature of the research question and objectives (Saunders et al., 2016). The research objectives in the thesis seeks to answer 'how' and 'why' questions regarding the nature of dynamic capabilities and a very useful way of unpacking these issues is to 'follow' an organization in a life-setting on an 'incident', 'event' or 'project' – these meet the description of a case as previously stated. In this regard, the research work followed the organization on a journey as it went about strategic learning and change using the learning from a successful project as an opportunity to review its strategy and reconfigure its capabilities, over a 15-month research period. According to Yin (1984) case studies have the advantage when 'how' and 'why' questions are being asked of events which the researcher has very little or no control over. "The case study allows an investigation to retain the holistic and meaningful characteristics of real-life events such as individual life cycles,

questionnaires and management processes" (Yin, 1984: 14). Yin (1984) further argue that case studies have a particular usefulness in social science research in a number of applications which include; explaining the causal relationships in real-life events that are too complex for questionnaires, surveys, or experiments to adequately capture, describing the real-life context in organizations, and the people within them as they go about organising, and exploring situations where events have no clear or single set of outcomes. These three conditions described by Yin (1984) are clearly relevant to the research aim which is to empirically investigate dynamic capabilities in an organization and thus, are further justifications to support the choice of case study research strategy in this PhD.

Furthermore, an alternative research approach is a quantitative study. Quantitative studies are often rich in statistical data and help to advance theory through the inference of common trends by describing tangible, visible aspects of a phenomenon e.g. broad organizational practices (Quinlan, 2011). This often requires collection of longitudinal data via historical sources or structured surveys which might be a challenge (Danneels, 2007). But quantitative studies are appropriate when a quantifiable, generalizable approach to advance theory is sought in research. The aim of the PhD research is not to advance generalizable theory therefore it is not suited to a quantitative approach. The research seeks to explore the context-dependent, 'socially-constructed' phenomenon of dynamic capabilities, and thus, may be appropriately studied using qualitative methods (Thompson et al., 2011). A qualitative, case study is likely to be more appropriate for understanding nuances embedded in capability renewal and reconfiguration processes and the micro aspects of how dynamic capabilities emerge, are deployed or perform (Danneels, 2007). In addition, the PhD focus is a microfoundational research approach. Felin and Barney (2013) argued that key aspects of microfoundations are not best researched using quantitative approaches such as traditional regression-based methodologies and cross-sectional datasets and even hierarchical linear models (HLM) do not adequately model complex interactions between firm levels which result in higher-level performance outcomes. Since microfoundations is primarily about understanding behaviours and their interactions which give rise to higher-level outcomes, rigorous small N research that each may provide particular insights to different aspects of microfoundations (Felin and Barney, 2013). Therefore, this is further evidence to justify the choice of qualitative single case study research strategy in this study of microfoundations of dynamic capabilities even though an alternative quantitative approach was considered.

In management research methods, there are questions about how the research design criteria of reliability, replicability, and validity, can be satisfactory met through case study research. Some writers on case study research, such as Yin (1984), state that these are appropriate criteria and

suggest ways in which case study research can be developed to enhance its ability to meet the criteria. For others, like Stake (1995), they are barely mentioned, if at all. There is also the specific question of how a single case be possibly representative so that it yields findings that can be more generally applied to other cases. Lee, Collier, and Cullen (2007) suggest that particularization rather than generalization constitute the main strength of case studies, thus, the goal of case study should, therefore, be to concentrate on the uniqueness of the case and to develop a deep understanding of its complexity. While this proposition is relevant, many researchers on the other hand, emphasize that while they are interested in the details of a single case, they sometimes claim a degree of theoretical generalizability on the basis of it. For example, Kanter (1997) explains that her case study of Indsco Supply Corporation enabled her to generate concepts and give meaning to abstract propositions (which she went on to test in three larger corporations). The Gioia methodology is based on a similar approach whereby initial concepts are generated and complimented by processes to develop constructs from which generalizable theory can be built – thus, demonstrates qualitative rigor in inductive research to meet criteria of reliability, replicability, and validity, through case study research (Gioia and Pitre, 1990). By adopting the Gioia methodology in this research, this thesis is of the view that a degree of theoretical generalization can be achieved based on the single case study research. Craig-Smith (1991) states that if the context of a case-study is incorporated, the analysis can be considered valid. Thus, case-study research allows for an in-depth analysis, providing that conclusions are relevant to the context in which the case study has been selected. Since the case in this study is an organization which is typical of a management consultancy firm in the informational technology security industry, the conclusions can be generalised to similar organizational settings.

Yin (2009) stipulates that the design of the case study should be guided by initial theory which builds on to theoretical propositions. In this regard, theory development in this PhD work was achieved through literature review and the collection of background information about the information technology security industry including the market environment and its regulation, as well as preliminary information about the organization to be studied. Eisenhardt (1989) argue that multiple data sources are required in case study research method, in order to triangulate findings and draw conclusions from more than one perspective. In this research, data from semi-structured interviews was triangulated by field notes obtained during observations at meetings and knowledge management sessions held at the company (i.e. research site). The findings were also enriched using secondary data through analysis of company documents and background information collected.

5.4 THE GIOIA METHODOLOGY - FOR QUALITATIVE RIGOR IN INDUCTIVE RESEARCH

5.4.1 BENEFITS OF THE GIOIA METHODOLOGY

The Gioia method enables a researcher to imbue an inductive study with "qualitative rigor" while still retaining potential for generating new concepts and ideas for which case study research are best known. It allows inductive researchers to apply systematic conceptual and analytical discipline that leads to credible interpretation of data which helps convince readers that the conclusions are plausible and defensible, and to generate persuasive new theories (Gioia & Pitre, 1990). This approach has been elaborated and refined as a way of conducting qualitative, interpretive research. It is also as a way of guiding analyses and presentation of research.

Another benefit of this approach is that it deviates from the norm in research fields whereby design and execution of theory development work is done as per traditional scientific method. The traditional approach leads to advances in knowledge that are too strongly rooted in what we already know hence delimits what we can know and does not encourage originality in theorizing (Corley and Gioia, 2011). The traditional approach leads researchers to focus on construct elaboration - constructs are abstract theoretical formulations about phenomena of interests (Edwards and Bagozzi, 2000; Morgeson and Hofmann, 1999; Pedhazur and Schmelkin, 1991). A construct is usually formulated so it can be measured; its primary purpose is to delineate a domain of attributes that can be operationalized and preferably quantified as variables. But construct development and measurement (quantitative feel) potentially blinds us to the fundamental work of *concept* development in organizational study. "Concept," refers to a more general, less well-specified notion capturing qualities that describe or explain a phenomenon of theoretical interest. Concepts are precursors to constructs (i.e. they give birth to constructs) in making sense of the organizing, organization, and organizations. The discovery and understanding of concepts are relevant for the theory building that can guide the creation and validation of constructs. Likewise, informed theory building and theory testing are both necessary if organizational study is to fulfil its potential for creating works that has originality, utility, and foresight (Corley and Gioia, 2011).

There is an acknowledgement that studying organizations via construct elaboration and measurement has served the field of social science research. However, something seems to be missing – that something that hinders our ability to gain deeper insight of organizational dynamics i.e. understanding the essence of organizational experience, and fundamentally the *processes* by which organizing and organization unfold (Langley, 1999). A deep focus on processes requires an appreciation of the nature of the social world and a profound recognition in social and

organizational study that much of the world with which we deal is essentially socially connected (Berger and Luckmann, 1966; Weick 1969, 1979). Studying social construction processes implies that we focus more on how organization members go about constructing and understanding their experiences and less on the number or frequency of measurable occurrences (that is, a more qualitative and less quantitative approach).

Rather than focussing too much on constructs, concepts are new tools that help us better understand organizing and organizations, particularly if we focus on concepts relevant to the human organizational experience in terms that are adequate at the level of meaning of the people living the experience and adequate at the level of scientific theorizing about the experience. The Gioia method achieves both through a systematic inductive approach to concept development. It benefits from the strong social scientific tradition of using qualitative data to inductively develop "grounded theory" (Glaser and Strauss, 1967; Lincoln and Guba 1985; Strauss and Corbin, 1998) which provides deep and rich theoretical description of the contexts within which organizational phenomena occur. Also, it is a holistic approach to inductive concept development which retains the high standards demanded of a scientific tradition of "rigorous" theoretical advancement.

5.4.2 THEORY OF GIOIA METHODOLOGY – GROUNDED ASSUMPTIONS

A basic assumption in an interpretivist approach in social science research is that the organizational world is socially constructed. In addition to this assumption, the Gioia methodology employs other crucial and actionable assumptions;

1. That the people or actors constructing their organizational realities are "knowledgeable agents" (they are rationally and emotionally reasonable). That is, people in organizations know what they are trying to do and can explain their thoughts, intentions, and actions. The consequence of this assumption for the conduct of research is that importantly, it foregrounds the informants' interpretations and initially puts the researcher in the role of "glorified reporters" – whose role is to give an adequate account of the informant's experience and not presume to impose prior constructs to theories on the informants as a yardstick or prism for understanding or explaining their experience. The benefit of this is that it gives voice to the informants in the early stages of data gathering and analysis as well as in the reporting of the research, which creates rich opportunities for discovery of new concepts rather than affirmation of existing concepts.

2. That the researcher is knowledgeable and can figure out patterns in the data, thereby bringing to the surface concepts and relationships that might escape the awareness of the informants, thus these concepts can be formulated in theoretically relevant terms. By following the procedures in this methodology, these assumptions can be enacted in a way

that enables presentation of a clear picture of the informant's experiences while also meeting the scientific criterion of presenting evidence systematically. In addition, the procedures guide the conduct of the research in a way that imposes qualitative rigor, encourages the presentation of the research findings in a way that demonstrates the connections among data, the emerging concepts, and the resulting theory.

5.4.3 USING THE METHODOLOGY IN PRACTICE

The methodology approach is based on a systematic presentation of both a "1st-order" analysis (i.e. an analysis using informant-centric terms and codes) and a "2nd-order" analysis (i.e. one using researcher-centric concepts, themes, and dimensions). The tandem reporting of both the informant and researcher voices allows a qualitative rigorous demonstration of the links between the data and the induction of new concepts as well as the level of insight that is required of high-quality qualitative research with rigor. This systematic approach, while not claiming to be the best or only way to demonstrate rigor in qualitative research, has the potential to advance the process of concept development within organization study.

5.4.4 LAYING THE RESEARCH FOUNDATIONS

The method begins with well-specified, if rather broad, research questions. Similarly, as necessary with qualitative research, the method uses multiple sources of data which include background information, field observations at meetings, company documents and semi-structured interviews. Observations and semi-structured interviews are the key data sources to obtain both a real-time and retrospective accounts by those actors experiencing the phenomenon of theoretical interest. This is "research as engagement" especially for the researcher and "engaging research" especially for the informants (Morgan, 1983). Diplomacy, discretion and transparency are always vital in 'research as engagement' and it is important that the researcher maintains confidentiality as stipulated in confidentiality agreements. Anonymity to informants is also maintained. The style of the research is 'immersion into the field' research – consistently making notes during observation and/or recording of interviews with informants, accurately capturing their own words and terms to help understand their lived experiences.

In addition, as the researcher becomes 'immersed' in the research site, it is important to be aware of the risk of *being* too close and essentially adopting the informant's views and biases, thus losing the higher-level perspective or bigger picture view needed for research focus and informed theorizing. A constant reflection on the research processes, activities and data collected as well as discussing the findings with multiple, independent people within the organization helps address Van Maanen's (1979) counsel to acknowledge the "fact of fiction" in ethnographic research. Also, the initial interview protocol was designed to focus on the research question(s), which were

thorough and did not contain leading-the-informant questions to prevent confirmation of the researcher's own ideas or biases. The protocol was fluid, dynamic and revisable and followed the natural progression of the research in the investigation of the guiding research questions in developing grounded theory (Glaser and Strauss, 1967). While these principles are quite general to qualitative research methods, the distinctiveness of the features of the Gioia method that enhance qualitative rigor are more evident in the approach to analysis, especially in organising the research data into 1st- and 2nd-order categories to present their assembly into a more structured form. The data analysis of research is discussed in a subsequent section of this thesis.

5.4.5   CRITICISMS OF THE GIOIA METHODOLOGY

There has been some criticisms and questions raised about Gioia methodology. The first relates to transferability of findings and that purely idiosyncratic findings would be of little benefit to wider domains. In response, Gioia et. al (2013) states that the Gioia methodology departs from pure interpretivists who argue that when one is studying the socially constructed structures and processes of others, those structures and processes are necessarily idiosyncratic because they are fashioned and performed by unique individuals acting within unique contexts. The authors argue that many concepts and processes are similar, even structurally equivalent (Morgeson and Hofmann, 1999) across domains. In addition, it is possible to generalize from a case study if the case generates concepts or principles with obvious relevance to some other domain. The authors further argue that similar to the philosophy behind choosing a good case with which to teach, that predication is based on finding the specific case that exemplifies a general principle that can be taught as a transferable generality—namely, ''principles that are portable'' from one setting to another (Gioia et. al, 2013: 24). Therefore, the transferability of emergent concepts and findings can be appropriate when using the Gioia methodology.

The second criticism relates to the implementation of the methodology by researchers and there are two aspects to this. The first is that the 1st-order/2nd-order conceptualization/terminology is becoming increasingly prevalent. Critics have stated that, ''Are we all going to talk mainly in terms of 1st- and 2nd-order findings in our research reporting now? Is that a good thing?'' (Nag and Gioia, 2012: 24) In Gioia et. al (2013), the authors respond "no" and "no" to those questions and state that different methodological approaches should rely on different conceptualizations of data. To force fit data into the 1st-order/2nd-order rubric when not required not only diminishes the potential value of those data, but also sacrifices the benefits of qualitative research's flexibility in applying different approaches to fit different phenomenological investigations. The second related and perhaps more important concern is that researchers seem to be applying the methodology as a template or treating it as a ''formula,'' essentially reproducing the exact format of the data structure from recently published studies. To this end, the authors stress that the

approach should be taken as a ''methodology,'' rather than a ''method'' and seen as a flexible orientation toward qualitative, inductive research that is open to innovation, rather than a ''cookbook.'' (Gioia et. al, 2013: 26). When the approach is treated as a template, it not only constrains its innovative possibilities, but also seems to get in the way of using it to address one of its main intents, which is to rigorously demonstrate connections between data and theory. Therefore, it is important for researchers to be mindful of these concerns about the Gioia methodology when adopting the methodology in research.

5.5 THE CASE AND RESEARCH SITE

In case study research, an 'important aspect of using a single case is defining the actual case' (Saunders et al. 2016: 186). The case in this research is to empirically investigate how a firm enhances its capabilities as well as to understand the multi-level nature of dynamic capabilities in organizations. The firm in question is a management consultancy organization and in terms of the services it provides, and the way work is organised around project teams, the firm is similar to many firms in the information technology security industry in the United Kingdom. Firms in the industry will differ in terms of size, complexity and the details of the professional services they offer. In line with research ethics practice and to abide by the researcher's non-disclosure agreement, the IT security firm researched in this PhD is anonymised. Therefore, a pseudo name is used for the firm in this thesis, Consultancy for Information Technology Security – CITS. The name, CITS will be used to represent the firm henceforth, in this thesis.

5.5.1 THE FIRM - CITS

The organization is a niche IT security firm that are specialists in information risk management. The firm is an information risk management consultancy founded by three leading information security directors in 2008, drawing on their wider experience of driving the information security agenda in the financial services industry at the Royal Bank of Scotland, where they worked together for over 20 years. The company views information technology security as about dealing with the compromise of CIA – confidentiality, integrity and availability of data, and implementing effective controls to avoid compromise. It combines industry best practice with pragmatic judgement to deliver understandable solutions and prides itself on providing value for money as a key differentiator for the company.

CITS is a hugely successful company in the IT Security industry and has acquired and retained some of the biggest clients in the financial services industry. These include Lloyds Banking Group, Bank TSB, Royal London Mutual Insurance Society Limited, Standard Life, Legal & General, National, ICAP, Worldpay, William's and Glyn's Bank, Tesco Bank, and Sainsbury's Bank. One of its

unique experience is helping financial institutions during transitions due to mergers or acquisitions. This experience was gained at Tesco Bank, Worldpay, TSB, Sainbury's Bank and William's and Glyn's Bank (source: CITS's website). The firm's main competitors are the Big Four management consulting firms namely, Deloitte, PwC, EY and KPMG. These companies have strong, credible brand names so niche consultancy firms like [company name] compete by specialising in the technical aspects of information security. For the next phase of firm growth, the company sought opportunities to review its capabilities to become more efficient and effective and provide a stronger platform for growth through re-usable methods.

In June 2015, CITS completed a one-year long project with its new biggest client, Royal London (*henceforth referred to as 'major client project - MCP' in this thesis*). The company believed that the learning and outcomes from the processes of this very successful project provided the ideal platform to renew its business strategy, enhance its capabilities and pursue growth opportunities. One of the directors stated, 'We have always updated our capabilities organically over time as we have got better at doing things and to meet new demands of clients and the industry… actually our capabilities have changed very little in the past two years. If we can tap into the success of Royal London project, it can be the right opportunity to enhance our capabilities and business strategy.' The journey that CITS was about to embark on offered a good case to study dynamic capabilities.

The PhD research at CITS began in August 2015 with unique access into an organization to empirically study dynamic capabilities through case study research. The data gathering study period at the research site covers a 15-month period from August 2015 to October 2016 and the research objectives were achieved by adopting a microfoundations research approach. Also, importantly this case research engaged in a multi-level analysis of top management teams, social groups, and routines, rather than a fragmented single level analysis common in literature, thus it addresses one of the research gaps in dynamic capabilities research agenda. By unpacking processes, the research looked simultaneously at both vertical and horizontal processes in an organization. First, the case study followed horizontal processes by which the firm used the outcomes of the *'major client project'* to renew its capabilities over the time period in question. Second, and in parallel with the first, the research studied the vertical organizational processes in CITS by which the firm exhibited dynamic capabilities.

It is important to provide some discussions on the firm's organizational structure for a number of reasons. First, understanding the organizational structure fits with the objectives of the study which is to investigate the multi-level nature of dynamic capabilities and identify what level(s) the phenomenon resides in organizations. Second, the structure of the firm has a bearing on the researcher's data collection and sampling approach, that is, which individuals at what levels of the

firm are appropriate to conduct interview and observation with – this is linked to the first point of understanding the structural nature of dynamic capabilities in firms. Third, since the firm is typical in structure to management consultancy organizations in the industry, it is important to explicitly present the structure if any generalizations from the research findings are to be made. It is noteworthy to mention that there might be some variations in structure between firms in the industry due to size, complexity and expertise functions; but overall organizational structures are rather consistent.

5.6 RESEARCH METHODS - DATA COLLECTION

The first phase of the firm's journey during the research period was the 'Evaluation and Re-formulation of the business strategy based on the learnings from the major client project'. The activities during this phase were (1) Meetings between the top management team, the Project Managers (PMs) and Subject Matter Experts (SMEs) that worked on the major client project, and the Business Development Manager, (2) Meetings between the top management team. The researcher attended these meetings and data collection was conducted through observations/field notes and interviews. The time period was August 2015 – January 2016. The sampling method adopted here was a no sampling since the researcher 'followed' the phase and the processes involved, and the sample chosen was all the individuals involved in the phase. Sampling is further discussed in the sampling section of this thesis and the observation and interview schedule provides more information.

The second phase was 'Redevelopment of organizational capabilities and knowledge articulation & codification to create artefacts'. The activities during this phase were (1) Meetings between the top management team (directors), Lead SMEs, Business Development Manager and Recruitment Manager (2) Meetings between the top management team (3) Meetings between Recruitment Manager and Technical Director (to discuss recruitment of personnel to enhance the firm's capabilities. The researcher attended these meetings and data collection was conducted through observations (field notes) and interviews. The time period was November 2015 – April 2016 (some part of this stage ran concurrently with the first phase). Sampling method adopted here was a not purposive sampling (Quinlan, 2011) due to the fact that the researcher 'followed' the processes involved in that phase, and the sample chosen was all the individuals involved in the phase. Sampling is further discussed in the sampling section of this thesis and the Observation/Interview schedule provides more information.

The third phase was 'The Dissemination of outcomes of the first two phases i.e. the renewed business strategy & codified knowledge' throughout the company. The methods of achieving this phase were (1) through events organised at the company which were tagged *Knowledge*

Management (KM) sessions, and (2) company documents sent to employees (and made available to the researcher). The KM sessions were led by the directors in the top management team and lead SMEs, and in attendance were other employees including SMEs, PMs, Analysts and the Business Development Manager. The sessions were held at late afternoon times so that employees working at client organizations attended after their normal working day. The researcher attended these sessions and data collection was conducted through observations/field notes. The time period was April 2016 – July 2016. In terms of sampling, the researcher observed the interactions of all individuals at the sessions and individuals were selected to be interviewed during this time period and also at the final stage of data collection. The sampling section of this thesis and the observation/interview schedule will discuss why and how the individual were chosen.

The final stage of data collection was from August 2016 – October 2016 and was done through interviews. Details about sampling are in the sampling section and the Observation/Interview schedule provides more information.

Table 7. Breakdown of Research Data Gathering Period

Company Phases of Capability Renewal	Corresponding Data Gathering Stage	Timeline
1st Phase Evaluation & Re-formation of the business strategy	Background Information and Primary & Secondary Data	August 2015 – January 2016
2nd Phase Re-development of capabilities and Knowledge articulation & codification	Primary & Secondary Data	November 2015 – April 2016
3rd Phase Dissemination of outcomes of 1st and 2nd phases	Primary & Secondary Data	April 2016 – July 2016
Final Phase	Final Data & Validation of Data	August 2016 – October 2016

5.6.1 RESEARCH INSTRUMENTS

To achieve an in-depth inquiry and a rich, detailed flow of analytical data, case study research may benefit from a combination of number of data sources, including archival records and documentation, observations, interviews and focus groups, reflection and the use of research diaries and other research aids (Saunders et al., 2016). According to Yin (2003), the choice of research instruments to collect data must be appropriate for the research study and useful to meet the research aim and objectives, and in particular to answer the research questions. Two

primary research instruments were used to collect primary data; namely semi-structured interviews and observations from which the researcher generated detailed field notes. The rationale behind the choice of interviews and observations as research instruments to be used is that are suited to 'how' and 'why' research questions where the researcher seeks to understand and capture the ways in which social phenomenon is constructed in real-life settings. The primary data was supplemented by secondary data obtained through analysis of company documents and reports, and background information about the organization and the wider environment in which the case study existed. This included developments in the information technology industry, industry standards and regulation, and the firm's competitors in order to understand the market. The background information was helpful when developing some of the interview questions and to better understand some of the terms in the interview responses, especially technical jargon. The fact that the PhD student has a master's degree in information technology security aided in gaining a general understanding of the firm and the industry and achieving a level of technical credibility while discussing issues with interviewees. The field notes from observations aided to enrich the interview findings and also to permit triangulation of research data and enhanced discussions in the findings chapter. Triangulation in research is the examination of the phenomenon under investigation from more than one perspective and two different primary data sources will together provide a richer, deeper, more nuanced and complex insight into the organization and phenomenon Yin (2003).

5.6.2 INTERVIEWS

Interviews as a research instrument are one of the most commonly used methods in qualitative case study research. This is based on the premise of the importance of people's stories to understanding human behaviour and the meaning attached to social actions and decisions as accessible through language (Seidman, 1998). Interviews are about, "obtaining here-and-now constructions of persons, events, activities, organizations, feelings, motivations, claims, concerns, and other activities, reconstructions of such entities as experienced in the past; projections of such entities as they are expected to be experienced in the future; verification, emendation, and extension of information (constructions, reconstructions, or projections) obtained from other sources human and non-human; and verification, emendation, and extension of constructions developed by the inquirer" (Lincoln and Guba 1985: 268). They allow a researcher to get a rich first-hand account of a participant's view of the present, past or future entity. There are two main forms of interviews; the more focused, structured interview and the less focused, more in-depth unstructured interview Lincoln and Guba (1985). A semi-structured interview finds a middle ground between the two interview forms.

In this PhD study, semi-structured interviews were carried out in most instances and provided the opportunity for time to be spent discussing issues that came up during the course of the interviews, while keeping to an agenda of answering the main research questions. A number of structured interviews was performed during the last round of interviews in order to verify some of the prior data/findings gotten after previous rounds of data collection and analysis. Brinkmann (2009) has noted that a standardised set of procedures for conducting interviews, both in terms of how to design interview questions and how to analyse interview data, does not exist. This emphasizes the need for the researcher to ensure that steps are taken to achieve and demonstrate the rigour of an interview study. This goal of rigour was achieved through the process of sampling, the conduct of the interviews, analysis of the interview data, and the presenting of the resulting findings by adopting the Gioia methodology.

The interviews were undertaken during three main stages of the empirical data collection period which corresponded with key milestones of the project at the organization. The first period of interviews was during – the learning from the 'major client project'. The second was – developing the business strategy and re-enhancing organizational capabilities. The third period was – implementation of the business strategy. The interviews were carried out with respondents across the three levels of the organization, and the decisions about who to interview and the appropriate number of interviews, is discussed in the Sampling section of this thesis. The interview period was intertwined with the observation period and some interviews were conducted on the same day as the observations, after the researcher had observed respondents at meetings and KM sessions. This scheduling had the advantage of encouraging respondents to discuss and further explore issues that arose in meetings while the issues remained fresh in the minds of all. It also reduced the travel to the research organization since some interviews and observations were scheduled to take place on the same day. The interview/observation schedule table provides details about the implementation of the interview strategy.

Semi-structured interviews were carried out with informants in face-to-face interviews in a meeting room at the research site. The interview entailed going through the detailed set of interview questions with follow up questions to clarify points or gain more insight into issues discussed – it was important to allow a natural flow of the interview progress. Interviews were scheduled to last for 1 hour but some ran for a maximum time of 1 hour 30 minutes. Two independent recording devices, a mobile phone with a recorder and an ipad were used to record interviews to serve as a backup should a recording device fail during the interview. Ethical research guidelines and procedures were applied in interviews which are covered in the Research Ethics section of this chapter.

Recorded interview data were transcribed by the researcher. The decision to personally transcribe the data was to gain more familiarity with the data but most importantly, to keep/reflect informant's 'voice' i.e. exact words and themes during transcription, which is significant when performing 1st-order and 2nd-order coding in creating the data structure using the Gioia methodology. In total 35 interviews were conducted and there was a total of about 45 hours of recorded interview data which was transcribed and this workload was manageable by the researcher and the time had been allocated in the researcher's work allocation schedule. The transcribed data was coded and analysed and presented in the data structure using the Gioia methodology.

5.6.3 OBSERVATIONS

Observation as a data collection method is a traditional method in ethnographic research and it is becoming more commonly used in business and management research. It essentially involves systematic viewing, recording, description, analysis and interpretation of people's behaviour, some action, activity or phenomenon (Quinlan, 2011). It can be rewarding and enlightening to pursue, and adds considerably to the richness of the research data. One of the best-known examples of managerial research that used observation as part of its data collection approach was the study of the work of senior managers by Mintzberg (1973) which led Mintzberg to cast doubt on the long-held theory that managerial work was a rational process of planning, controlling and directing. Observation as a method is generally classified into three kinds of observation namely; non-participant observation, participant observation and covert observation. There are three critical decisions which a researcher must make in an observation study – what exactly is to be observed, how to conduct and record the observation (Quinlan, 2011).

This research adopted a non-participant observation method and used an unstructured observation technique, which allowed the researcher to observe the action or phenomenon under investigation in the research work and record the observations. To observe these actions/phenomenon, observations are carried out at three main types of events in the organization – meetings and knowledge sharing sessions where these actions and phenomenon unfolded in real-life settings in the organization. A third, albeit less frequent observation was carried out during informal social events organised by the company which the PhD student was invited to attend. This, along with the other formal events, allowed the researcher to observe the cultural context and company norms and values which provides a more nuanced, richer understanding of how the firm operates, organizational dynamics and how individuals interact - by entering the social world of those who are being observed. The observation schedule provides details about how these are carried out. The observations were recorded as field notes in a field diary which provided the observation data that was analysed.

One of the basic principles in research is the principle of rigour and fieldwork through observation should be systematic, rigorous and valid. There are no clear-cut rules about rigour; the way in which observation is designed and carried out by the researcher establishes the rigour of the observation (Quinlan, 2011). In designing an observation study, the appropriateness of observation as a data collection method in the research work is dictated by several factors – the data requirements of the study, the location of the data, the kind(s) of data available and the level of access possible to that data, the aims and objectives of the research, the population of the research, the location of the population, and by the context for the research (Quinlan, 2011).

The first research observation was scheduled to take place after the first round of interviews by which time a preliminary understanding of the organization had been achieved. The observation schedule was agreed with the management to coincide with key meeting dates and Knowledge Management session events that aligned with the research focus. The observations were clearly and thoroughly organized, and the observation schedule table shows when and with whom the observations were conducted. By being a non-participant observer, the researcher was able to take brief, jotted field notes which were written up later. Mental notes were made during social events where it was inappropriate to be seen taking notes. These notes were then developed into full field notes as soon as possible, and the information included events, people, conversations, as well as the researcher's initial ideas about interpretations, impressions and feelings.

5.6.4 SAMPLING

Deciding on the most appropriate sampling method in qualitative studies can be quite challenging due to the fact that there is no clear-cut guidance as to how to select participants to form a sample (Trost, 1986). In quantitative studies, it is argued that a chosen sample is representative of the wider population. However, this argument does not hold in qualitative studies in which a sample which shows some variations is necessary (Trost, 1986), especially as this might aid to reveal more interesting theoretical insights or help to identify outliners from the norm (Glaser and Strauss, 1967). In this research, the main rationale adopted in the sampling approach was based on the decision to follow the organization on its strategic change journey and let that lead the researcher to participants involved from which a sample would be taken; this approach would allow the researcher to engage with individuals involved in both the vertical and horizontal processes being investigated in relation to dynamic capabilities. First, with regards to horizontal processes, that is, the 3 organizational project phases implemented during the research duration as identified earlier, the sample chosen to participant in the research were all those individuals (see discussions on the project phases) – the exception to this was with the participants at the KM sessions whereby the researcher choose a sample from the individuals who attended, to interview. This is because it served no purpose both in terms of the time required and theoretical

insight, to interview all the individuals that attended the sessions, rather a representative sample of SMEs, PMs and Analysts were chosen for interviews. Second, in terms of vertical processes, this relates to one of the research objective which is to investigate where dynamic capabilities reside in organizations and the multi-nature of the phenomenon. Therefore, as the researcher followed the horizontal processes in the organization, which in turn revealed individuals involved in the process (i.e. vertical), the guiding rule for choosing an appropriate sample was to identify individuals within the organizational structure who were involved in the process. This turned out to be individuals at the 3 levels of the organizational structure, that is, the top management team, management team and the lower level. It was important that the sample of participants chosen for research were representative of the 3 levels of organization's structure. In addition, the Business Development Manager and Recruitment Manager were included in the research sample. The Business Development Manager was included as a participant because after initial research at the company, it was discovered that the manager served as a strong link between the top management team level and the management level – the manager attended most top management team meetings and all the Knowledge Management sessions. Therefore, including the manager in the sample was seen as a potential avenue to gain valuable insights as to how the firm operates in terms of achieving the research objectives. The Recruitment Manager was included in the sample after initial research revelations for two reasons. First, the manager worked closely with the top management team (particularly with the CEO-role director and Technical-lead director) to understand the requirements of clients and to recruit employees for the company so as to adequately provide the needed resources for the clients. Second, the manager was involved in allocating employees/resources on to client projects. These are the justifications for including the Recruitment Manager into the sample in order to gain useful insights into how the firm operates as that relates to the research objectives. These discussions illustrate what served as a guide in reaching the decision as to the appropriate number of respondents chosen for this study as there isn't a definite rule on this in qualitative study. The observation/interview schedule provides details of the number of participants in this study.

There are different views amongst scholars as to the number of interviews to conduct in a qualitative study in order to demonstrate rigour in research and Becker and Bryman (2012) argue that this number depends on the study being conducted. Alder & Alder (2012) suggest thirty interviews whereas Brannen (2012) argues for about forty. In this study, the number of interviews conducted was thirty-five and this fits within a ball mark figure specified by the two scholars mentioned. At the start of the PhD research the number of interviews planned for/anticipated was between 25 to 40 as that number seemed manageable for a PhD work. Since the research goal was to investigate an organizational phenomenon in a real-life setting, it was decided that

the exact number of interviews conducted would be influenced by how the research unfolded in reality and when it was deemed that adequate data had been collected to satisfactorily meet the research objectives and hopefully answer the research questions – keeping in mind a range of 25-40 interviews as this seemed manageable. Ideally, researchers should achieve a theoretical saturation point at which "no additional data are being found whereby the sociologist can develop properties of the category" Glaser and Strauss (1967: 61). However, in practice it is impractical not to have a rough estimate of sample size due to resources and time constraints, especially in a PhD study and Patton (1990: 186) recommend that qualitative studies should have "minimum samples based on expected reasonable coverage of the phenomenon given the purpose of the study and stakeholders interests." Based on these considerations, at 35 interviews, it was felt that the research goal had been satisfactorily reached and the number of interviews was to some extent influenced by the overall length of the firm's project. The final round of interviews was held in October 2016, in part to validate some findings that were emerging from the data analysis and it was felt that it was an appropriate time to bring data collection to an end.

Figure 6. Data Collection Trail – Interview/Observation Schedule (August 2015 – October 2016)

Participants / Events ( ) refers to number of times person was interviewed	Aug 2015	Nov 2015	Jan 2015	Feb 2016	April 2016	May 2016	July 2016	Aug 2016	Oct 2016	Level of Empirical Analysis
3 Directors – Top Management Team (4)		✓		✓				✓	✓	Individual, Group and Firm Level
6 Managers = 1 Business Dev. Manager, 1 Recruitment Manager, 2 Project Managers, 2 Subject Matter Experts (2)		✓	✓	✓	✓	✓	✓			Individual and Group Level
4 Analysts (2)			✓	✓		✓	✓			Individual Level
Observations at Meetings	✓	✓	✓	✓	✓			✓		Individual, Group and Firm Level
Knowledge Sharing Sessions Attended		✓		✓	✓	✓				Individual, Group and Firm Level
Access to Company Documents	✓	✓	✓	✓	✓	✓	✓	✓		Individual, Group and Firm Level

Number of interviews conducted - 35

5.6.5 THE DATA ANALYSIS

Qualitative/interpretive researchers have often noted that it is somewhat impractical to parse the interviewing from the analyses as they often tend to take place together (Langley, 1999; Lincoln and Guba, 1985; Locke and Golden-Biddle, 1997). A myriad of informant terms, codes, and categories emerged early in the research process - a process akin to Strauss and Corbin's (1998) notion of open coding. In the Gioia methodology, during the 1st-order analysis an attempt was made to strictly adhere to informant's terms and not attempt to group terms to form a smaller number of categories. As such, the initial number of categories was high at the front end of the study and appeared overwhelming at this stage but the idea is keep as open as possible the informant's perspective and not necessarily seek for meaning or sense at this point. "You have to get lost before you can get found" (Gioia, 2004: 11).

As the research progressed, the second phase of the analysis began to look out for similarities and differences among the many categories - similar to Strauss and Corbin's (1998) notion of axial coding, a process that gradually reduced the germane categories to a more manageable number (about 20). Categories were then given labels (retaining informant terms) after which the categories array created was then scrutinised by asking the question; Is there some deeper structure or patterns forming in this array? It is at this point that the researcher assumed the role of knowledgeable agent who thinks at multiple levels simultaneously (i.e. at the level of the informant terms and codes *and* at the more abstract, 2nd-order theoretical level of themes, patterns, dimensions, and the larger appearing narrative – answering the questions "What's going on here" and "What does this tell us" theoretically). Developing tentative answers to this question by way of "gestalt analysis" (Gioia and Chittipeddi, 1991) led to the formation of deeper questions at subsequent interviews to pursue subjects that were increasingly focused on concepts and tentative relationships and patterns emerging from the interviews. This is what Glaser and Strauss (1967) refers to as theoretical sampling.

The researcher began to seek out theory during this 2nd-order analysis, asking whether the emerging themes suggest concepts that might help describe the phenomena being observed. A focus was made on nascent concepts that did not seem to have adequate theoretical referents in the existing literature or existing concepts that "leap out" because of their relevance to this research domain. Once a workable set of themes and concepts was at hand - and a 'theoretical saturation' point was reached (Glaser and Strauss, 1967), it was investigated whether it was possible to distil the emergent 2nd-order themes even further into 2nd-order "aggregate dimensions."

Furthermore, a data structure was then built from the full set of 1st-order terms, 2nd-order themes and aggregate dimensions. The data structure is the first pivotal result from the Gioia methodology approach. The data structure allows a configuration of data into a sensible, clear visual aid as well as provides a graphic representation of progression from raw data to terms and themes in conducting the analyses – this is a key component of demonstrating rigor in qualitative research (Pratt, 2008; Tracy et al., 2010). More so, the process of constructing the data structure compelled the researcher to think about the data theoretically and not just methodologically. However, this does not necessarily mean that the data structure captured relationships between 2nd-order themes (a step that occurred later in the theorizing process). Rather, this forced deeper engagement with abstractness of the data creating a foundation for balancing the deep richness of the informant's view in living with the necessary "30,000-ft" view often required to draw forth credible theoretical insights (Corley and Gioia, 2004). During the process of data gathering and after the initial stages of analysis, the researcher began to teleport between emergent data, themes, concepts and dimensions and the relevant literature, not only to see whether any findings have precedents, but also whether any new concepts are developed.

5.6.6 DEVELOPING DATA STRUCTURE INTO GROUNDED THEORY

There are great benefits of creating a data structure as discussed in the previous paragraphs. However, a data structure is more or less a static picture of a dynamic phenomenon. Process research investigates processes hence there is a need to convert the static picture of data structure to a motion picture. As such during the entire research, the researcher kept a front-and-centre focus on the ultimate goal of building a vibrant, inductive theory that was grounded in the data (as suitably demonstrated in the data structure), one that captured the informant's experience and the observed phenomenon in theoretical terms. The resulting grounded theory would hopefully show the dynamic relationships among the emerging concepts that describe or explain the phenomenon of interest under investigation and one that made clear all the relevant data-to-theory links. This allays the usual concerns that qualitative research too often does not show just how data relate to theory. The key question for qualitative researchers as theory developers or model builders is how to account for not only the major emergent concepts, themes, and dimensions, but also for their connections and dynamic relationships in a transparent manner. By familiarising and getting intimate knowledge of the data and seeking relationships among the emergent concepts, the researcher was able to acquire theoretical insights that would not be apparent simply by inspecting the static data structure itself. Also, deep insights required for theory development often accompanies close familiarity with the data in the sense of deep immersion in the data and the data structure. Writing up research work and findings is the process of building a narrative which is centred on possible theory development. Table 5 is a

summary of the steps and features of the Gioia Methodology for Theory Development which was adopted in this PhD research.

Table 8. Steps and Features of the Gioia Methodology for Theory Development (Source: Gioia and Pitre, 1990)

Steps	Key Features
Research Design	• Articulate a well-defined phenomenon of interest and research question(s) framed aimed at surfacing concepts and their inter-relationships • Initially engage with existing literature, with suspension of judgement about its conclusions to allow discovery of new insights
Data Collection	• Give extraordinary voice to informants, who are treated as knowledgeable agents • Preserve flexibility to adjust interview protocol based on informants responses • "Backtrack" to prior informants to ask questions that arise from subsequent interviews
Data Analysis	• Perform initial data coding, maintaining the integrity of 1st-order (informant-centric) terms • Develop a comprehensive compendium of 1st-order terms • Organize 1st-order codes into 2nd-order (theory-centric) themes • Distil 2nd-order themes into overarching theoretical dimensions (if appropriate) • Assemble terms, themes, and dimensions into a "data structure"
Grounded Theory Articulation	• Formulate dynamic relationships among the 2nd-order concepts in data structure • Transform static data structure into dynamic grounded theory model • Conduct additional consultations with the literature to refine articulation of emergent concepts and relationships

5.6.7   RESEARCH ETHICS

The research in this PhD study was carried out in line with the ethics rules of the University of Stirling. The ethics framework stipulates that harm should be minimised for research participants, researchers, research organizations and non-academic collaborative researchers. Ethics approval for this project was granted by Stirling Management School's Ethics Review Committee. Within Stirling Management School, "light touch" ethical review procedures apply to research that is "minimal risk", as determined if a project does not involve certain listed characteristics which would give rise to concerns.

During recruiting participants for the research during data collection stage, participants were providing an information sheet – the document explicitly state that participation in the research project is voluntary and that the participants have the right to withdraw at any point. This reinforced "informed consent" is stressed by the European Science Foundation (2011). In addition, it explained that all attempts will be made to ensure the anonymity of respondents and

the firm is respected. The purpose of the research and what participation involved were clearly stated in the information sheet, so that potential participants are aware as possible of the implications of participation in the project and the value of participation to them and their firm. Importantly, a Non-Disclosure and Confidentiality Agreement was signed between the researcher and a representative of the firm's management team and this agreement was honoured throughout the research project. The procedures discussed above demonstrate how ethical obligations in the research project were addressed.

5.7 CONCLUSION TO THIS SECTION

This section addressed the rationale and appropriateness of the methodology adopted in the PhD research to suit the research aim and objectives and importantly, to address the research questions. It started with theoretical discussions on ontological and epistemological arguments and proceeded to present case study research approach and design as used in this work. In addition, the Gioia methodology adopted for qualitative rigour and vigour was discussed as well as the data structure which demonstrates the evidence of the link from data to theory development. The next section will present the main output from adopting the research methodology in this research. It will present the industry, firm and the data structure created from the Gioia methodology used.

Figure 7. A summary of the Research Methodology adopted in the PhD research

Theoretical Base	Main Methodology	Context	Empirical Focus
Theory of Dynamic Capabilities	Gioia Methodology, Case Study Research Approach using Semi-structured interviews, Observations, Secondary data sources	Firms in Information Technology Security industry	Investigation of the Multi-level nature of Microfoundations of Dynamic Capabilities

SECTION TWO

5.8 THE INDUSTRY AND FIRM

5.8.1 INTRODUCTION AND OVERVIEW OF THE RESEARCH METHOD

To answer the research questions, the researcher employed the research methodology described in section one of this chapter to study of a firm undergoing capability renewal and reconfiguration. The research applied the microfoundations of dynamic capabilities framework (Teece, 2007) to investigate the individuals, processes and activities the firm engaged in to sense, seize and reconfigure its assets. The data collection method was participation observation,

interviews, analysis of company documents and secondary research about the industry the firm operated in. During the observations, the researcher kept a diary of events in which he recorded activities that took place at the firm, details of formal and informal conversations, the context of meetings, and other general observations. The notes in the diary were reviewed and reflected upon soon after events and key questions for further data collection were identified. The observation field notes and the researcher's reflections are contained in Appendix Three.

The observational data were augmented by 35 semi-structured interviews with key informants, including the firm's directors, managers, SMEs and analysts, the criteria for choosing individuals to partake in the research was discussed in sampling sub-heading. In addition, other sources of data were a range of internal documents, including internal communications, project documents, business plans, marketing documents and sales pitches/presentation slides made to clients. These documents provided important background information about the firm and its current operations. Secondary data sources included research done by the researcher on the internet about the industry, competitors and regulation through both internet searches and news links provided by informants at the firm. These provided useful contextual information.

This section will present the main outputs from adopting the research methodology summarised above. It will present the industry, the firm and the data structure from the Gioia methodology which will be discussed in detail in the findings chapter.

5.8.2   THE INDUSTRY

Information technology security relates to three main things, or what the industry refers to as the cyber security trinity: people, processes and technology (itgovernance.co.uk, 10 July 2017). It is argued that to secure an organization properly an organization needs an information security management system which addresses people, processes and technology in a single, integrated approach that is strategic as well as operational. People relate to staff training and awareness about security matters, professional skills and qualifications, and competent resources. Processes deal with management systems, governance frameworks, industry best practices, and IT audit to ensure governance and compliance. Technology concerns the operational backbone of an organization but technology cannot be deployed without competent people, support processes and an overall integrated plan. As technology changes and IT security risks and vulnerabilities evolve with technology, organizations must maintain a dynamic information security management system to protect the organization. IT security firms in the industry provide products and services to help keep organizations secure.

The Industry Standards

The premise of information technology security is about protecting 'the CIA'. There are three main types of information compromise and the core of IT security is to implement effective controls to avoid compromise. Availability compromise 'A' refers to not having access to critical information which can present businesses and organizations from executing operations or functioning entirely. Integrity compromise 'I' relates to errors introduced into information that can have financial impact on businesses and their customers. Confidentiality compromise 'C' refers to leaking of sensitive information which organizations are legally required to protect and/or which if lost would cause reputation damage to organizations – this is the most common form of security breach. These are the three main types of information compromise (CIA) and the core of IT security is to implement effective controls tailored around industry standards to avoid compromise.

The Basics – ISO27013: 2015 Information Technology Security Techniques is a set of international standards defining information security (IS) control requirements and it is currently the dominant standard in the industry today as most organizations align their IT security policy to this standard. It is great at informing organizations "what you should have" but does not detail "the how" of implementing effective controls required to limit information compromise from key threats. Figure 8 depicts the core components of the ISO27013 industry standard for guarding against IT security threats.

Figure 8. Depiction of ISO27013: 2015 Information Technology Security Techniques (Industry Standard)
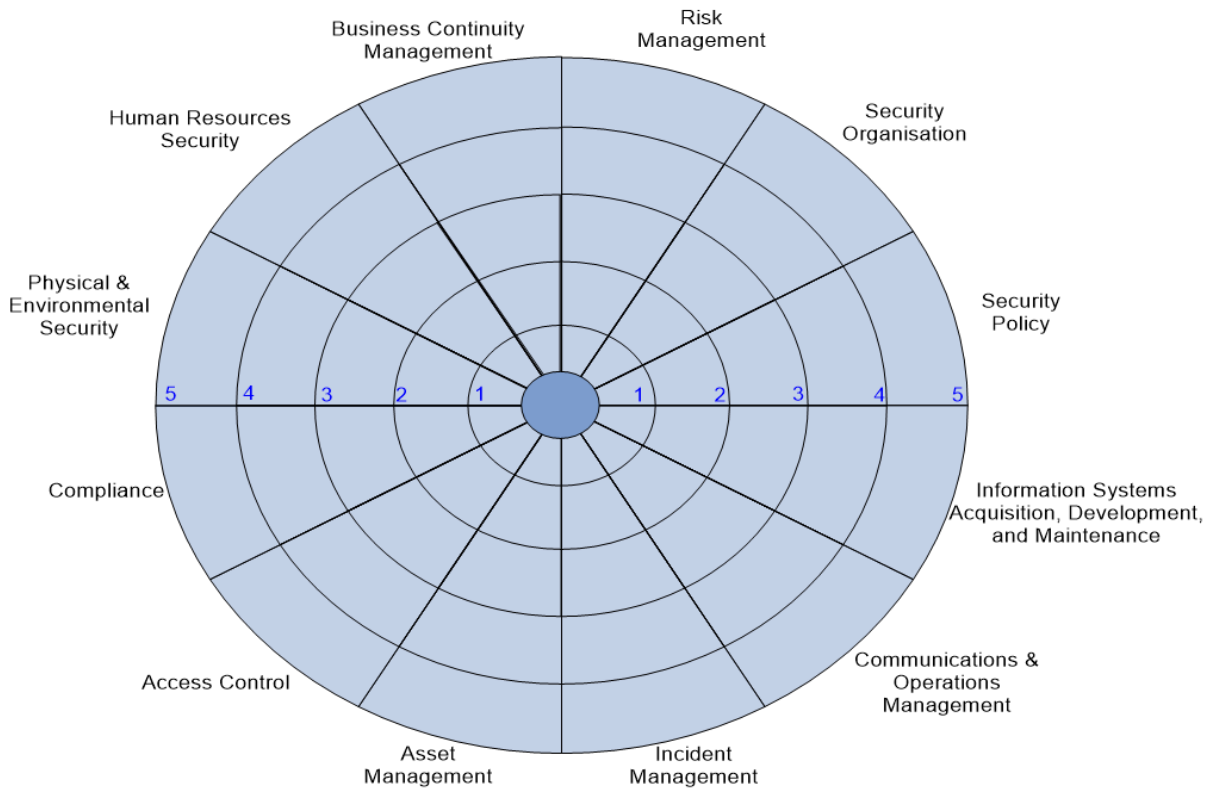
Industry Regulation

As information technology has increasingly become central to organization's activities and processes thus increasing the need for IT security, together with the challenge of an ever-changing threat landscape, there has been increasing regulation in the industry. Regulation is playing a more significant role both in terms of general protection of information and specifically within financial services. For example, The Data Protection Act (1998) was introduced because of a growing concern about the security of information within organisations. Regulations, such as this, are intended to benefit both organizations and customers who rely on firms to keep their information safe. The new EU data protection regulation – General Data Protection Regulation (EU GDPR) which will formally apply in the UK from 25 May 2018 is a legal requirement to help organizations and individuals understand the new legal framework in the EU and their responsibilities for data protection (itgovernance.co.uk, 10 July 2017). More recently the UK Government through its financial services regulators, The Prudential Regulation Authority (PRA) and Financial Conduct Authority (FCA) have started to play a more active role as they recognise

the threat that Cyber Security places on UK businesses. An organization called CREST is a non-profit organization that serves the needs of a technical information security marketplace that requires the services of a regulated professional services industry. It represents the technical information technology industry by offering a demonstrable level of assurance of processes and procedures of member organizations (crest-approved.org, 10 July 2017). CREST, working alongside the UK central Bank, the Bank of England (BoE) has developed a framework called STAR (Simulated Targeted Attack and Response) to deliver controlled, bespoke, intelligence-led cyber security tests that replicate behaviors of threat actors to develop effective responses. This provides assurances that organizations have appropriate countermeasures and responses to detect and prevent cyber-attack, particularly those to the most critical parts of the UK's financial services (crest-approved.org, 10 July 2017).

Industry regulations have been valuable to protecting organizations and at the expectations of organizations to comply with and respond to new/changing regulatory requirements is even more pertinent.

Common Forms of IT Security Threats and Controls

Below is an overview of three forms of common threat and the types of controls that can be implemented to mitigate them. First threat is inadvertent data leakage. Effective controls against this include regular third-party reviews, a register of data transfers and assurance of transfer mechanisms, regular education and awareness to employees on keeping data secure, encryption of laptop hard drives and USB port lock down, and data leakage prevention tools. Second, is insider data compromise. Effective control mechanisms include fraud tracking on key banking platforms, encryption of laptop hard drives and USB port lock down, role-based access control, and break glass privileged system access controls. Third, is external cyberattack. Common controls against this threat are security operations centre in place to detect attacks, distributed denial of service (DDOS) prevention in place, and external facing infrastructure regularly scanned for vulnerabilities and weaknesses.

These control requirements are based on the industry standards however, the details of implementation will differ across organizations.

5.8.3 THE FIRM - CITS

The Top Management Team

The company has three distinct organizational layers. The top management team consists of the 3 directors; Director C, Director B and Director A. C exploits over 25 years of experience in the information security industry helping major UK banking groups to drive programmes to improve

security and policy compliance and for many years and was responsible for ensuring that the RBS group operated globally in line with best information security practice. C states on the company website, 'My line management responsibilities in various UK banks have given me an intimate understanding of the challenges in maintaining customers' trust by protecting data. All of our clients want to make things happen; to put theory into practice and that is proving to be one of company's major differentiators.' C takes the unofficial role of sales director of the company and is largely responsible for winning new business through client relationships or 'knocking on doors' to win new clients. Director B's wealth of experience has included senior management positions at RBS, and recently include leading the definition and design of a 3 year, £multi-million IT Security transformation programme for a major UK bank. B says, 'Given the abstract nature of information risk, gaining senior leadership buy-in to a major IS strategy investment is challenging. This is because it requires a clear definition of the problem and investment needed, as well as clarity about how the proposed solutions will address the actual risks.' B is the unofficial technical director of the company due to his technical expertise, and he drives the development of the company's offerings and capabilities. Director A has extensive and diverse experience across global financial services and was previously the Head of Information Security for the Royal Bank of Scotland Group throughout the UK & Ireland, where he had responsibility for security across the Groups many brands and substantial supplier base. Director A states, 'My belief is that effective management of risk enables business leaders to focus their scare resources on driving improvement activity in the most relevant areas. Helping our clients adopt a structured, pragmatic approach is one of our key differentiators.' Director A assumes the unassigned role of CEO of CITS as he is responsible for managing the activities of the company and ensuring that it remains profitable. All three directors are equal partners at the same hierarchical level in the company, however they recognise each other's strengths and expertise, thus assume unofficially assigned roles based on mutual understanding. They do, however, share roles and complement each other's expertise, assume any of the different roles at a given point in time, and in many ways all directors do some aspects of sales, technical aspects, and managing and leading the firm.

Management Level (Middle Management)

The next level in CITS's hierarchy is the management level which consists of individuals at manager and senior manager levels. The roles are Project Managers (PMs), Subject Matter Experts (SMEs), Business Development Manager and Recruitment Manager, and each of these roles manage a functional team or group of individuals under their remit. It is noteworthy to mention that the research into the company revealed that the skills-set for the project managers is quite generic in the broad IT industry, hence recruiting qualified PMs do not pose too much of a challenge in terms of talent availability. However, SMEs need to possess more domain specific,

technical expertise in information technology security and this is where there is acute skills shortage in the IT security industry, thus finding qualified talent is a massive challenge for firms. There is also skills shortage for technical analysts. Typically, the firm's client project structure will consist of (1) a Project Manager who owns and oversees the project internally, and reports to one or more directors (e.g. Technical Lead director), (2) A Lead SME who manages a team of SMEs and analysts, and reports to the PM, (3) SMEs and analysts who report to the Lead SME, and (4) Director(s) who deliver the project to the external client Project Sponsor. The Business Development Manager and Recruitment Manager, who sit between the Managers and Directors in the firm structure, support the project in terms of resourcing and coordination. This project structure ensures that resources are aligned and that there is an effective line of control and accountability on projects. Figure 9 shows a typical project structure in the firm.

Lower Firm Level

Analysts make up the final level of the company's structure. They consist of a broad range of mostly technical IT security disciplines, for example penetration testers and security auditors. These skills-set are in short supply in the industry as the availability struggles to keep with the pace of technological changes and evolving IT security threats. A report in January 2017 revealed that the UK cyber security skills shortage is second in the developed work (and growing) – UK cyber security vacancies have risen by nearly a third (31.9%) between 2014 and 2016, thanks in part to the increased activities and visibility of hackers and high-profile attacks. People needed to fill those vacancies are just not there (The Independent Newspaper, 17 January 2017). Therefore, a good recruitment strategy, and strategic resource planning and execution is required to attract and retain these valuable talents. Analysts at CITS report directly to their line managers who are Lead SMEs, and to PMs on projects. The employee size of the company varies between 80 to 120 employees depending on the number of client projects engaged at a given time. The company exploits a resource hiring model hiring many associates (associates refer to PMs, SMEs and Analysts) on a contract basis to gain the benefits of a variety of people. This model has the advantage that it minimises overhead and cost outlays when projects are fewer. The disadvantage is that there is less certainty of desired resource being available when required and the challenge of maintaining a 'bench' of available resources. Importantly, the directors as leaders play a key role in that every client project is led by director(s) and it is made clear to the client this extra experience as part of the offering. In addition, the company emphasizes the 'use of Power of 3' that is, the complimentary wealth of knowledge and experience which the 3 directors provide to client's projects. This serves as another differentiator for the company as not many competitor (niche) firms are able to provide that level and breadth of highest level resource to all projects.

It is significant to note that management consultancy firms like the research firm have a flexi-structure organizational structure in that employees (at all levels but less so at director level) are part situated in their employer's company and part situated in the client organization where they might work daily on projects. This flexi-structure is particularly relevant with regards to sensing and seizing opportunities from the external environment, as will be discussed later in this thesis.

Figure 9. Diagram of a Client Project Structure at the firm
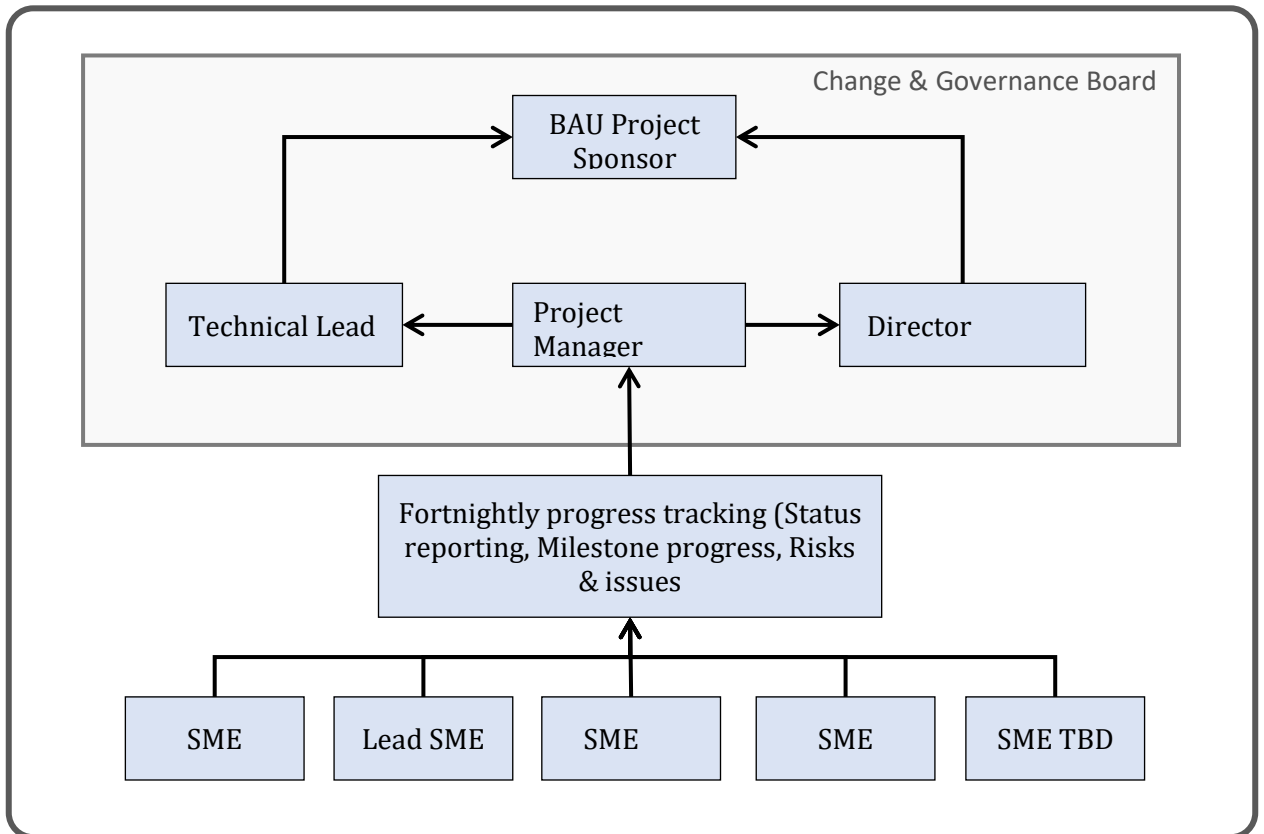
The Firm's solutions and capabilities

CITS's solutions to clients are encapsulated in the firm's capabilities framework which provides the following services;

i-Assess rapidly delivers a comprehensive and quantified list of gaps in an organisation's information security controls, services and operating model.

i-Predict prioritises control gaps based on the most concerning threats, resulting in accelerated remediation action and solutions.

i-Define delivers an up to date inventory of system assets and criticality scores. This improves the quality of control improvement prioritisation.

i-Know delivers control MI and a material risk position. This readily maps back to regulator expectations and the organisation's own policy.

i-Decide provides a view of the required investment to address information security risks, based on risk appetite. Additionally, i-Decide delivers the control improvement and risk acceptance strategy.

i-Protect defines the activities to address information risks and close control and operating model gaps, improving the security risk position of an organisation.

5.9   DATA STRUCTURE

The data analysis employed the Gioia methodology and consisted of three main stages. The first stage involved drawing on the different accounts of interviewees. This helped to build a narrative to develop a detailed understanding of what had transpired at the firm. The second stage consisted of re-examining the data to identify initial concepts and grouped them into first-order categories through a process of open coding. This involved an inductive process of working across data sources looking for similarities and differences in the data, and focusing on the activities and events through which the firm renewed and reconfigured its capabilities. In the third stage of analysis, the researcher employed axial coding – the search for and identification of relationships between and among first-order concepts (Strauss and Corbin, 1990). In this way, the first-order categories were grouped into a smaller number of second-order themes. This was not a linear process but rather proceeded iteratively, moving among data, emerging patterns, and the literature until the data was refined into adequate conceptual themes (Eisenhardt, 1989). This allowed a synthesis anchored both empirically in the research data and theoretically in literature. By applying the microfoundations of dynamic capabilities framework in the empirical research, it became evident during the data analysis that the second-order themes related to activities of

sensing, seizing, and reconfiguring elements of the framework (Teece, 2007). These three elements of the framework were associated with particular outcomes that relate to those aspects of the framework (i.e. sensing, seizing, and reconfiguring). The activities and outcomes constitute the aggregate theoretical dimension.

Figure 10 shows the application of the detailed microfoundations of dynamic capabilities framework to empirically investigate the 'how' and 'why' of capability renewal & reconfiguration, and the diagram of the firm's capabilities frameworks before and after capability renewal & reconfiguration. The thesis explains below how figure 10 was created.

There are two big oval diagrams labelled 'Firm Solutions'. The oval diagram on the left-hand side represents the firm's capabilities framework before reconfiguration (referred to as a) while the oval diagram on the right-hand side represents the firm's capabilities framework after it was reconfigured (referred to as b). The entire diagrams between the two big oval diagrams represent the holistic Teece's (2007) microfoundations of dynamic capabilities framework which is applied in this study to empirically investigate why and how the firm renewed and reconfigured its capabilities and capabilities framework i.e. why and how the firm moved from point a to b. Teece's (2007) microfoundations diagram has three main components – sense, seize and reconfigure. The top component (sense) is titled, elements of an ecosystem framework for 'sensing' market and technological opportunities (Teece, 2007). The middle component (seize) is titled, strategic decision skills/execution (Teece, 2007). The bottom component (reconfigure) is titled, combination, reconfiguration, and asset protection skills (Teece, 2007). The details within each of these three components are now described.

The ability to 'sense' aspect of the framework refers to the central theme of 'Analytical Systems to Learn and to Sense, Filter, Shape and Calibrate Opportunities' represented by the top oval diagram. This theme consists of several sub-themes which are contained in the four rectangles clustered around the oval diagram. Overall, this aspect of the framework shows the elements of an ecosystem framework for 'sensing' market and technological opportunities (Teece, 2007). The ability to 'seize' aspect of the framework refers to the central theme of 'Enterprise Structures, Procedures and Designs for Seizing Opportunities' represented by the middle oval diagram. This theme consists of several sub-themes which are contained in the four rectangles clustered around the oval diagram. Each of the four rectangles has a summary theme rectangle with curved edges attached to it. Overall, this aspect of the framework shows strategic decision skills/execution i.e. 'seizing' (Teece, 2007). The ability to 'reconfigure' aspect of the framework refers to the central theme of 'Continuous Alignment and Realignment of Specific Tangible and Intangible Assets' represented in the bottom oval diagram. This theme consists of several sub-themes which are contained in the four rectangles clustered around the oval diagram. Each of the four rectangles

has a summary theme rectangle with curved edges attached to it. Overall, this aspect of the framework shows combination, reconfiguration, and asset protection skills i.e. 'managing threats/transforming' (Teece, 2007). In summary, figure 10 depicts the application of Teece's (2007) microfoundations of dynamic capabilities framework used to in the research to investigate firm's capability renewal and reconfiguration in the IT security industry.

Figure 11 shows the data structure with the categories, themes and aggregate dimensions from the interview data by applying the microfoundations of dynamic capabilities framework. Appendix Two provides supporting evidence which contains representative first-order categories that underpin the second-order themes that form the data structure. Appendix Three contains observation data which includes field notes and the researcher's own reflections.

Figure 10. Applying Microfoundations of Dynamic Capabilities framework to investigate firm's capability renewal and reconfiguration in IT Security Industry

Firm's Capabilities Framework before Reconfiguration

- i-Assess
- i-Predict
- i-Protect
- i-Decide
- i-Know
- i-Define

Firm Solutions

Firm's Capabilities Framework after Reconfiguration

- i-Assess
- i-Operate
- i-Decide
- i-Know
- i-Protect

Firm Solutions

Processes to Direct Internal R&D and Select New Technologies

Processes to Tap Developments in Exogenous Science and Technology

Analytical Systems to Learn and to Sense, Filter, Shape and Calibrate Opportunities

Processes to Tap Supplier and Complementor Innovation

Processes to Identify Target Market Segments, Changing Customer Needs, and Customer Innovation

Elements of an ecosystem framework for 'sensing' market and technological opportunities (Teece, 2007)

Delineating the customer Solution and the Business Model

Selecting the Technology and Product Architecture; Designing Revenue Architectures; Selecting Target Customers; Designing Mechanisms to Capture Value

Calibrating Asset Specificity; Controlling Bottleneck Assets; Assessing Appropriability; Recognising, Managing, and Capturing Cospecialization Economies

Selecting Enterprise Boundaries to Manage Complements and "Control" Platforms

Enterprise Structures, Procedures and Designs for Seizing Opportunities

Selecting Decision-Making Protocols

Recognizing Inflexion Points and Complementaries; Avoiding Decision Errors and Anticannibalization Proclivities

Demonstrating Leadership; Effectively Communicating; Recognising Non-Economic Factors, Values, and Culture

Building Loyalty and Commitment

Strategic decision skills/execution i.e. 'seizing' (Teece, 2007)

Decentralization and Near Decomposability

Adopting Loosely Coupled Structures; Embracing Open Innovation; Developing Integration and Coordination Skills

Managing Strategic Fit So That Asset Combinations Are Value Enhancing

Cospecialization

Continuous Alignment and Realignment of Specific Tangible and Intangible Assets

Governance

Achieving Incentive Alignment; Minimizing Agency Issues; Checking Strategic Malfeasance; Blocking Rent Dissipation

Learning; Knowledge Transfer; Know-how Integration; Achieving Know-how and Intellectual Property Protection

Knowledge Management

Combination, reconfiguration, and asset protection skills i.e. 'managing threats/transforming' (Teece, 2007)

Figure 11.   Data structure created from Interview Data showing categories, themes and aggregate dimensions by applying Gioia Methodology

Data Structure (Created from Interviews)

First-order categories   *Second-order themes*   *Aggregate theoretical dimensions*

- **A.** IT Security industry is a competitive and dynamic marketplace so there is a need to constantly evolve
- **B.** IT Security moves at a much faster rate than general IT

1.IT Security industry is competitive and dynamic

- **C.** Fundamental new developments in IT such as the cloud and cyber are presenting new challenges and opportunities for IT security
- **D.** Knowledge management is an opportunity internally to most firms to be effective, however in IT security it is external and a threat to business if not renewed

2.Dynamism creates new opportunities and threats to firms

- **E.** Businesses migrating processes/data to IT systems recently has increased IT security risks exponentially leading to a challenge for the IT Sec industry to meet this need
- **F.** There is a huge opportunity to help businesses to keep them safe and secure
- **G.** The big challenge is for the IT Sec industry is to recognise this opportunity

3.Opportunity recognition to exploit it

Analytical Systems to Learn and to 'Sense' Opportunities: **Environmental Dynamism and Industry Challenges**

- **H.** Skills shortage is a challenge in the industry especially in spheres of new, leading-edge technologies
- **I.** The industry discriminates against talent who do not possess formal academic qualifications even though they might have the job skills
- **J.** IT security skills may not require formal academic training

4.Problems of skills shortages

- **K.** The industry has a difficulty converting the security story into a business language that the Board understands
- **L.** Taking the business on the journey of security is a big challenge
- **M.** Successful delivery of IT security solutions requires and understanding and integration of people, processes and technology

5.Connecting with a macro level discourse and delivery are significant challenges

- **N.** Engaging with regulators helps shape industry and to gain industry intelligence which is a source of competitive advantage
- **O.** Sensing of changes in the industry is best achieved intuitively through working with major, significant client organizations
- **P.** Best learning and education is achieved by working with and observing clients

6. External engagements impacts on ability to sense and shape Opportunities

- **Q.** Experiences and activities are the sources of new knowledge
- **R.** The more significant and bigger the client, the more useful and relevant the learning and new knowledge
- **S.** At external events and workshops people are very revealing about their experiences and situations which give healthy war stories
- **T.** Getting new clients provides more interactions and experiences which ultimately creates more knowledge

7. Processes to Tap Exogenous New Knowledge and Learning Opportunities

- **U.** On the job learning by directors leads to knowledge that is brought back to the firm tacitly
- **V.** Staff working on client projects bring in valuable opinions and knowledge to the TMT

8. Actors bring in New Knowledge and Experiences

- **W.** New people employed bring in new dimensions from their experiences and improve company artefacts
- **X.** The firm improves its offerings and capabilities through new employees

9. New People bring in New Dimensions to the firm which improves artefacts

- **Y.** One of the drivers to evolve knowledge management and codification is client request but some clients are not demanding enough of our knowledge
- **Z.** We are a small firm so the tacit knowledge on the inside is enough to meet client demand but this would be a problem as the firm grows

10. Levels of Knowledge Management is partly driven by client demand

- **AA.** Consulting experience of directors is a source of competitive advantage which helps to win business from clients
- **AB.** Evidence of business success and storytelling of success provides credibility to clients which helps to win and retain clients

11. Consulting experience and storytelling of success gives credibility and competitive advantage to win business

- **AC.** There is a need to have a shared common understanding of some core knowledge which is used for different purposes
- **AD.** The detailed technical knowledge in an actor needs to be brought out and shared so that we can tell the client but before that tell it to ourselves
- **AE.** Shared common understanding is important because directors do a bit of everything as they change roles even though they de-facto and assume a place
- **AF.** The same knowledge is used for different purposes

12. Common knowledge is exploited differently, internally & externally by TMT

Analytical Systems to 'Sense and Shape' Opportunities: **Exploiting Knowledge and Experiences**

- **AG.** Power of 3 helps to achieve the right balance of operational effectiveness (processes) and needed level of technical details
- **AH.** A problem in IT Sec industry is an obsession with technical knowledge (technology) to the detriment of process knowledge and implementing operational effectiveness
- **AI.** Business owners and decision makers are more concerned with operational knowledge and risk management that will make the business secure
- **AJ.** Converting the technical security language to a business language for decision makers is a challenge

13. Demystifying processes/operational knowledge is more value creating than technical knowledge

- **AK.** The business proposition of security at senior level is risk management and that is where value lies
- **AL.** Experience as practitioners is vitally important to turn complexity security into risk management

14. Risk Management gained through practical experience is of value

Analytical Systems (and Individual Capacities) to 'Sense' Opportunities: **Operations Risk Management**

- **AM.** Difficulty in getting tacit knowledge out of actor's brain in a manner so that others can understand it
- **AN.** Different levels of individual cognition and intellectual capability affects ability for knowledge transfer and understanding by actors

15. Challenge of knowledge transfer between actors in TMT

- **AO.** Tension is created to get the individual excited
- **AP.** There is no truce as we are open to tensions

16. Creating tensions facilitates knowledge transfer

- **AQ.** Shared vision and objectives amongst directors helps to balance out tensions which leads to agreements in knowledge transfer efforts
- **AR.** Objects and artefacts are used to enable a shared understanding of knowledge used internally for codification and externally to 'dance' with clients to get solutions

17. Artefacts and Common Grounds enable shared understanding of knowledge

Analytical Systems (and Individual Capacities) to 'Sense' Opportunities: **Sharing Knowledge**

- **AS.** Natural evolution and internal organizational learning mediated capability reconfiguration
- **AT.** Capability reconfiguration and clearer articulation of capability framework improved its consistence which also enables better replication of capabilities
- **AU.** Capability reconfiguration and better articulation of framework allows for easy inclusion and integration of new capabilities which supports firm growth
- **AV.** CyberPlus has recently been developed and easily integrated within the framework

18. Strategic organizational learning shapes replication efforts and firm growth

- **AW.** The greater the codified documentation and the less frequency of use (for replication), the greater the challenge of standardization and success of replication
- **AX.** Reconfiguration and codification decisions and efforts were driven mainly by internal decisions and less by external influences from client feedback
- **AY.** Strategic decision on codification and governance was done by directors, however knowledge articulation and codification was achieved by practitioners, bottom-up

19. Codification attributes and frequency of use for replication affects success outcomes

Enterprise Structures for 'Seizing' Opportunities: **Learning shapes Capability Renewal & Reconfiguration**

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- **AZ.** Speed is a key differentiator of the firm's strategy
- **BA.** Speed is achieved by taking a fast, reasoned approximate estimate and decision about the client organization's IT security risk position and solution required
- **BB.** The client does not always take advantage of the speed and is slow at decision making maintaining a state of hiatus
- **BC.** There is a tension in the firm as to whether to maintain speed strategy or change strategy to adopt prolonged project to increase billing revenue as competitors do

20. Speed strategy allows the firm to differentiate itself in the market/industry

- **BD.** The firm's strategy and USP or differentiator is to get the job done at speed
- **BE.** The Big 4 consultancy competitors are not driven by speed as speed undermines revenue, they want complexity and prolonged engagement to increase revenue

21. Firms in IT Sec industry pursue different strategies for revenue

- **BF.** Codification and replication as a method of growth was a deliberate business decision with investment committed to the replication strategy
- **BG.** Replication journey has led to growth of the business

22. Investment in replication supports growth strategy

- **BH.** Organizational staff structure of permanent staff and associates pose a challenge for replication efforts
- **BI.** Standardised, tested methods and structure together with codified artefacts increases confidence in achieving tasks and leads to success outcomes of tasks
- **BJ.** There is evidence that investment in codification has paid off with increased client success and satisfaction

23. Codification increases business confidence and success but challenges due to staff structure

- **BK.** Codification allows for sharing tasks with other actors and prevents a reliance on directors only, thereby reducing risk to the business
- **BL.** Use of codified artefacts allows faster accomplishment of tasks and therefore is used to drive 'sell as an accelerator' concept of the firm's speed strategy

24. Codification and replication reduces business risk and supports firm's 'speed' differentiation strategy

Enterprise Structures for 'Seizing' Opportunities: Designing Revenue Arch. – **Firm Strategy & Codification**

- **BM.** Bespoken firm capabilities that are tailored around commonly known industry-wide solutions magnify articulation challenges for actors – SMEs and Analysts
- **BN.** Actors have same performative understanding of industry routines but different ostensive understanding of bespoke capabilities and how routines interrelate
- **BO.** Clarity about how routines are connected (demystifying processes) and clarity of language helps to achieve a better shared ostensive understanding
- **BP.** Difficulty in using codified artefacts could relate to clarity of language
- **BQ.** Greater levels of actor's expertise and experience aids understanding of bespoke capabilities and how routines interrelate

25. Demystifying bespoken capabilities and clarity of language aids knowledge articulation and codification and reuse

- **BR.** Competitor firms have their own unique language and nuances
- **BS.** A spin on language is a valuable differentiating factor that creates a firm's brand and the challenge is to make the language 'flavour' clear to actors
- **BT.** Practical experience gained using codified artefacts helps better understanding of language, with added benefit of actor's improving the artefacts
- **BU.** Demystifying hierarchy of routines within a capability, processes and detailed granular language aids replication by actors
- **BV.** There is equifinality in language and processes between firms

26. Firm capabilities and processes as well as unique language is a differentiator and value creating

Enterprise Structures for 'Seizing' Opportunities: Designing Value Mech.- **Clarity on Capability & Language**

- **BW.** Standardization of documentation to serve what purpose remains a challenge
- **BX.** Delegation of tasks to actors by doing replication presents a new challenge of harvesting softer knowledge and insights from clients back into the firm

27. Codification and replication creates a challenge of harnessing knowledge and insights about clients

- **BY.** Consensus rather than vote is used to solve disagreements within the TMT
- **BZ.** Time allows for reconsiderations which lead to consensus and agreements
- **CA.** Active listening helps to recognise common grounds or accept superior arguments
- **CB.** Shared, common goal amongst directors helps to achieve consensus

28. Time enables deliberations and consensus

Enterprise Structures for 'Seizing' Opportunities: Avoiding Decision Errors – **Conflict and Consensus**

- **CC.** Directors recognise and accept each other's relative strengths and expertise
- **CD.** Questioning of opinions and expertise sometimes lead to frustration and conflict
- **CE.** Questioning and challenging of opinions which causes conflict is necessary to achieve clarity and to avoid decision errors

29. Balance of conflict and consensus is needed for progress and right decision-making

- **CF.** Recruiting best talent in the industry is a key differentiator and a source of competitive advantage
- **CG.** With the fast rate churning of staff in consultancy firms, having long serving staff with an identity with the firm is a key differentiator
- **CH.** Leveraging and fully maximising the collective power and knowledge of our people remains a challenge for a small sized organization especially with staffing structure

30. People are a key differentiator for the firm and source of competitive advantage

- **CI.** Strong networks and relationships built with associates and consultants is vital for recruiting and retaining scarce IT security talent
- **CJ.** A thorough recruitment process is used to identify the right talent from the open market

31. A model of trusted networked colleagues is used to recruit talent

- **CK.** The process of specifying internal and external talent and resource requirements of the firm is key to address opportunities and needs
- **CL.** Improved recruitment capability has enabled an increase in talent employed which has supported business growth by method of replication

32. Processes of resource/requirement management is vital

- **CM.** Recruitment Manager's learning of the business is important to understand and simplify the process and to take more ownership of recruitment
- **CN.** A broad range of commoditised non-technical skills like project managers are sourced by the recruitment manager

33. Recruitment Manager role is important and learned over time

- **CO.** Directors share roles with regards to people, processes and tasks requirements needed for talent resourcing
- **CP.** Explicit coaching by director increases recruitment manager's capability

34. TMT leadership plays an active role in resourcing right talent

- **CQ.** Technical director oversees technical requirements involving assessing firm's available talent and recruitment of technical people
- **CR.** Technical resources such as SMEs are more challenging to source and have greater impact on the firm's ability to operate

35. Essential technical resource is the responsibility of TMT

Enterprise Structures for 'Seizing' Opportunities: Mechanisms to Capture Value – **Recruitment Model/Process**

- **CS.** The changing industry and industry standards shape the solutions and frameworks clients adopt and in turn demand from IT security consultancy firms
- **CT.** IT security consultancy firms must adapt their bespoke solutions and frameworks to these industry standards

36. Firm's capabilities and framework are shaped by the changing industry

- **CU.** Mapping of the framework and codification is important (internally) to the firm because it allows actors to speedily complete holistic solutions
- **CV.** Mapping of firm's framework to that of the client is important (externally) because it makes it easier to sell the solutions to the client to get revenue

37. Mapping of the firm's framework is necessary to align with firm's strategy

Continuous Align/Realignment of Tangible/Intangible Assets: **Shaping Capabilities and Framework**

- **CW.** Directors provide leadership but are not directly involved in codification by SMEs and analysts and Business Development Manager is champion for documentation
- **CX.** Directors take actors on Knowledge Management journey on the use of higher level tools and artefacts of risk management - iDecide and iAccess

38. Active role of leaders in Knowledge Management journey

- **CY.** Lead SMEs take actors and teams on the technical Knowledge Management journey on use of artefacts
- **CZ.** Technical artefacts and journey are less complex than risk management ones and are also more successful

39. Technical Knowledge Management journey is less complex and more successful than Risk Management journey

- **DA.** Layering of documentation and artefacts on process on technology and restricting the levels accessible to clients provides some intellectual property protection
- **DB.** Less complex tools, frameworks and artefacts are harder to guard against intellectual property theft

40. Complexity of capability and knowledge restrictions provide intellectual property protection

- **DC.** Know-how and storytelling is value creating which enhances the artefacts
- **DD.** Ability to map frameworks, know-how of using artefacts and storytelling when using artefacts is tacit knowledge which provides some intellectual property protection
- **DE.** On the flipside, knowledge transfer of tacit knowledge within the firm gives away intellectual property internally

41. Storytelling and tacit knowledge provide intellectual property protection but internal knowledge transfer challenge

- **DF.** The massive market potential of the IT security industry makes intellectual property theft less of a concern for a small sized firm like the organization
- **DG.** Big direct rival firms or a franchise firm might be more concerned about intellectual property theft

42. Firm size and nature of competition might shape concerns towards intellectual property protection

- **AM.** Difficulty in getting tacit knowledge out of actor's brain in a manner so that others can understand it
- **AN.** Different levels of individual cognition and intellectual capability affects ability for knowledge transfer and understanding by actors

43. Challenge of knowledge transfer between actors in TMT

- **A0.** Tension is created to get the individual excited
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44. Creating tensions facilitates knowledge transfer

- **AQ.** Shared vision and objectives amongst directors helps to balance out tensions which leads to agreements in knowledge transfer efforts
- **AR.** Objects and artefacts are used to enable a shared understanding of knowledge used internally for codification and externally to 'dance' with clients to get solutions

45. Artefacts and Common Grounds enable shared understanding of knowledge

Continuous Alignment and Realignment of Specific Intangible Assets: **Knowledge Management & IP Protection**

5.10 CONCLUSION

The findings from the 15-month study of CITS and journey the firm underwent from August 2015 to October 2016 can be broadly categorised into three main phases, namely; First, The evaluation and re-formulation of the business strategy based on the Royal London project, Second, The process of re-development of capabilities, knowledge articulation and codification to create artefacts, and Third, The dissemination of the outcomes of the first two phases (i.e. business strategy and codified knowledge) throughout the company. The microfoundation of dynamic capabilities framework of sensing, seizing and reconfiguring capabilities (Teece, 2007) was used as the theoretical model to empirically unpack the processes the firm engaged in and the individuals involved on the journey, to gain insights into how capabilities are reconfigured and renewed and why they are renewed. The findings were presented in the data structure created using the Gioia methodology. The next chapter is the Findings chapter of the thesis which will triangulate the interview data, observation data and secondary data to provide an overarching narrative of research findings that address the research questions and objectives.

CHAPTER 6: FINDINGS

THE MICROFOUNDATIONS OF DYNAMIC CAPABILITIES – SENSING, SEIZING AND RECONFIGURING ASSESTS AND CAPABILITIES

INTRODUCTION

By applying the microfoundations framework to the data collected, the process allowed the researcher to identify those elements of the framework that were relevant to this case study where a firm renewed and reconfigured its capabilities. In examining the research data from the data structure there were 45 emerging themes that related to the microfoundations of dynamic capabilities. The coding also revealed that these 45 themes pointed to 11 outcomes which were clustered around the aspects of sensing, seizing and reconfiguring of the microfoundations of dynamic capabilities framework and these relate to the analytical systems and individual capacities, firm processes and structures that are responsible for how and why capabilities are renewed and reconfigured. The model assumes that these outcomes shed light on what levels of analysis as it relates to sensing, seizing and reconfiguring based on the actors and actions involved. In order words, the model provides some insights into how dynamic capabilities exhibits by the individual actor, aggregate actor and the firm.

The discussions in the findings chapter are derived mainly from the interview and observation data which were independently collected during the research. The interview data and observation data are provided separately and placed in the appendix of the thesis (Appendix Two – Interview Data and Appendix Three – Observation Data). This was done to allow for sufficient space in the main body of the thesis to have an integrated triangulation of the research findings to providing an overall compelling, evidence-based narrative of the research findings.

The next sections of the thesis will discuss the findings from the data structure which are triangulated with data from observations and secondary data from company documents and research about the industry. The discussions will be categorised into the three main aspects of the framework applied; Sensing (and shaping) opportunities and threats, Seizing opportunities, and Managing threats and reconfiguration. The emerging themes and outcomes from the data structure will form the topics for the discussion.

SECTION ONE: SENSING (AND SHAPING) OPPORTUNITIES AND THREATS

Based on the data analysis, there were three outcomes (aggregate theoretical dimensions) and 14 themes (second-order themes) that relate to this aspect of the framework. They inform the nature of the industry, firm, and how the firm organises its activities mainly at upper echelon levels. The three outcomes are; Environmental Dynamism and Industry Challenges, Exploiting Knowledge and Experiences, and Operations Risk Management.

6.1 ENVIRONMENTAL DYNAMISM AND INDUSTRY CHALLENGES

The IT Security industry is a competitive and dynamic marketplace. The strategy literature states that in order to identify and shape opportunities, enterprises must constantly scan, search, and explore across technologies and markets, both 'local' and 'distant' (March and Simon, 1958; Nelson and Winter, 1982). For the firm's top management, one of the drivers for the need to constantly sense for opportunities and threats is because of environmental dynamism of the IT security industry. According to Director A,

"One of the drivers is that we operate in a competitive marketplace and dynamic marketplace … so competitive in terms of there are lots of people now doing what we are doing therefore we need to remain current and up to speed, and dynamic because the marketplace we operate in is changing and fast changing. Therefore, knowledge of yesterday is not current tomorrow" (1A1) - Interview

He argues that the IT Security industry is a competitive and dynamic marketplace so there is a need to constantly evolve to remain business relevant and identify opportunities. Director B shares the same view and goes further to stress that the dynamic nature of the IT security industry as compared to general IT makes the sensing of opportunities and threats even more pertinent. He states that IT security moves at a much faster rate than IT in his adeptly coined phrase,

"We are not selling cars, we are selling into a space that moves … IT doesn't move at that rate anymore [fast], IT has slowed down. IT is more commoditised but security isn't because of the bad guys … the bad guys are getting worse and worse, there's more and more things people are taking advantage of, in terms of putting information where it is convenient … like the cloud and things, it's made things worse" (Director B 1B1) - Interview

This supports Teece's (2007) assertion that being able to identify the structural evolution of industries and markets as with IT in this case, is an important element of sensing opportunities and threats. The directors are of the view that fundamental new developments in IT such as the cloud and cyber are presenting new challenges and opportunities for IT security.

Therefore, such dynamism creates new opportunities and threats to firms. These external changes highlight that whereas in many industries knowledge management and sharing is an opportunity internally to most firms to be efficient and might be sufficient, in the IT security industry it is very much external and a threat to a firm if not renewed. Significantly, there were a few notable examples at the firm which gives credence to this view. For example, during an observation of a top management team (TMT) meeting by the researcher, Director B speaking to the other directors stated,

"Changes in the external environment is a risk to the business but also an opportunity, for example cloud security and PAAS. This happened recently in Standard Life [a client] where we assumed we knew but did not know some new changes in cloud security!" (4c) - Observation

Similarly, at a Knowledge Sharing session at the firm, Katy (an analyst) provided information that the new data protection legislation, EU GDPR now mandated compliance requirements for third party firms, thus creates a potential new target market opportunity for the company *(10c) - Observation*.

This emphasis on the importance of sensing new knowledge exogenous to a firm aligns with the statement by Teece (2007) where he argued that, 'Indeed, much of the information gathered and communicated inside the enterprise has minimal decision relevance. Even if relevant, it often arrives too late. Management must find methods and procedures to peer through fog of uncertainty and gain insight.' (Teece, 2007: 1325).

Therefore, it is pertinent that firms must sense and recognise these external changes that create opportunities to exploit. Over the past few decades, businesses have been migrating processes and data to IT systems to reduce costs but doing that has increased IT security risks exponential which presents a challenge for the IT security industry to meet this growing need. The directors' views are that this challenge isn't a downside, rather it is an opportunistic side for the industry to meet this demand and the big challenge for the industry is to recognise this opportunity.

"It's a huge opportunity to help people [businesses] sort out their world but they can't see it or they don't understand it" (Director B 3F1) - Interview

"The big challenge for our industry is to realise this opportunity … it's not a downside, it's an opportunistic side" (Director B 3G1) - Interview

In taking advantage of these opportunities, the challenge for IT security firms would be to help businesses understand the need for security and taking the business along on the journey of security when delivering security solutions. More so, the process to identify target market segments is an aspect of sensing opportunities for a firm to exploit (Teece, 2007). At the research firm, creating a 'space' for deliberations as observed during Knowledge Sharing session provided

an avenue for staff to suggest to senior management that third-party firms and small and medium-sized enterprises (SMEs) are a new potential target customer base which has resulted due to the new EU GDPR compliance requirements. *(10c) - Observation*

Furthermore, the opportunities to exploit in the industry are not without challenges and the ability to sense, and perhaps deal with these challenges is a dynamic capability. A significant challenge in the IT security industry is skills shortage with an estimated shortage of 600,000 information security specialists globally. From Director C's perspective, this skills shortage is even more pronounced within new, leading-edge technical solutions. An example was given of a market leading tool called CyberArk whereby despite its huge demand, not more 40 or 50 people in the UK could deploy it. Director B provided a reason for the skills shortage problem. He argues that the industry does not recognise and discriminates against talent who do not have formal academic qualifications related to information security even though such individuals might have the right skills to do the job. He says,

"And I think the skills shortage thing … part of the problem there is the industry is its own worst enemy. Most of the people in the industry from the old days think that the only way you can do security is if you've got some security badge. When there wasn't much to doing security, people had a lot of time to go and get qualifications … engineering qualifications in security and so they did all that … and so the guys who lead on that have got all those qualifications"
(4I1) - Interview

From his perspective, an individual with good general knowledge in IT and practical experience, for example a good IT practitioner or risk practitioner can find their feet easily and do well in the IT security domain. Without a broader appreciation of the wide variety of skills available in the industry regardless of qualifications attainment, the industry would struggle to fill this skills gap.

A second challenge the industry faces is a lack of ability to connect with a macro level discourse required to communicate effectively with and get buy-in from senior business management and decision makers who are responsible for approving expenditure on information security at firms. Due to organisations migrating processes and data into IT systems, IT has become central to and vital to business operations that these systems need to be safe and secure. In other words, information security is now the cost of doing business and this has not always been the case so some business leaders 'can't see it' or 'don't understand it'. Investments in IT has traditionally been regarded a cost to the business (cost centre), rather than a profit-maker as it does not directly generate revenues as a sales or marketing function would. However, as IT is so central to business functioning today, keeping it safe and secure is now the cost of simply doing business and the responsibility for selling this message to business leaders and communicating it in a way that it is well received rests heavily on the IT security industry. From the perspective of the directors, the industry has a difficulty converting the security story into a business language that

business leaders understand and associated with that, taking the business on the journey of security to get commitment at all levels of the organization is a huge challenge for the industry. The third challenge the industry faces and related to the second is, the industry is not very good at delivering the security solutions stated in the business case approved by decision makers. Director C also added,

"… and maybe associated with that, the industry is not very good at implementing what it promises. Two things; not good at implementing projects generally but if you look at the business case that was written … if we buy this tool we can do these ten things, and three years later two of the things are working and the other eight there is no view of how they will ever make it work. Because again the industry is populated with people that think security and aren't really very good at solutions which involves people and process as well as technology" (5M1) - Interview

In other words, the industry is not very good at managing and delivering projects, and successful delivery of IT security solutions requires an understanding and integration of people, processes and technology. Not many IT security personnel are well equipped with the right skill sets required to achieve this.

6.2   EXPLOITING KNOWLEDGE AND EXPERIENCES

The literature on microfoundations of dynamic capabilities highlights the importance of sensing changes in the wider external environment but goes on to stress that direct engagements and interactions with external entities allows firms to acquire new knowledge and information needed to sense and shape opportunities. For example, elements of the ecosystem framework for 'sensing' opportunities include processes to tap supplier and complementor innovation, and customer innovation (Teece, 2007) - these entities mentioned are all external to a firm's boundaries. These processes and individual capacities to sense knowledge dynamism is necessary in the IT security industry.

More so, according to Teece (2007), there are constraints on the rules by which competitive forces play out in an industry and these constraints are imposed by regulators, standard-setting bodies, laws, social mores, and business ethics. Having differential access to new information and knowledge can create opportunities for firms (Schumpeter, 1934). The directors at the research firm share this view. Director C had informed the senior management team that he was privy to information that some client organizations were meeting periodically with the principal regulator and all global regulators in the IT security industry, thus gaining industry intelligence. On that Director A commented,

"So, we've then got a client that is absorbing all that information. That told us other people were meeting with the regulator and setting the bar, we are on the outside of that. Therefore, we are at a disadvantage …" (6N3) - Interview

Therefore, it is evident that engaging with industry regulators can help firms to shape the industry, and also gain industry intelligence which could be a source of competitive advantage if they exploit that knowledge to respond to market conditions faster than competitors.

In addition, acquiring new knowledge about the industry can be best achieved intuitively through working with external actors, especially major, significant organizations, according to Director C. Engaging with such organisations and just being able to observe good and bad practices is an important source of knowledge and to keep on top of changes in the industry. The challenge for a firm like [company name] is harnessing and exploiting this external knowledge intuitively gained back into the company. Director A pointed this out,

"I do think it's still a bit of a gap in our knowledge framework … how we harvest all that back in and more broadly socialise it, share it" (6P2) - Interview

This challenge associated with knowledge management in the firm will be discussed in later sections of the thesis.

More so, the more significant and bigger the client, the more useful and relevant the learning and new knowledge. This is so because major organisations face greater pressures to meet commercial and legal obligations and therefore tend to keep on top of current developments in information security in order to assess the changing IT security threat horizon to the organization and whether there is a need to respond and change prioritization. By working with people at these client organizations, actors are able to tap such current knowledge and bring it back into the firm. Added to that, the more clients the firm gets increases the interactions and experiences of actors which ultimately provides more knowledge. Director A argued,

"I think the third would be, the more clients we get the more interactions we have, the more knowledge we gain just going into the client organizations … different people have different experiences" (7T1) - Interview

Another benefit of interacting with clients through their employees that work at client sites is, the firm is able to know first-hand the client's problems and needs thereby sensing opportunities to sell solutions. At an observation at TMT meeting, Louise (Business Development Manager) commented,

"The guys [employees] on the client sites, they know the client's problems and needs by working directly with the client and we get this information from them. This is something we can get better at or seek to more actively get this information from our guys." (6a) - Observation

Similarly, this importance of interacting directly with clients to sense opportunities was echoed in an exchange between an analyst (Katy) and the directors during a Knowledge Sharing session at the firm,

Katy speaking to directors. "If you tell us what you want to sell to HSBC, we can all work towards it."

Director A. "Sometimes we go in and want to sell peers, apples but we realise that they want grapes and plums …
sometimes we just don't know.

Director C. "B [director B] is now working in HSBC to help a senior director there, Mark to drive a security change
programme. By getting his feet through the door, he will be able to see what other problems HSBC have and we can
then seize the opportunity and see what offerings we can sell to them that suits them." (8c) - Observation

This would imply that sensing opportunities to win business or projects by the firm is sometimes
not a planned, deliberate event, for example a sales pitch to a client. Instead, opportunities do
arise just by being in and around client organizations. In fact, in some instances the directors
being responsible for forging the high-level business relationships with client organizations
through personal contacts, have to move with certain individuals when such individuals change
organizations because these personal relationships can be vital to getting work from clients.

Director A. "We used to have a very good relationship with [bank name] but all the people we knew have left!
Sometimes C [director] … in fact, all three of us sometimes have to move too with people we know to maintain these
relationships to get business." (8c) - Observation

Another valuable source of new knowledge into the firm is the social media platform Twitter,
perhaps a more useful source than traditional avenues such as technology magazines and
websites. During an observation at a TMT meeting, Director C commented,

"Information is Twitter-driven and more useful than reading magazines and websites. I'll ask Louise to share a list of
gurus to follow to make sure that our employees are on top of new developments and develop themselves. Declan will
be assigned to manage this monthly" (4C) - Observation

In terms of sharing such new knowledge across the firm and knowledge management in general,
the firm has a process for sharing and controlling who has access to information and documents.
Intellectual property protection to protect knowledge assets is necessary and the challenge is to
strike the correct balance between knowledge sharing with employees (and with clients) and the
required IP protection.

Informal external events and workshops are also a useful source of knowledge as actors in the
industry are very revealing about their experience and situations which give healthy 'war stories'.
Director C stated,

"I more than anybody will go to events and workshops just to hear conversations going on … It could be through
presentations or could be in conversations. People are very revealing about their experiences and vendors are very open
about situations and incidents and that gives very healthy war stories" (7S1) - Interview

In addition to seeking to gain new knowledge by actively engaging at external events and client
organizations, actors at the firm bring in new knowledge and experiences through practical
learning. The directors argue that their on-the-job learning through experience is a vital source of
knowledge that is brought back into the firm tacitly. There is also an open channel for employees

working on projects to contribute their opinions and knowledge to the top management team, however it has been identified that the firm can improve in this area as Director B argued,

"Our guys [staff] also have worked out there they've got their own experiences. Their opinions and knowledge is valuable to us but we are not using that enough" (8V1) - Interview

This once again highlights deficiencies in knowledge harnessing and challenges of knowledge management in general especially for a consultancy firm's employee-structure where staff are often physically situated at client organizations.

Furthermore, another avenue for new knowledge to the firm is new employees who bring in new dimensions to the firm which improves a firm's artefacts and offerings. The expertise of new individuals brought into the firm is valuable. Director C commented,

"Well, we are getting an input though [from staff]. We bring in new persons, if you think about what Jim brought in on the exercise he's working on. He added a dimension from his experience and he looked at some of our artefacts and he improved on them" (9W1) - Interview

Therefore, recruiting knowledgeable new staff helps to enhance the firm's capabilities and improve artefacts used when delivering solutions. Later in this thesis, we will discuss some of the difficulties associated with creating and improving the firm's artefacts.

Interestingly, the level of knowledge management in the firm is partly driven by client demand. Even though the firm recognises the benefits of harnessing knowledge and actively engages in knowledge management, it is argued that one of the drivers for improvement in knowledge management is client demand for knowledge as stated by Director A,

"One of the things we are suffering from is that some of the clients aren't demanding enough of our knowledge and therefore we can get away with second order [knowledge management]. We have a client now starting to really poke at our codification and that's just been a wake-up call to us and says, actually we should be there, and we should be ahead of the game" (10Y1) - Interview

It is argued that the tacit knowledge within a relatively small firm of its size can currently meet its client's knowledge demand, but the firm would need to improve its knowledge management approach as it grows its client base. It is also rather interesting that during the period of the research project as will be shown in this thesis, the firm's strategic decision to improve its knowledge management to aid its replication efforts made it possible to increase its client engagements and to grow the firm by employee numbers.

Furthermore, the internal and external knowledge and experiences gathered by the firm along with the activity of storytelling by the top management team is exploited to achieve competitive advantage which helps to win and retain clients. Consulting experience and storytelling of success,

in particular, gives credibility and competitive advantage to win business. Director B explains in detail,

   "Experience as practitioners [is our source of competitive advantage]. We've got different competitors … The thing that wins us business is, I would say, is our consultancy effort, our ability and that differentiates itself because we are practitioners who have done it ourselves. We've owned the obligation and owned the accountability within large companies and we are now applying not only the knowledge of the subject area but the knowledge and experience of implementing it and that I think gets us the credibility that puts us up able to compete with the Big Four, KPMGs, Ernst and Youngs etc. I think we have less of a differentiator at the bottom of our end use which is staff augmentation where we are just sourcing people now from the market to fit our specific demands" (11AA1) - Interview

He explains that this experience of 'delivering' security as consultants makes it possible for the firm to compete with major consultancy firms and win business contracts from clients. He goes on to argue that once these contracts are won, the firm has less of a differentiator in terms of recruiting people to deliver the projects although this research study found evidence that the firm possesses a value enhancing recruitment process. As the firm successfully delivers work with clients, evidence of that and storytelling of the success creates more credibility which helps to win and retain clients. Director C comments,

"The credibility we have with our longest-term client is that we just have a very good track record of doing it so they will continue to do it with us. With our newer clients, it tends to be … it's a natural extension of you told us what to do, can you help us do it? Yes, you can, we trust you until we lose the trust in you" (11AB1) - Interview

Success creates even more credibility and a snowball effect that the firm trades on to win clients. Director B echoes this in an interview and during an observation,

"We are getting a little bit of a snowball effect now with some of our newer clients where because we've done it … our biggest client has got the biggest security change programme in the UK, we help them with that and our other clients know that and we certainly tell them that when we speak to them so that gives us credibility. It's trading on some experience stuff that we've done before" (27CB2) - Interview

"One of my clients has seen one of my other clients in a 'Leaders-In-Action' conference and [because] I have now suggested, he told the client that I helped the other client do the things that they've done … now when I say x y z and a b c, he says 'Oh yeah, that's right you guys did that.' You get that kind of cycle going on" (9a) - Observation

It is evident that not only is success a source of credibility but being able to exploit that through storytelling is of great value in winning business. It would be in firm's interest to have high performance to maintain success, credibility and to protect their business reputation.

In addition to that, common knowledge is exploited differently, internally and externally by the Top Management Team. As with experience, knowledge is exploited by the firm to its advantage in rather skilfully different ways. Therefore, there is a need for the directors to have a shared common understanding of some core knowledge so that it can be used for different purposes. Director A aptly explains,

"What is that diagram with three circles called … We [directors] are a Venn diagram. So, if you think of us like a Venn diagram, there will be a sweet spot in the middle where we all need to understand something in a common fashion but we will all be going off using it maybe for slightly different purposes on occasions. So, if it is for selling the knowledge would be used in this way. If it is to help install and change something in the client, we might use it in a different way" *(12AC1) - Interview*

The knowledge source could be any of the directors on a given instance and Director B who is more technically inclined often shares technical knowledge with the directors so that they can sell it to the client but before that tell it to themselves. Director B,

"So, the process we are going through is a good process. Particularly A [director A] is very organised and focused on, let's get that stuff on the table so not only I can understand it, A will be able to understand it" *(12AD2) - Interview*

This shared common understanding is necessary because all the directors do a bit of everything in terms of client sales or technical solutions delivery and they might change roles even though they are de-facto and assume a place. The knowledge sharing allows this flexibility and exploiting the knowledge asset to many useful purposes.

It is evident from these discussions that acquiring knowledge and experiences and exploiting that, is fundamental to sensing opportunities by the firm.

6.3   OPERATIONS RISK MANAGEMENT

In the IT Security industry, demystifying processes and operational knowledge is more value creating than technical knowledge. IT security is about people, processes and technology and while the directors often share technical knowledge, they also exchange operational and process knowledge. From their perspective, intellectual complexity or rather, operational and process knowledge is of more value in an operational environment. Also, the collective perspective of all three directors (or Power of 3 as the firm refers to it) helps to achieve the right balance of operational effectiveness and the needed level of technical input. Director B explains,

"Some of the big tensions A [director A] and I have is that A is more simple-minded and practical and in the operational environment if you have lots of details in place you don't get any value out of it … it's like 70% and you just struck off the ends. Whereas I'll look at things and want to go to complicated details and with Lloyds I say we need all these thousand things and A will go, that's bullocks! And I'll go but we might need that one day and then we have this debate about do we really need them which is important [the debate]. If everyone was like me, we will have all these complicated propositions but one or two of them will be effective" *(13AG3) - Interview*

Director C provides further insights when he argues that there is a problem in the IT security industry where there is an obsession with technical knowledge to the detriment of process knowledge and the implementation of operational effectiveness. He says,

"We've seen it in the security field. There's a lot of very clever people who will argue about the theory and argue about the theory and three years later they will still be arguing about the theory and nothing will actually happen … nothing

would have migrated from theory into process and operational model and the outcome that the shareholders wants, that is, the business to be secure will be no more secure" (13AH1) - Interview

"Therefore, what we've got, B [director B] can go toe to toe with these people and then will come away with right, we've got enough of that [delivery focus] now let's get articulation in business language let's just get talking business language" (13AI1) - Interview

This is important because business owners and decision makers are more concerned with operational knowledge and risk management of the organization that will make the organization secure. Therefore, first, understanding operational complexity and the inherent risks and second, converting that technical security language to business language for decision makers is of immense value but can be challenging. This fits into the narrative earlier discussed about the challenge of the industry to speak a language the Board understands and taking the business along on the journey of security. For this firm, they believe that speaking the business language and demystifying processes is a strength of the organization and they exploit that in the marketplace. Director A emphasizes the importance of that,

"Being able to demystify [processes/operational knowledge and technical/business language] is a strength of our organization and we trade on that" (13AJ2) - *Interview*

This ability to demystify complex security into the concept of risk management which is gained through practical experience is of value. Managing IT security risks of an organisation protects it and since the wellbeing of an organization is largely within the responsibility of senior management, the business proposition for security at senior level is risk management. An IT security firm that delivers risk management provides value to client organisations and this could differentiate it from its competitors as Director B argues,

"So, in our world, the business proposition for security for an organization at the senior level is risk management. We, unlike a lot of security companies, we trade on that. If your perimeter is good, like a lot our clients achieve … the big clients they spend the money on that, we'll say you're good on that, actually spend the money on a risk management tool" (14AK1) - Interview

He goes on further,

"We have lived in and worked in a space where we try to turn security into risk management … complex security in terms of what processes you need to put in place as well as technology. We turn it into a risk management thing because security is the cost of doing business. It has crept up on everybody. It didn't used to be the cost of doing business, it used to be something you just sort of did because it was the right thing to do" (14AL1) - Interview

Businesses need to manage IT security risks as a matter of priority because IT has become so central to business operations. Actors that have worked as practitioners have acquired the knowledge and experience needed to understand complex IT security in a manner that they can decipher the threat horizon and solutions needed so that organisations can be in charge and

manage the risks to their business. The research firm through its directors has built this risk management capability and delivers that to clients. During the research project, one of the goals the firm embarked on was to grow its risk management capacity by getting more staff to learn and perform the risk management capability and the thesis will relate this journey in subsequent sections. More so, unlike their competitors, the firm frames security in the form of risk management which is a differentiator for the firm and a possible source of competitive advantage.

Summary

This section of the chapter has discussed the analytical systems and individual capacities used to sense, filter and shape opportunities in the IT security industry by the firm. It has described the nature of the industry as that relates to sensing opportunities and outcomes that arise such as environmental dynamism, industry challenges and knowledge dynamism. The section covered aspects of the firm and especially its top management team who play a prominent role in sensing opportunities by highlighting exploiting knowledge and experiences, and operations risk management.

The next section will present the enterprise structures, procedures, designs and incentives for seizing opportunities by applying the microfoundations of dynamic capabilities framework to the firm and industry. The overarching dimension will centre on the firm's strategies employed to 'seize' opportunities identified and will also seek to provide a narrative to explain 'why' and 'how' the firm renewed and reconfigured its capabilities which occurred during the period of the research project. It is important to investigate why and how because the themes are central to one of the main research questions of the thesis: how do the microfoundations of dynamic capabilities impact on a firm's capabilities renewal and reconfiguration? The outcomes of the investigation by applying the microfoundations of dynamic capabilities framework that relate to seizing opportunities by the firm will be discussed.

SECTION TWO: SEIZING OPPORTUNITIES – STRATEGIC DECISION SKILLS AND EXECUTION

6.4 LEARNING SHAPES CAPABILITY RENEWAL AND RECONFIGURATION, AND REPLICATION

Teece (2007) argues that selecting the product architectures that deliver value to customers and the business model that delivers a financial return to the firm and adapting these to suit to changing environment is important for firm success. On the journey of the research project, by April 2016, the research firm had renewed and reconfigured its capabilities as outlined in Figure 10 framework diagram, and one of the aims of the PhD research was to uncover why the firm decided to renew/reconfigure its capabilities, by engaging with the top management team. From the perspective of the directors, natural evolution and internal organizational learning mediated the decision to reconfigure capabilities as Director A explained,

"We were subject to natural evolution … So, as we spent more time thinking about what we were offering as services, it forced us to sharpen our thinking and reconfigure our offering" (17AR1) - Interview

This idea of strategic organizational learning that occurred at the firm is consistent with the dominant strategic learning and change cluster within the dynamic capabilities research themes (Vogel and Guttel, 2013) discussed in literature review chapter. Director C provided further evidence on the reasons for change,

"A [Pointing to firm's old capability framework diagram] had a bit of complexity and it was difficult to consistently articulate the difference between one stage of the process and the next and one aspect of the offering and the other, and we reckoned that we could rationalise the number of things and it would be a clearer articulation of our offerings to the client" (18AT1) - Interview

In parallel with the decision to reconfigure capabilities for better articulation and consistence, was the firm's decision to vastly improve its replication efforts as a growth strategy for the firm. By having a clearer articulation of its capability framework and consistence, that enabled a better replication of the firm's capabilities. Director A argued that this has yielded positive results,

"We've got one tool now which is a hundred percent consistent and we can get it out of the box, go and run it and we've brought new people in, they can go and run it. We've used it three times, two clients bought it" (18AT3) - Interview

A second benefit gained by reconfiguring the capabilities and a clearer articulation of the framework is that the new framework allows for easy inclusion and integration of new capabilities which ultimately supports the growth of the firm. In this regard, the company has recently developed CyberPlus solution through the expertise of the technical director and four subject

matter experts at the firm *(4a)* and that has fitted effectively within the firm's overall capabilities framework. Despite some successful outcomes from the reconfiguration, the process has not been without challenges. Director B stated,

"We evolved it [capability framework]. The top part of it was confusing to us and to our clients. So, I think the big journey is what's underneath that in terms of the control framework in trying to make that more effective but also make it understandable and we've definitely challenged ourselves and we're still wrestling with it to make it even better" *(18AT2) - Interview*

It is an ongoing process of alignment and re-alignment of the framework through continuous organizational learning. More so, the reconfiguration of the capabilities framework created better consistence which meant that offerings and their processes can be better codified and 'taken out of the box and run' or replicated. Although these strategic decisions and governance on the process were led by the directors, the actual knowledge articulation and codification was achieved by practitioners, bottom -up. Director A commented on this,

"Practitioners. Largely it was done bottom-up, the people who knew most about this was the practitioners that operate and run the service … people like Chris, Jerry, Stuart who are intricately involved. The bit I did most was, I forced us to do it. I have never operated the service and done it … I asked questions in the way you're asking me questions" (19AY2) - Interview

There have been challenges during the process of knowledge articulation and codification and re-use of documentation for replication. The greater the codified documentation and the less frequency of use for replication, the greater the challenge of standardization and success of replication, as Director A explained,

"So, I'm describing that one [capability on recertification]. I'm saying we now have a repeatable process, it goes through reusable cycles every quarter and the team are involved intricately in it and it works. When we go into this one [a more complex capability], the documentation and the structure are exponentially greater than they were in previous incarnations and the biggest bit we are leading on, B [director B] and I have done three workshops with the guys [staff] in the last 2 weeks is so that they can do it on their own and it has that repetition" (19AW1) - Interview

Therefore, it can be said that codification complexity and frequency of use affects success outcomes. These discussions above have provided some insight into individual and group actors in the organization involved in seizing opportunities. While selecting the firm's technology and product architectures as well strategic decisions regarding reconfiguration and replication were taken by the top management, the process of knowledge articulation and codification were largely within the remit of managers and individual actors in the firm who deliver the services in practice. Senior management also provided leadership and governance to the overall processes.

6.5 FIRM STRATEGY AND CODIFICATION

6.5.1 FIRM STRATEGY

The function of a business model is to 'articulate' the value proposition and select the appropriate technologies and features (Chesbrough and Rosenbloom, 2002: 533-534). One of the things that the firm articulates to be of value to clients is, delivering tasks 'speedily' and the firm has made this one of the central tents of its differentiation strategy. Speed is a key differentiator for the firm as Director B explains,

"One of our differentiators is to do it [client's work] at speed. We want to help you understand what you need to do quickly and then help you to do it quickly" (20AZ1) - Interview

It therefore raises the question of how the firm does achieve tasks much faster than competitor firms. Director A provides insightful knowledge here,

"One of the things we might be doing is actually we want to make an assessment of what the weather looks like at the moment [a client's current IT security risk position]. We sit down with the client we'll go, 'OK it's grey, dance'. What the Big Four come along and say, 'We need twenty perspectives on that. We'll walk around, we'll go down there and then in 3 weeks' time we'll tell you it's grey but a bit changeable'. But we encourage them to say, 'actually let's not forensically analyse. This part you need a broad-brush view that says, we going to you about two hundred things, let's get our view of that, plus or minus it would be wrong. But it's a fast view that you can act on'. And as C [director C] says, we find that they tend to be slow in acting on it and maybe we don't hang on to them long enough" (20BA1) - Interview

In other words, speed is achieved by taking a fast, holistic, reasoned approximate view (best estimate decisions) about the client organization's IT security risk position and the solution needed. Director B explains how this fast, holistic view is also beneficial to the firm as a form of sales strategy,

"You've [the client] got that reducibility. We tell you the problem, we know how to fix it, this is the solution.' It is the way we sell, we don't have salesmen" (10a) - Observation

Similarly, Director C explains that the sales proposition to clients aligns with the speed USP or differentiator,

"We want a chuck of the investment funds, we want to help you write the business case so if we have to write 23 business cases for 15 families, that is important to convey that very quickly because one of our differentiators is to do it at speed. We want to help you understand what you need to do quickly and then help you to do it quickly" (21BD1) - Interview

It is evident that the speed differentiator is also a form of sales strategy for the firm to win client's business and get a chunk of the client's IT security spend budget. Therefore, it can be argued that the speed strategy is value enhancing to both the firm and its clients. However, the directors are of the view that the client does not always take advantage of the speed achieved as the client is

slow at decision making maintaining a state of hiatus. This has created a situation of re-thinking this strategic approach and deliberations as to whether the firm should maintain the speed approach or change strategy to adopt prolonged projects to increase billing revenue as competitors do. Director C presents the dilemma,

"Therefore, the reason we might be naïve is, we should maybe be designing more into our offering that keeps us around in volume, billings, while they have a state of hiatus within the client, the way that our competitors do" (20BC1) - Interview

At this point, it remained to be seen if the firm will give up its speed differentiator and the discussions chapter of this thesis will inform of how this dilemma progressed. Another negative issue related to the speed strategy is that achieving speed could result in sub-optimal work as identified in the Royal London project meeting. The transcript below captures the decision taken by the firm at that meeting.

Speed and quality can be a double-edged sword as the company found out in this project and they have come up with processes to deal with this challenge. A routinized process is to be implemented to ensure that projects do not move faster than necessary and that all project members implement this. Where clients want quick project deliverables at the detriment of quality, the risk of this action is to be communicated to the client and the decision made by the client. These processes and procedures to achieve a balance of speed and quality should be replicated across other projects (3a) - Observation

The insight here shows the importance of managing both speed and quality effectively.

Generally, firms in the IT Security industry pursue different strategies for revenue and another strategy of the research firm is its cost-leadership approach. Providing a fast, holistic approach allows the firm to achieve another of its core strategies which is a cost-leadership strategy. In fact, one of the firm's marketing slogan is 'we attract a rate card to be materially cheaper than the Big Four consultancy firms.' This slogan was stated in the company's sales pitch presentation slides made available to the researcher. Also, during a Knowledge Management session at the firm the Directors gave some insight into how this is realised,

Director A. "A feedback I got from a director at Standard Life was, 'You gave us four chunks for the price of 1, you are underselling yourself … also you are robust, pragmatic, talked simple language and your people are competent and excellent."

Director B. "A director formerly at Deloitte and now at HSBC said to me, 'This documentation you have given me that shows how the control frameworks all fit together, I haven't seen that before. Don't give that away for free.' He is thinking as consultant in the Big 4 who probably has a sales target and can sell that artefact for 10k. We are not driven in the same way, we do not have massive shareholders. Our USP is to get the job done."

Katy [an SME] is response quizzed. "I keep hearing we are selling ourselves cheap. Do we want to change this strategy?"

Director B. "We have a deliberate strategy to be cheaper, we want repeat business."

Director A. "It allows us to show all to the client .. the problem and the solution needed in one go and then we say, we can also do this for you [provide the solution]. Also, we let the client know we are giving them a discount but also tell them the full price otherwise they won't appreciate its value" (9a) - Observation

In another observation at Knowledge Sharing session at firm, the researcher captured conversations that took place,

Director B. "We have a strategy to be cheaper than our competitors."

Director A. "We have a deliberate strategy to be cheaper than the Big 4 [big four consultancy firms]. So, I was speaking to a client last week about his feedback from a project we just successfully delivered. He said 3 things about the success, 'One, you are pragmatic. Two, you are robust. Three, we see the full solution in practice and holistically without asking for more.' Whereas the Big 4 would say; We give you this [deliver this part of the project as agreed] but we can give you this secondly and then this thirdly [we can go further and solve more of your problems] for an extra amount of money. They will look to do the second part for more money and then another sum for the third. We gave all at one go so we are cheaper." (7b) - Observation

These insights show that the firm's strategy is to provide comprehensive solutions makes the firm cheaper and more value for money compared to competitors. The Big Four consultancy firms, on other hand, will structure solutions into segments or packages which would require a payment for each segment delivered to clients. The cost-leadership approach of the firm also supports the firm's sales and marketing strategies, especially to win repeat business. Director A argues that client retention is more prudent than trying to win new clients,

"It is easier to go back and be friends with someone you are already friends with than try to make new friends all the time" (9cc) - Observation

However, the speed strategy of the research firm does create a problem of under-quoting to clients sometimes since the firm's holistic approach means a lot of work is achieved as Director B explains,

Our USP is trying to get the job done. We don't have massive shareholders or sales target, so we are actually quite granular. That actually has created a problem for us in quotes because we've got a lot of details in there our guys need to absorb" (21BD2) - Interview

It is important therefore that the firm offer a profitable, competitive quotation to clients while still achieving their speed goal.

In contrast, the Big Four consultancy firms pursue a different strategy for revenues. They are not driven by speed as speed undermines revenue; they want complexity and prolonged client engagement to increase billing revenue. This is because they have an army of people to sell to the client and want their project teams deployed at the client earning revenues while the client stalls prolonged decision making due to project complexity.

Furthermore, the third arm of the firm's strategy is a replication strategy for firm growth. Following organizational learning from the successful Royal London project, the management team made a strategic decision to invest in knowledge codification and re-use (by method of replication) and spend on workshops and knowledge management session to train staff to 'get up to speed' with doing replication. Director B explains the rationale behind the decision to invest in replication strategy for growth,

"We didn't have a choice [to do codification and replication], we can't scale up. We want to scale our business and if we don't do something to get the guys up to speed with it, then we are limited to me and a few people doing it [risk management] and there are lots of reasons why we don't want that. So, we have to do that, and we are committed to doing that but we haven't found a very effective way of doing that" (22BF1) - Interview

As noted by the director the process encountered challenges which included difficulties with tacit knowledge transfer, clarity of language in artefacts, and intellectual property protection. These issues will be dealt with in more detail in later sections of this chapter. Despite these challenges, the replication journey has had some good success and led to the growth of the business. In less than a two-year period, the firm has increased the skills-set within the company and grown the employee size from about 80 to 120 people. The exact employee figure depends on the number of projects the firm is engaged in at a time.

Furthermore, the firm's adoption of a strategy of cospecialization is more sustainable and revenue-enhancing for the firm. Perhaps the biggest change to the firm's strategic approach following the Royal London project was summarised in a comment by Director A during a knowledge sharing session,

"Normally our clients buy 2 things from us … staff augmentation [our people] and professional services which is our offerings. Developing this part [offerings] makes us more sustainable. We can tailor it and also use it off the shelf which is faster. We can repeat it and teach you how to do it. From this year, we improved our strategy and started to sell our control framework … our artefacts. We have done this for a while and as we build more confidence in the artefacts … it has IP, then we will increase the price." (10a) - Observation

In other words, the firm no longer sells it people and offerings (or capabilities). It now sells its people, capabilities and artefacts and the artefacts are brought to life by its people and capabilities. The combination of people, capabilities and artefacts in knowledge-based enterprises is what is referred to in the literature in dynamic capabilities as cospeacialized assets. According to Teece (2007), value-enhancing investments inside the knowledge-based enterprise (such as an IT security management consultancy firm) are often cospecialized to each other. Cospecialized assets are a particular class of complementary assets where the value of an asset is a function of its use with another particular asset i.e. joint use is value enhancing. Importantly, cospecialization

is important to both seizing opportunities and reconfiguring intangible assets, as microfoundations of dynamic capabilities.

It is argued that the firm has exhibited dynamic capability in cospecialization through its decision to invest in knowledge codification to create artefacts as well as training involved, and the strategic foresight to package the cospecialized asset as a new product to sell to clients. Despite the challenges experienced along the journey and which will be covered later, the firm is confident that this new approach has led to successful outcomes, is more sustainable and would generate more revenue for the firm.

6.5.2 CODIFICATION SUPPORTS GROWTH STRATEGY AND SUCCESS

The decision to invest in codification increases business confidence and success but challenges due to staff structure. Both the strategy and organizational behaviour literature emphasize the fit between and amongst strategy, structure, and processes (Teece, 2007: 1337). As the firm embarked on the process of knowledge codification to support its replication strategy, structure played a prominent role as the organizational staff-structure of permanent staff and associates pose a challenge for replication efforts. Director B comments,

"One of the challenges we are having is that with our permanent members of staff we can carve out a bit of time for them to come on the journey with us. With our associate members of staff we can't do that and so far we haven't found an effective way to cross that river. It is difficult for us to say we are going to sink 50k on those guys to be up to speed on it and go off and do it because that is a financial consideration and because they are actually in the client most of the time and trying to get them out of the client for a bit and putting them back in the client, to do that is actually very hard" (23BH1) - Interview

For permanent staff fully bedded into the firm, the process of knowledge transfer on use of codified knowledge is more straightforward due to their physical presence at the firm and financial costs of the process appears to be justifiable since it is arguable that these staff will remain at the firm longer (than associate staff), hence the firm can reap long term benefits of the investment in the process. In the case of associate staff based mostly at client organizations, the same arguments are perhaps weaker which the director alluded to. In the first six months of embarking on the replication strategy, the firm was more successful in achieving knowledge articulation and codification to create documentation and artefacts. Within that time-period, developing and implementing an effective method to get staff up to speed on using the documentation and artefacts had been less successful and the acid test will be in how well staff can use the knowledge to achieve replication of routines.

From the perspective of the senior management, the decision to invest in codification and replication remains justified by their belief that standardised, tested methods and structure

together with codified artefacts increases business confidence in delivering tasks and leads to success outcomes including increased client satisfaction. There are also other benefits of doing codification and replication by the firm. For example, codification allows for sharing tasks, e.g. risk management, with other actors therefore it prevents a reliance on directors only, thereby reducing risk to the business. Director C stated,

"It [codification] is easier to sell and to get more people to do it so we can increase our capacity, vastly reduce dependency on us as the directors to do any of the work" (24BK1) - Interview

In other words, codification makes it easier to sell the artefacts as cospecialized assets, allows for replication thereby increasing capacity of the business, as well as reducing risks to the business. Director A explained,

"There is a greater propensity for the client to come and say they like it because we have more confidence in what we've put in there. When you are building something and starting together, there's no time so therefore the likelihood of screwing it up is greater and if you're doing a repetition thing screwing up round one kind off might influence the long-term gain" (24BL1) - Interview

By having a repeatable structure and processes, there is more confidence gained as a result of performing the routines consistently thereby reducing the risk of failure which could cause client dissatisfaction and might result in loss of business from the client in the long term.

Another key benefit of codification is that the use of codified artefacts allows faster accomplishment of tasks by actors therefore it is used to drive 'sell as an accelerator' concept of the firm's speed strategy. 'Sell as an accelerator' is a marketing concept and slogan used as a fulcrum of the firm's speed strategy. It is pitched to clients that 'off-the-shelf' artefacts are deployed to accelerate through the project stages to evaluate 'where the client is at' in terms of IT security risks, 'where they need to be' and to deliver the required solutions. By achieving these stages quickly, they are able to charge the client less compared to competitor firms. Speed as emphasized earlier, is a key differentiator for the firm.

In addition to that, codified artefacts are used by actors to facilitate communication across different levels of audiences. The granular language and details provided in artefacts is structured into layers to serve the needs of different types of audiences and staff working at client organizations have found it useful when communicating with people. This was evident in a conversation during a knowledge sharing observation as noted by the researcher,

Director B. "The control framework drills down to the control attributes with 5-tier levels and the level you get to depend on who you are talking to, along with the stories you tell [when using the artefacts]. You can talk to respective audiences, for CEO you might stop at the first level."

Paul [Analyst]. "I take the control framework and develop about 3 or more questions and ask them [the client] if I am not satisfied with their initial answers. I have found it very useful." (9b) - Observation

Appendix Four shows the pyramid tiers of the control framework levels, which is used by actors to engage with different levels of audience at client organizations.

Therefore, it can be said that these artefacts in some ways serve as 'a guide book' for actors at the firm and a source of knowledge about how the firm's routines interrelate. The challenge may perhaps be in building up and maintaining this 'book index' as the firm grows and continually renews and reconfigure its capabilities.

6.6   CLARITY ON CAPABILTY AND LANGUAGE IS OF VALUE

It has been explored why the firm performed capability renewal and reconfiguration, and the benefits of related processes such as knowledge codification and replication. The discussions here will seek to provide an insight into the 'how' of the firm's capabilities and replication, the processes and practices involved and how the firm manages to capture value by engaging in these activities.

Demystifying bespoken capabilities and clarity of language aids knowledge articulation, codification and reuse. The microfoundations of dynamic capabilities framework for 'seizing' opportunities present that strategic decision skills and execution for seizing opportunities include designing mechanisms to capture value for the firm (Teece, 2007). Value could be captured in the way firm's capabilities and routines are designed and deployed. According to Teece (2007), good business models achieve advantageous cost structures and generate value propositions acceptable to customers (Teece, 2007: 1331). As the firm engaged in capability reconfiguration, the senior management provided insights into how the firm's capabilities and routines including its replication, are articulated and deployed. According to Director B, the firm's capabilities (bespoken) are tailored around industry-wide solutions. However, this leads to knowledge articulation and codification challenges for actors such as SMEs and analysts. He explains in this comment,

"I more or less operated the other one [capability] for years on my own, now we are giving it to other people to do it so the knowledge transfer is different and the thing with it, to contrast the other thing [other capability], it is kind off bespoken, invented thing whereas recertification everybody knows what it is. If you walk into this room and ask a security guy what is recert, they will know what it is but if you ask what is iDecide they won't" (25BM1) - *Interview*

There appeared to be a mismatch between actor's (employees) understanding of common industry solutions and that of the firm's as well as unique ways in the firm delivers its solutions which might be peculiar to the firm. Director A captures this as he added to the conversation,

"There is a takeaway for us in that B [director B] which is, we know how we do recert at [firm name] and lots of people know what is a gap analysis … we've got to give them the right tools. So, I think there's something in there for us to think about. There is a lot if insight there in terms of the contrast" (25BM2) - *Interview*

In other words, actors might have the same performative understanding of industry-wide routines but different ostensive understanding of the firm's bespoken capabilities and how the routines interrelate. Therefore, providing clarity about how routines are connected (what the firm calls 'demystifying processes') and clarity of language helps to achieve a better shared ostensive understanding which is necessary if routines are to be successfully replicated or 'commoditise' by the firm as explained by the directors,

"So, we are trying to work out a way of telling our language that we know works for us and has worked before in more or less my, Gary's and A's [director A] head into something that we can commoditise with our SMEs" (Director B 25BO1) - Interview

*"The bit that you'd add to that, we are trying to ask some questions about a given control, and actually the guys will drift … So, I'll use a fruit analogy because it's easy. We were asking questions about the apple and that started to drift into other things that sit in the fruit bowl like the orange, the banana and the pear. And B [director B] said, 'save that until we get to the orange, banana and pear'. And the guys say, 'what is the orange, banana and pear? **And actually, it all came back to, do I really understand how things all sit together and how it relates to each other**. And there is a 20% prize in being clear to everyone how things interrelate and language" (Director A 25BO2) - Interview*

It can be concluded that the value in using codified artefacts for replication could lie in having clarity of language and a clear description of how routines fit together so that actors have the understanding needed to deliver tasks. It is also value-enhancing to make it clear to actors what is unique to a firm's bespoken capabilities compared to industry-wide capabilities and how the capabilities are deployed to create value for clients. Director B explains this using external vulnerability scanning capability as an example,

"So, if I say to you [company name] thinks good external vulnerability scanning looks like this and we use some language, because Gordon is trying to use that as a measure of something else … he just wants me to be really crisp about what my good and bad is. We all know what external vulnerability scanning is, but what is it to [company name] because this whole framework is our view of what's important and what's not important" (25BP1) - Interview

These pose knowledge transfer challenges during replication efforts and actor's expertise and experience plays an important role. It is argued by the directors that greater levels of actor's expertise and experience aids understanding of bespoken capabilities.

Furthermore, the firm's capabilities and unique language is a differentiator and value creating. It has been discussed that clarity about a firm's language and routines is necessary for replication. Every firm would have their own unique language and nuances. A spin on language is a valuable differentiating factor which creates a firm's brand as Director B states,

"We've just got a different spin on it [language], different take on it, and we sell that take, that take is our brand"
(26BS1) - Interview

This spin on language is valuable and profit-generating and the challenge is to make the language 'flavour' clear to actors. This challenge is amplified as the firm performed knowledge codification and train employees to use codified artefacts for replication. One of the ways of overcoming this challenge is on-the-job learning. Practical experience gained by actors as they use codified artefacts helps better understanding of language. A benefit of setting employees out to use the artefacts is, actors can improve the artefacts as they gain knowledge and experience by using them.

A second way of enabling successful replication by actors is by demystifying the hierarchy of routines within capabilities and providing granular language and details in artefacts so that actors have a better level of understanding needed. It is significant to note that the route every firm will take to achieve the same solution would differ therefore there is equifinality in language and processes across firms.

Over the research period, the firm had experienced some successful outcomes from their knowledge codification and replication strategy. This includes growth in the size of the firm and client satisfaction as mentioned earlier. There remain some challenges related to the strategy. First, standardization of documentation to serve what purpose remains a challenge, as Director A noted,

"I don't think we've got a very effective approach to documentation at the moment. If I'm hard on it, we haven't really normalised what documentation should be and what level, to serve what purpose, to serve what master type of thing"
(27BW1) - Interview

It can be argued that this is expected in a firm still in an infancy stage of implementing a well-developed replication strategy.

A second challenge relates to gaining insights about clients, for example sensing opportunities or feedback from conversations the directors would normally have with clients. By delegating tasks to employees through replication, it has created a new challenge of how to harvest softer knowledge and insights from clients back to the firm. Director B comments,

"An example would be, so, I talked to a client this week and he said, 'That's going brilliantly, I'm on top of it'. If I wasn't in the room, how would we [directors] have known that" *(27BX3) - Interview*

The process needed to harvest softer knowledge is a gap in the firm's knowledge framework. This is significant because exploiting knowledge about clients through engagement with clients is a vital way to sense opportunities as highlighted in section one which dealt with microfoundations of dynamic capabilities to sense opportunities.

In addition to that, adapting routines and artefacts for replication across different clients poses another challenge. The firm, like most consultancy firms, provide the same solutions to different clients and therefore needs to adapt bespoken routines and accompanying artefacts (toolsets) to suit the client's environment. This implies that it is necessary to have generic toolsets which can be adapted to suit clients before use by actors. Failure to have a generic toolset will pose a challenge of using bespoken toolset to match to client environment. On the other hand, use of a generic toolset would require customisation for every client which creates more work and difficulties as actors essentially learn on the job. This was the experience of staff that worked on the Royal London project as noted by the researcher during meeting observation *(2c) - Observation*.

6.7   CONFLICT AND CONSENSUS ENHANCES DECISION MAKING

Decision errors are not uncommon in managerial decision making in both large and small organizations. These errors can be especially damaging in fast-paced environments with path dependencies and network effects, as there is less opportunity to recover from mistakes (Teece, 2007: 1333). According to Teece (2007) firms can implement procedures and take a disciplined approach to purge bias, delusion, deception, and hubris. The research identified some features that deal with decision making and avoiding decision errors at the firm, especially among the top management team, and conflict and consensus was a significant theme.

Time enables deliberations and consensus. Teece (2007) suggest that management should create an environment where individuals involved in making decisions, at both the management and board level, feel free to offer their honest opinions even if that creates disagreements. This appears to be evident in this firm as they are open to tension and conflict and consider that a positive thing. From the perspective of the top management team, it is vital to allow time for the directors to deliberate decisions and find a means to come to a consensus. This is particularly important for the smooth running of the firm since the three directors are equal partners with the same level of hierarchical power at the organization. The element of time in different flavours - be it in hours, weeks or even months, allows for reconsiderations which leads to consensus and agreements. In addition to time, active listening by actors helps to recognise common grounds or accept superior arguments. Up and above that, shared common goals amongst the Directors helps to bring about consensus and defuse tensions. Director B explains,

"We are all quite aligned in what we want to achieve and the way we want to achieve it. We don't do things at all costs, we're not dishonest. We won't cut corners, we want to do a quality job. Some of the time the energy that we have to try and achieve that, behind it when we realise we are trying to achieve the same thing we are just passionate about it, it [disagreement/tension] just disappears" (28CB1) - Interview

Therefore, it can be said that having shared values and the right organizational culture plays a significant role in achieving the right 'organizational space' for healthy disagreements to avoid decision errors but ultimately finding consensus to progress with decisions as a firm.

There is also the importance of having a balance of conflict and consensus which is needed for progress and the right decision making. During deliberations to achieve consensus, the directors respect each other's opinions, and recognise and respect each individual relative strength and expertise areas. However, questioning of each other's opinion and expertise sometimes create frustration and conflict. The questioning and challenging of opinion is necessary though to achieve clarity on matters and avoid decision errors. Director B comments,

"That's true. For example, A [director A] would say, that's crap I think that thing is crap and that thing, it might be something that you feel that is actually quite good and you're passionate about it. In the old days before we got together [formed this company but worked together at RBS] I would be like, 'What do you mean!?' But I've learned that it is actually a way of making sure that we are doing the right thing. Because that's the way A works … A's work is absolute, it works well" (29CE2) - Interview

Director B states that good questioning is a strength of director A and director A goes on to make a point that any one of the directors might play that questioning role at any given instance. This is a valuable asset of the firm to have three very senior and experienced directors at that managerial level supporting decision making including about client projects. In fact, the firm also exploits this enhanced decision making in its marketing slogan 'power of 3' to clients. Teece (2007) states that competitive advantage can be gained by firms that adopt techniques to overcome decision biases and errors (Teece, 2007: 1333). It can be argued that the firm achieves some advantage in this area.

6.8   RECRUITMENT MODEL, PROCESS AND LEADERSHIP IN RECRUITMENT

6.8.1   RECRUITMENT MODEL AND PROCESS

The firm's people are a key differentiator for the firm and a source of competitive advantage. People are a key asset to any organization especially in an industry where there is a skills shortage and strong competition for talent. The ability to recruit and retain scare talent could give a firm competitive advantage over rivals. More so, for this firm, people form one arm of its cospecialized asset strategy of people, capabilities and offerings which means its recruitment model and process is an essential part of the business strategy. The firm states that its ability to recruit best talent in the industry is a key differentiator for the firm and a source of competitive advantage. They achieve this because of the recruitment process they put in place. Director B notes,

"We have a recruitment process that pulls people from our rivals therefore we discern out the wheat from the shaft" (30CF2) - Interview

A second reason why the firm achieves a talent advantage over competitors is that it succeeds in building loyalty and commitment with employees. This helps to create an identity or brand with the firm, especially as language used by actors and storytelling of experiences are important elements of the way work is achieved in the industry. The ability to entrench loyalty and commitment in employees is of value and a fundamental dynamic capacity as the theory and framework for seizing opportunities states (Teece, 2007). The firm believes it is able to build loyalty and commitment by 'learning to live our values' and promoting the right culture in the organization. Part of the firm's values is to 'attract and retain good people' and it believes a number of its principles and measures implemented allow it to achieve this. These include - the strength of the firm comes from its diversity and all opinions and inputs are valued; Open and honest communication, we share information and we don't hold back on giving positive or negative feedback; team environment and make our people feel part of a team; and we strive for excellence and are proud of the standard we achieve. Some of these statements resonate strongly with the comments made by staff about their experience at the firm, to the researcher at two social events at the company the researcher was invited to (Christmas 'work' party in December 2015 and Summer drinks event in July 2016 where permanent staff, associates and partners were present). A few notable comments are presented below,

"I enjoy working at the company you feel comfortable giving your opinions … it's a very friendly and relaxed environment" (Mark 11a) - Observation

"Compared to other places I've worked … this company strives to deliver high quality which is really good because it pushes you to do your best and you actually learn a lot doing that" (Stuart 11b) - Observation

"I've been at the company since it started. For me it's the work-life balance. They recognise that work is important but there are many other important areas in our lives as well" (Paula 12a) - Observation

It would appear the values and culture at the firm has had a positive impact in building loyalty and commitment and retaining staff. With the fast rate churning of staff in consultancy firms in general, having long serving staff (retaining staff) leading to an identity with the firm is a differentiator. Director B states,

"One of the reasons we do that [recruiting process] is unlike a lot of resourcing scenarios and resourcing companies like Hyncth and Hedge in IT, they just pick people in and put them in. But our guys have a bit of an identity with us, they are long serving, they are good anyway" (30CG1) - Interview

This is an advantage the firm enjoys. However, they feel that they get more benefit more from their human asset and that exploiting and fully maximising the collective power and knowledge of

their people remains a challenge for a small sized organization, especially because of its staffing structure.

6.8.2 LEADERSHIP IN RESOURCING AND RECRUITMENT

Top management team leadership plays an active role in resourcing the right talent. Teece (2007) argues that demonstrating leadership is an essential component for taking advantage of (i.e. seizing) opportunities. As pointed out, the directors demonstrate leadership in resourcing and recruitment and share roles with respect to people, the processes and articulating task requirements needed for good talent resourcing. Although these activities at the firm might sound mundane and common to many firms, microfoundations research argument is about unpacking the mundane, nuanced practices and processes to shed light on the 'why and how' which could elucidate our understanding of the source of a firm's competitive advantage which exhibits at the macro or organizational level. It is noteworthy to recall that the firm's recruitment is one of its source of competitive advantage;

"A key part of our differentiator is, we get feedback that we give better people than the average provider of people in the market" (Director A 30CF1) - Interview

The directors provide some insight into how the resourcing and recruitment is done, below,

"We have a process for capturing the requirement from the client which we [directors] are involved in and basically we look at that on a weekly basis and scrutinise it. C [director C] has a way of getting that on the table and we consider opportunities and needs. I interview the SMEs" (Director B 34CO1)

"B [director B] used to do 100% of it. Since you've first met us, I do a bit more analysis on pre-requirement and zero input post" (Director C 34CO2)

"I don't do the people. I do the process with the clients, less people less time" (Director A 34CO3)

What is evident is, by sharing/distributing roles and inputs, the directors combine and collectively exploit their individual expertise and strength areas.

It is also important to note that the essential technical resource at the firm is the responsibility of the top management team. The technical director oversees the technical requirements which involve assessing the firm's available talent and the recruitment of technical people. This is because technical resources such as SMEs are more challenging to source due to shortages and which significantly has an impact on the firm's ability to operate. Director B explains,

"We need different types of resources, for example a project manager, SME. Project managers are not the hardest … the skills are more commoditised and they are not necessarily interchangeable with the teams, and Nicola [recruitment manager] can get these. SMEs we put a slightly higher bar, some of the things we want to do will completely depend on if they can do it or not. So, I interview those guys" (35CR1) - Interview

The director's role in recruitment was also evident during an observation by the researcher at a top management team meeting where director B provided feedback to the team about an SME he had interviewed. The researcher's notes on his reflection of the conversation that took place are below,

The directors are actively involved in resourcing and recruiting talent. While technical skills are important, relationship building and client management skills are equally vital. The company is desperate to keep hold of the valuable talent because of his technical skills but put him on an appropriate project to assess his client management skills. His long-term prospects with the company will depend on his performance as well as the availability of right project. (1b) - Observation

It can be concluded here that the director's leadership and involvement in resourcing and recruitment is value-enhancing to the firm. A further analysis of information contained in some of the company documents made available to the researcher provides additional insights into some general advantages and disadvantages of the firm's resourcing model. The firm is partly made up of permanent employees, but it also exploits a resource model to hire associates on a contract basis as needed. Some of the advantages of this resource model is that it allows the firm to benefit from a wide variety of talent; it minimises overheads and cost outlays when business and projects dry up; and it enables greater flexibility to change people and align the right skills to opportunities at the firm or as the industry changes. There are some disadvantages to the contract-based model of resourcing which including, it leads to less certainty of desired resource being available when required and the challenge of maintaining a 'bench' of available resources. Overall, it is argued that the advantages outweigh the disadvantage which has made the resource model sustainable for the firm and has supported its significant growth in the last two years.

Summary

These discussions above conclude this section of the thesis that deals with enterprise structures, procedures, designs and incentives for seizing opportunities as a microfoundation of dynamic capabilities. While in theory and as a framework it is possible to separate the elements and entities that sense out opportunities, and those that endeavour to execute upon them, in reality, the two functions (i.e. sensing and seizing) cannot be cleanly separated, and the activities and processes discussed must be seamlessly integrated inside a single firm (Teece, 2007). The research at the firm has demonstrated that this is indeed the case in practical organizational life as the processes and actors involved in sensing and seizing opportunities are intertwined.

The next section will cover managing threats and reconfiguration as a third arm of the microfoundations of dynamic capabilities framework and will look specifically at continuous alignment and realignment of specific tangible and intangible assets, as it relates to the firm investigated in this thesis.

SECTION THREE: MANAGING THREATS AND RECONFIGURATION

INTRODUCTION

According to Teece (2007), the key to firm success and sustained profitable growth is the ability to recombine and reconfigure assets and organizational structures as the enterprise grows, and as markets and technologies change, as they surely will (Teece, 2007: 1335). This is necessary to achieve what is termed 'technical' fitness and 'evolutionary' fitness (Helfat et al, 2007). Technical fitness is defined by how effectively a capability performs its function, regardless of how well the capability enables the firm to make a living, while evolutionary fitness or external fitness refers to how well the capability enables a firm to make a living (Teece, 2007: 1321). Evolutionary fitness is strongly impacted on by the external environment and the selection of the environment the firm makes, to adapt to external changes in the external environment. Internally, as firms achieve successful ways of achieving tasks (related to technical fitness) that success breed some level of routine which is necessary for operational efficiency. Routines help sustain continuity until there is a change in the environment creating the need to adapt, and/or internal organizational learning has resulted in the discovery of more efficient ways of performing routines. Changing routines and structures and reconfiguring capabilities is costly and could lead to heightened anxiety within the organization. Therefore, it is pertinent that the right decision making is made by management and they create a culture within the organization that is open to accept high levels of change. Teece (2007) argues that an important managerial function is achieving semi-continuous asset orchestration and capability renewal, including the redesign of routines. The skills required to achieve continuous alignment and realignment of specific tangible and intangible assets in a firm is a dynamic capability as espoused by the microfoundations of dynamic capabilities framework (Teece, 2007). This section will discuss the microfoundations of dynamic capabilities for managing threats and reconfiguration that relates to the research performed at the firm.

6.9   SHAPING CAPABILITIES AND FRAMEWORK

A firm's capabilities and framework are shaped by the changing industry. In the IT security industry, the external environment, notably the changing industry and industry standards shape the solutions and frameworks (i.e. IT security control frameworks) that clients adopt and in turn, demand from IT security consultancy firms. Director C explained,

"What we are seeing is, periodically, over the security industry, maybe over twenty plus years, people [organizations] have tried to align with something that is an industry standard … and the information security forum was there. NIST is the current one and it comes from The States, it's a standard for security like ISO. Information Security forum was probably first and has some global coverage, the British Standards Organization signed off to some of that and that became the international standard probably about fifteen years ago, I would guess and that's ISO, and now there is a

feeling in quite advanced organizations that we need to move beyond that and what we are seeing, our more advanced customers are aligning with that" (36CS1) - Interview

"What we have to therefore do with our tool is to understand how it maps into these various industry standards" (36CT1) - Interview

In other words, IT security consultancy firms have to adapt their bespoken solutions and frameworks to match with these industry standards as the standards change or new standards become more dominant in the industry. Changes in the external environment might also be driven by government decisions or changing legislation and security firms need to respond in the solutions they provide and the underlying capabilities they need to possess. For example, during a research observation at the top management team meeting, it was discussed that the UK Government has introduced a requirement that IT companies doing business with government institutions must be a CyberPlus certified. Therefore, the directors deliberated on whether the firm should develop CyberPlus solution as one of their offerings to provide to their clients as IT companies doing business with the government might require it. From the perspective of director B, as a niche consultancy, the firm should be proposing that solution to clients to shape the client's demands rather than just responding to client demand. The practicality and cost implications for the firm were also discussed and subsequent actions planned *(1a) - Observation*. Similarly, in another research observation it was discussed that the new EU GDPR data protection legislation might require the firm to consider what new solutions clients would require hence will need the firm to adapt their solutions and capabilities accordingly *(13c) – Observation.*

In this regard, the top management stated that even though the firm responds to external changes, it does not have a methodical and systematic process or schedule to renew its capabilities and offerings. Rather, renewal and reconfiguration is done largely organically in an ad-hoc manner through learning and experiences and as opportunities present themselves. Sometimes their capabilities and offerings evolve organically due to a client's demand or insights sensed directly from clients about the needs of the industry. Again, with the use of an analogy, Director A explains,

"The client might have asked for peers, we say, we can give you apples to for an extra £10,000. The client might say, can we get kiwis too, we need kiwis. We [the company] then understand that kiwis are the flavours that those type of clients want so we add kiwis to our offerings. We develop or acquire the resource and capabilities to deliver this product or service." (6b) - Observation

In order to acquire the skills-set or capabilities required to deliver a new offering, the firm searches the marketplace to recruit the people that they require. Their resourcing/recruitment capability which has improved over time, which they believe is superior to their competitors, allows the firm to acquire the talent required to support growth in capabilities and offerings. In

fact, the directors have considered spinning of the recruitment capability as a separate company but are cautious about the distractions that could cause to their core business *(5a) - Observation.* Also, knowledge and skills gained by staff working at client organizations is brought back into the firm and used to create new offerings or enhance its capabilities. An example of this was noted in a meeting observation which relates to employees working at Lloyds bank and the director's exploring the possibility of exploiting knowledge gained by staff as Lloyds are industry leaders in the DPL space of Information Asset Protection *(8d) - Observation*.

In addition to that, the mapping of firm's framework is necessary to align with (and support) firm's strategy. It is important that the firm possesses the right capabilities and solutions required in the marketplace. But it is also vital that the capabilities, offerings and accompanying frameworks 'match' to both internal and external contexts to achieve technical fitness and evolutionary fitness. In this regard, mapping of firm's framework is important to the firm (internally) because it allows actors to speedily complete holistic solutions thereby achieving technical fitness and significantly, supports the firm's speed strategy. Director B stated,

"The reason why we need to do that [mapping] perhaps with all the standards, we are trying to be more specific about, when somebody says do access recertification which is on this line item, should we check your access? We actually go quite specific about the minimum thing you need to do is this and you should be doing that and that's a bonus … and the reason we do that is because what we are trying to do all in one go, is access the organization at that level so that we can tell them what they need to spend to fix it" (37CU1) - Interview

Evolutionary fitness is also necessary in that the capabilities and framework must be packaged in a way that makes it sellable or attractive to clients so that the firm is able to earn revenue. Director C captures this point succinctly,

"Ok, can I now give the client dimension. If you can't map your proprietary framework which ours is, to something that the client is using, it's very difficult to sell. So, we've seen clients decide to just fire their expenditure to align to international standards which have 15 or 16 families of things which we have as well but NIST has 50. Therefore, you have to be able to sub-divide and map to go to those because for us, as B [director B] says, we want to accelerate through the first stage of assessing where you are currently at cuff the mark, where you need to be" (37CV1) - Interview

Therefore, mapping of the framework to that of clients is important to the firm (externally) because it makes it easier to sell the solutions to the client to get a return (evolutionary fitness). In addition, it makes it possible to accelerate through the client's project stages thereby supporting the firm's speed strategy.

6.10 KNOWLEDGE MANAGEMENT

The main goal of journey the firm went on during the research project was to exploit the learning, knowledge and experiences of the Royal London project and incorporate that into the business model and renewed business strategy. A significant part of this journey was to capture knowledge

and experiences through knowledge articulation, codification and replication. In this respect, it can be said that knowledge management is a core component of the firm's organizational activities. The microfoundations of dynamic capabilities framework depict knowledge management as an essential element for the continuous alignment and realignment of firm's tangible and intangible assets as seen in Figure Ten as shown in page 133. This section of the thesis will narrate the findings that relate to knowledge management at the firm during the research project.

Learning and Knowledge Transfer are essential for Replication. In the context of dynamic capabilities, the ability to integrate and combine assets including knowledge is a core skill (Kogut and Zander, 1992; Grant, 1986). Also, Teece (2007) argues that intangible assets are critical to firm success, therefore the governance and incentive structures created to enable learning and the generation of new knowledge though salient, is important. This responsibility falls largely on the senior management and it requires promoting an organizational and individual learning culture, decision making and good investment decisions to support knowledge management. The discussions in this thesis show that the firm's management team took a strategic investment decision to capture and share individual and organizational knowledge by knowledge articulation and codification and reuse that knowledge during replication. This included activities and events across and within all levels of the organization; project team meetings involving employees at different hierarchical levels, top management team meetings to discuss and implement the strategy, meetings between directors and managers, workshops for knowledge articulation and codification, workshops and knowledge sessions to share outcomes and teach on the use of codified artefacts for replication, and social events to promote buy-in and commitment from employees. The processes and results of these activities have provided much of the data for this thesis.

Transferring knowledge and teaching employees on the use of codified artefacts for replication was a key aspect of the firm's knowledge management journey. Lead SMEs took SMEs, analysts and other members of their teams on the technical journey. For the wider knowledge transfer and learning, this was led by the directors at knowledge sharing sessions at the firm some of which were attended by the researcher (as noted in the Observation Schedule data in Appendix Three). In the first knowledge sharing session, the directors presented the replication strategy which was to build reusable methods and services, unveiled the reconfigured capabilities framework, and demonstrated the use of some of the codified artefacts. The benefits of the replication strategy to the firm and its clients were outlined during a presentation made at the firm by Director A,

The benefits to the clients included; faster outcomes i.e. sell into clients to accelerate the outcomes of the engagement, consistent message to the client in terms of language, credibility of using industry standards, tailored to meet client need, and library based on experience. The benefits to the company are; creates structure and method, easier to teach and coach, company talks to itself and client with one language (8a) - Observation

Explaining the benefits was important to get buy-in and commitment from employees to the strategy and new processes involved.

The challenges of knowledge management and transfer were also stressed, especially in relation to knowledge articulation and codification and clarity of language and its use which is vital in differentiating the firm and building its brand. Director B commented,

"The amount of time you [the team] spend when you start thinking about what you actually do in tasks [articulation] and putting it down [codification]. We could spend a whole day arguing about language or the right definition … what do things actually mean, what is an offering? The right wordings or language is important, it is vital to use that to create an identity or brand." (8b) - Observation

The directors also stated that documents and artefacts will be made available in a repository and the acid test will be in how effectively staff can use them. It was also valuable for staff to provide feedback on use so that the artefacts could be improved *(8b) - Observation*.

With regards to achieving know-how of risk management, that can be regarded as having both a science and artful element to it. As discussed in this work, a differentiator for the firm is that, unlike many of its competitors, it turns complex information security into risk management and it trades on this because it believes the value proposition for security at senior level of an organisation is risk management. Also, as discussed earlier on in this thesis, the firm's operations risk management capabilities have been led by the directors and an aspect of its new business strategy was to delegate this activity to project managers to increase capacity and reduce business risk due to reliance on the directors. This would require achieving know-how of risk management by the project managers through use of codified risk frameworks and learning provided by the directors in workshops and knowledge sharing sessions. In a knowledge sharing session observed by the researcher, the directors provided insightful knowledge into the know-how of risk management. The risk management activity is a 3-step process; gap assessment, risk measurement, and cost calculation. Measuring IT security risk accurately to a metrics is extremely challenging but is of immense value. Director A explains in some interesting discussions,

"Every company … PWC does risk assessment and show red, amber and green. But what is vital is to cost the risk and show that and it is difficult."

"I was playing golf the other day in Ireland with the Chief Information Officer of HSBC and said to him, 'Surely you guys have an effective way of measuring information security risk.' He said, 'Even though society has had credit for hundreds of years, we still had the financial crisis … It is extremely difficult to measure risk'".

"It is difficult to measure information security risk to a metric. IDecide and iKnow control frameworks allows measurement of risk metrics easy and sensible for the client to see. It's a 3-steps process ... gap assessment, risk, and cost. We can give the frameworks to our Project Managers to use and get the costings right. Director B used to do this [risk process] but by end of this year we want it to be 30% dependent on B and 70% on the Project Managers." (10b) - Observation

He argues that while competitors do risk assessment in a qualitative form, there is more value in measuring risk in a quantitative manner which is difficult, but the firm achieves that with its tools, iDecide and iKnow. This would suggest that efficient risk management requires some scientific and mathematical way of calculating and presenting risk clearly so that organizations can make good, informed decisions about IT security risks. It remains to be seen how successful project managers will be in performing the risk management task. Furthermore, director B agrees that there is value to the scientific approach to risk management but argues that there is also an additional skilful, art element to risk management and goes on to highlight some of the challenges in achieving risk management. He explains in an exchange with a project manager,

Director B. "The risk assessment and management requires a lot of tact and nuanced conversations. If you tell the client exactly how bad they are [high amount of risk] with the metrics, they feel exposed, they don't want to hear it ... CEOs say different things. It's a bit like houses where the back garden is rubbish but the front garden is good [laughter]. Lloyds has developed an excellent metric system but they don't like the numbers [the truth] so they hide it at the back of fancy reports [laughter]. So, the trick is having the risk metrics but having the skill ... the right language, rhetoric, stories and conversations to deliver it to the client."

Marcel [Project Manager]. "How do we have the same conversations with the clients regarding the risk metrics, we are not there to see when you [the directors] do it ... I mean use the same language, rhetoric and the rest of it?"

Director B. "We will get you guys involved in the conversations we have with the client as we do it going forward, partly the language in the artefacts ... that's why we've tried to make it as granular as we can. Also, learning by experience, by throwing you in the deep end. That is the acid test ... it is challenging but exciting." (9b) - Observation

It is evident here that risk management requires a delicate understanding of the client's risk appetite and culture and perhaps the risk approach adopted by individuals involved at the client organization. To be successful, it would also need nuanced conversations and a well-crafted narrative of the risk management proposition. This would suggest the presence of agency factors as there is a choice to be made and an incentive to align the risk approach taken by the staff at the research firm delivering the risk management and the risk approach/appetite of decision makers at the client organizations. In the literature of dynamic capabilities, Teece (2007) state that incentive issues are embedded in an understanding of agency and incentive design issues (Teece, 2007: 1339) and argue that minimising agency issues in organizations is necessary. This can be achieved by promoting the right values and culture in organizations and minimising the abuse of discretion by actors through appropriate accountability and oversight by management. So far, it can be argued that these are attributes present at the research firm as the research did

not uncover any evidence of negative risk management performance. In addition, practical experience gained by doing risk management over time, along with language detailed in the artefacts will help project managers to develop and improve on the artful skill of risk management.

Furthermore, another challenge the firm faces with respect to knowledge management is the costs involved in knowledge transfer and training employees on the new capabilities and framework, especially with the staff structure of permanent employees and fixed-term contract employees (associates and partners). Director A describes the dilemma,

"As a small, niche consultancy we don't have vast resources to spend to bring in our staff and take them on the knowledge management journey. So, the challenge is how we can share, exploit and get knowledge to them and from them as best as possible and at the same time protecting our intellectual property." (6c) - Observation

There are obvious benefits of knowledge management and transfer as outlined in this thesis but there are also significant cost implications especially for a small sized firm with limited resources. The challenge therefore would be how to strike the correct balance between costs and benefits to the advantage of the firm. There are also concerns about the protection of intellectual property of intangible assets of the firm when knowledge and artefacts are shared as well as the need to guard against IP theft from outsiders or competitors. The next section will discuss intellectual property protection at the firm.

6.10.1 KNOW-HOW AND INTELLECTUAL PROPERTY PROTECTION

At the research firm, complexity of capability and knowledge restrictions provide intellectual property protection. Intellectual property protection is a core component of the microfoundations of dynamic capabilities framework for continuous alignment and realignment of firm's tangible and intangible assets. In fact, Teece (2007) argue that a firm's governance mechanisms that enables the flow of knowledge and technology while protecting intellectual property rights from misappropriation and misuse are fundamental to dynamic capabilities in many sectors today (Teece, 2007: 1339). This is especially relevant to the research firm as they pursue their strategy to build and share knowledge for replication. The senior management share these IP protection concerns and are of the view that the complexity of the firm's capabilities and knowledge access restrictions the firm implements provide some intellectual property protection. Director A provides some insights into how the firm achieves IP protection,

"Two, three things that partially answers it [question on how to protect intellectual property of intangible assets]. So, in terms of … we give the client a level of documentation that says we do 1,2,3, we don't share with them 1.1,1.2, that gives them the details of, if you don't do that little bit in the middle you'll screw it up. So, we keep some from them in the backroom and the same with the technology which is, you'll see that bit, if you're very clever you can go and re-write it but we don't make it easy for you to go and plagiarise it" (40DA1) - Interview

In an observation during a top management team meeting, the firm's Business Development Manager supported this assertion. She added,

"The offerings we have redeveloped, we have a new control framework behind it and behind that we have a macro 1, macro 2 and macro 3 levels of artefacts. There are Excel spreadsheets of details behind macro 3. Most staff only get macro 3, they may never see macro 1. I create what they need from macro 1 which is higher level stuff and added to macro 3 which a staff may need to completely deliver a job or task on a project. This macro 3 is knowledge that is kept and replicated so that any staff can use it with minimal training and go an achieve a task. Macro 1,2 and 3 is the make-up of the offerings which is sold to the client." (7a) - Observation

In other words, layering documents and artefacts in a hierarchical order and restricting levels of access to both clients and staff helps to achieve intellectual property protection – knowledge is provided on a 'need to know' basis. This method works well for the more complex solutions, however less complex tools, frameworks and artefacts are harder to protect from intellectual property theft since they are easier to decipher. An added challenge is the fact that such intangible assets cannot be patented as Director C noted,

"We can't protect it [pointing to a less complex control framework]. We did have a conversation somewhere sometime, somebody said you can't patent it" (40DB2) - Interview

Despite this limitation to achieving IP protection, the directors believe that storytelling and tacit knowledge enhance the value in artefacts based on the idea of cospecialized assets and thus, provide some form of intellectual property protection.

From the perspective of all three directors, know-how of using the artefacts and storytelling done when using artefacts are of immense value which enhance the artefacts and that means the artefacts on their own are of 'less value'. They comment,

"Half of the value [of the artefacts and documentation] is the story we tell with it" (Director A 41DC1) - Interview

"The raw IP in the middle is only a fragment of the whole" (Director B 41DC2) - Interview

"The nick-able IP is only a fraction" (Director C 41DC3) - Interview

More so, because know-how and storytelling have a large tacit knowledge element to it, such knowledge is difficult to steal. This view is widely supported in the strategy literature, Teece (2007) states that tacit know-how is difficult to imitate and has a certain amount of 'natural' protection (Teece, 2007: 1339). In addition, the mapping of firm's proprietary framework to client's environment for use can be a complex endeavour and has certain tacit components – providing some 'natural' protection, thus can make that difficult to accomplish for people who might steal the framework. Director A describes this succinctly when he stated,

"So, you can steal my car but you can't drive it like me type of thing" (Director A 41DD1) - Interview

Adding to that, Director C added further insight into the challenge of using and matching bespoken frameworks to client environments which provides some intellectual property protection. He explained,

"We actually saw an individual at our client site who was the interim CISO and he had his own framework that he developed somewhere else and brought it along and had used it before and it just couldn't match with ours and in some ways the way they described it as if it was more advanced than ours. They just couldn't make it work again. They couldn't sell it, they couldn't package it, they couldn't describe it in a way that made it effective or valuable" (41DD2) - Interview

These challenges associated with using proprietary frameworks make the firm less concerned about theft or unauthorised use of their framework. On the flip side, by transferring tacit knowledge to staff through knowledge codification and training at workshops and knowledge sharing sessions, the firm gives away intellectual property internally. On this Director A comments,

"I think effectively we're describing a limitation of our own model which is, our tacit knowledge which we need to impart onto others in the firm, how do we do it effectively and therefore make our IP not plagiarise-able" (41DE1) - Interview

This is a dilemma faced by most firms especially those in knowledge-intensive domains seeking to share and exploit knowledge internally.

Furthermore, firm size and nature of competition might shape concerns about IP protection. At present, the firm does not appear to be overly concerned about the loss of intellectual property of its intangible assets. Director C explains the reason for this,

"I think there is something else in play here, we're not really concerned about the loss of the IP. We had a view and we still have a view that the market is so massive and we're such a small player in it that there's plenty of places to go and sell our stuff and try to make end roads and it's likely that our major competition that we engage have their own version anyway, and therefore it is ours versus theirs or us versus them. The people who steal it they'll go and find their own clients that we are unaware of" (42DF1) - Interview

He argues that the massive market opportunities in the IT security industry makes the issue of intellectual property theft less of a concern for a small sized firm like CITS. However, bigger direct rival firms or franchise firms might be more worried about intellectual property theft. Directors commented,

"If we were Accenture constantly competing with Deloitte, we might be concerned that Deloitte don't get hands on to our thing" (Director C 42DG1) - Interview

"Also, if we were building the company up, turning the company around and saying we'll franchise that, if there is a product where we are trying to sell ten thousand units, it would be a problem but we are not doing that yet" (Director B 42DG2) - Interview

It is evident from these findings that it is important that firms protect the value of their intangible assets that generate revenues. Dynamic capabilities and strategic management in general is focused not only on how to generate rent streams, but also how to prevent them from being dissipated or inappropriately captured by various entities or groups inside and outside the enterprise. The design and creation of mechanisms inside the enterprise to prevent the dissipation of rents by interest groups (both management and employees) would appear to be relevant to dynamic capabilities but has not been high on the agenda of strategy researchers (Teece, 2007: 1340).

6.10.2 KNOWLEDGE TRANSFER IN TEAMS

There are benefits of knowledge transfer for replication, however there are some challenges relating to knowledge transfer between actors in teams. The directors in the top management team benefit from sharing knowledge which is used for different purposes like sales or technical propositions, but this knowledge transfer effort is not without difficulties. Director B describes the problem he faces,

"It always feels to me like I'm having this thing [tacit knowledge] sucked out of me in a way that I'm trying to package it up and it's quite hard to package it up in a way that the guys will get it" (43AM1) - Interview

Director A provides further insights into this,

"I was going to use an analogy. B's [director B] brain works like a 78 record and it goes round very, very fast and C [director C] and I are more like a 33 … So, what we have to work out is how to slow the speed down to make sure it all comes out in a coherent fashion. So, it's coherent to B but it's going so fast that it isn't always coherent to us" (43AN1) - Interview

This shows that different levels of individual cognition and intellectual capacity affect the ability of transfer of knowledge and understanding by actors. Helfat and Peteraf (2015) introduced the concept of "managerial cognitive capability" which highlights the fact that capabilities involve the capacity to perform not only physical but also mental activities and there is heterogeneity of these cognitive capabilities among top executives. The challenge therefore is how to balance out the individual levels and Director B argues that getting out the details for all directors to understand in a coherent manner is especially important so that each director can engage effectively with clients to arrive at solutions or 'dance' – the language used by the firm.

"We have this thing going on … So, if I go to a meeting with all this stuff … what we call 'dance', you dance with the client and come up with the answers [solutions]. That doesn't work if you don't have the understanding … the details. So, we try to get it on the table because we all [all directors] need to be able to do that [dance with the client]. I'm going through a process now with one of our clients where we need to dance a bit" (43AN2) - Interview

Without a means of achieving knowledge transfer between the directors, the 'dancing' activity performed by each director will not work well.

Tension facilitates knowledge transfer in teams. In addition to slowing down the thought process of directors so that the knowledge provided is coherent to each other, another way of facilitating knowledge transfer is by creating tensions within the group as Director A comments,

"We use tensions [to facilitate knowledge transfer conversations]. We have to push B [Director B] until he gets excited, he raises his voice, shouts at us, leaves and comes back and says I agree guys [laughter]. This is just how it works. If we don't create that tension, we don't get the conversations. It's just how it works" (44AO1) - Interview

Director B agrees that positive tension in the group is necessary. The group is open to tension and there is no truce in the way they work as a team, he says. In Rau's (2005) study of socio-political relations among members of a top management team, the author demonstrated the positive moderating effects conflict and trust has on team performance. The positive impact of conflict or tension also relates to wider teams and not just senior management teams. In an observation by the researcher at the Royal London project meeting at the firm, there was an agreement among employees across all levels of the firm that positive tension in project teams was needed to improve tracking and monitoring of project deliverables and an individual will be assigned to quality-check project members work even though that might lead to tensions within the group. The following exchange occurred,

Jane. "As a niche consultancy firm, we need to do Tracking and Monitoring (T&M) before the client kicks us."

Director B. "T&M is Gerry's strength, how do you apply this rigour across all people. It shouldn't be difficult."

Alan disagrees. "It is personal skill, it is the disposition of the individual to do it. It is how people are wired."

Louise suggest. "T&M should be assigned to person within a project team to do that."

Director B. "That will bring about tension due to trying to check and monitor other people's work i.e. micro-managing."

Director A. "Tension is a positive thing because it means that you are challenging. No tension is a bad thing."

It is agreed that tension is acceptable and an individual on project will be responsible for T&M. An SME will flag it up when work done by people in their SME area of expertise is not of the required quality. That person will resolve any tensions/conflicts. (2a) - Observation

Despite the tensions that occur within the top management team, the fact that the directors share a common vision and objectives helps to diffuse out tensions which lead to agreements during knowledge transfer efforts. Director B stated,

"We are all quite aligned in what we want to achieve and the way we want to achieve it. We don't do things at all costs, we're not dishonest, we won't cut corners, we want to do a quality job. And some of the time the energy that we have to try and achieve that, behind it when we realise we are trying to achieve the same thing, we are just passionate about it, it [the tension] just disappears" (45AQ1) - Interview

In terms of the process of knowledge transfer, actors use objects and artefacts such as MS Word and Powerpoint to capture knowledge which is then used to help achieve a shared understanding of knowledge that is codified internally into a capability framework and used externally to 'dance' with the client. This is fundamental to the way the firm organises its activities.

CONCLUSION

This chapter has presented detailed research findings clearly as they appeared from research based on empirically applying the microfoundations of dynamic capabilities framework of sensing, seizing, and reconfiguring of firm's intangible assets. The discussions integrated with the findings referenced to key theoretical themes in relevant literature and as well as related to the central research theme of how and why capabilities are renewed and reconfigured. Table 9 provides a clear summary of findings that were uncovered in the research as discussed in this chapter.

Table 9. Summary of the Research Findings derived from the data structure in the research

	The findings 1 to 5 provide insights about environmental dynamism and industry challenges in the IT security industry.
1.	The IT Security industry is competitive and dynamic
2.	Dynamism in the industry creates new opportunities and threats to firms
3.	Opportunity recognition to exploit in a big challenge for the industry
4.	Problem of skills shortages exists in the industry
5.	A macro level discourse with business leaders and project delivery are significant challenges
	The findings 6 to 12 inform of how the firm exploits knowledge and experiences to sense opportunities.
6.	External engagements impact on ability to sense and shape opportunities and threats
7.	Processes exist to tap exogenous new knowledge and learning opportunities in the industry
8.	Actors bring in new knowledge and experiences to the firm
9.	New employees bring in new dimensions to the firm which improves firm's artefacts
10.	Levels of knowledge management in the firm is partly driven by client demand
11.	Consulting experience and storytelling of success gives credibility to win business
12.	Common knowledge is exploited differently internally and externally by the firm's TMT
	The findings 13 and 14 provide insights about operations risks management at the firm.
13.	Demystifying operational knowledge is more value creating than technical knowledge
14.	Risk management gained through practical experience is of value
	The findings 15 to 17 provide insights about knowledge sharing at the firm needed to

	sense opportunities.
15.	There is the challenge of knowledge transfer between actors in TMT
16.	Creating tensions within TMT facilitates knowledge transfer
17.	Use of artefacts and finding common grounds enable shared understanding of knowledge
	The findings 18 and 19 inform of the nature of organisational learning that shapes capability renewal and reconfiguration at the firm.
18.	Strategic organisational learning shapes replication efforts and firm growth
19.	Codification attributes and frequency of use for replication affects success outcomes
	The findings 20 to 24 inform about firm strategies and knowledge codification activity at the firm.
20.	Speed strategy allows the firm to differentiate itself in the market/industry
21.	Firms in the IT security industry pursue different strategies for revenue
22.	Investment in replication supports the firm's growth strategy
23.	Codification increases business confidence and success but challenges due to staff structure
24.	Codification & replication reduces business risk and supports 'speed' differentiation strategy
	The findings 25 to 27 provide insights about clarity on firm capability and language required to seize opportunities.
25.	Demystifying bespoken capability/language clarity aids knowledge articulation & codification
26.	Firm bespoken capabilities and unique language is a differentiator and value creating
27.	Codification and replication creates a challenge to harnessing knowledge and client insights
	The findings 28 and 29 inform of the importance of conflict and consensus needed to avoid decision errors when seizing opportunities.
28.	Time enables deliberations and reaching a consensus
29.	Balance of conflict and consensus is needed for progress and correct decision-making
	The finding 30 to 35 provide insights about the recruitment model and process at the firm which is vital to seizing opportunities.
30.	People are a key differentiator for the firm and source of competitive advantage
31.	A model of trusted networked colleagues is used by the firm to recruit talent in the industry
32.	Processes used for resource & requirement management is vital
33.	Recruitment manager role is important and is learned over time
34.	TMT leadership plays an active role in resourcing right talent
35.	Essential technical resource of the firm is within the responsibility of TMT
	The findings 36 to 37 inform that shaping of firm capabilities and framework is needed for continuous alignment/realignment for firm's tangible and intangible assets.

36.	Firm's capabilities and frameworks are shaped by the changing industry
37.	Mapping of the firm's capability framework is necessary to align with the firm's strategy
	The findings 38 to 45 provide insights about knowledge management and intellectual property protection at the firm.
38.	Firm leaders play an active role in firm knowledge management (KM) journey
39.	Technical KM journey is less complex and more successful than risk management journey
40.	Complexity of capability and knowledge restrictions provide intellectual property protection
41.	Storytelling and tacit knowledge provide IP protection but knowledge transfer challenge
42.	Firm size and nature of competition might shape concerns towards IP protection
43.	There is challenge of knowledge transfer between actors in TMT
44.	Creating tensions facilitate knowledge transfer in teams
45.	Artefacts and finding common grounds enable shared understanding of knowledge

The next chapter is the discussions chapter of the thesis. It will provide an in-depth narrative and timeline of events at the firm based on the research findings. Specifically, it will directly address the research questions and state what the contributions of this PhD research project are. Lastly, the chapter will present a conceptual model developed from the work in this thesis and make arguments about its applicability and limitations within certain contexts or environments.

CHAPTER 7: DISCUSSION

7.1   INTRODUCTION

This chapter will elucidate the research findings presented in the previous chapter and present insights. The discussions will be centred on the chronological timeline of events at the firm as well as addressing the research questions. In this way, the structure and approach taken in the discussions chapter outlined below is based on the broad research findings;

(1) The chronological timeline of events at the firm relating to experience accumulation, knowledge articulation and knowledge codification, are integrated with discussions regarding sensing, seizing and reconfiguring at the firm during capability renewal and reconfiguration. Zollo and Winter (2002: 344) argue that dynamic capabilities emerge from the co-evolution of tacit experience accumulation processes with explicit knowledge articulation and codification activities, while sensing, seizing and reconfiguring are microfoundations of dynamic capabilities (Teece, 2007). Therefore, the narration of the timeline of events approach taken will show the levels that these activities happen i.e. where dynamic capabilities exhibit, and the actors involved in sensing, seizing and reconfiguring. The outcome of this endeavour is that it simultaneously addresses the first two research questions which are; 1) How do the microfoundations of dynamic capabilities impact on capability renewal and reconfiguration in organizations? And 2) What is the multi-level nature of dynamic capabilities i.e. at what level(s) do dynamic capabilities reside? The answers to these research questions will be integrated into a conceptual model developed in this chapter. The output of every section of the timeline will contribute an input towards the model which importantly, will provide a chain of evidence of how the model was conceived and built up.

(2) Based on the discussions that arise from (1), the chapter will present processes and activities that sustain or enable dynamic capabilities. Thus, it addresses the third research question which is, 3) What are the processes and activities that sustain or enable dynamic capabilities in firms?

(3) From the research findings, the role of structure on dynamic capabilities will be discussed which addresses the fourth research question, 4) Does structure constrain or enable dynamic capabilities in organizations?

(4) The ten outcomes in the data structure of the Gioia methodology adopted in the methodology chapter will be central to discussions in (1) to (3).

7.1.1 OVERVIEW OF THE CHAPTER

Zollo and Winter's (2002) conceptual work on deliberate learning and the evolution of dynamic capabilities is one of the most influential papers (4th most cited) in dynamic capabilities scholarship (Peteraf et al., 2013). The work proposes that dynamic capabilities are shaped by three learning mechanisms which are (1) experience accumulation, (2) knowledge articulation, and (3) knowledge codification processes. At any point in time, firms engage in a combination of learning behaviours through semiautomatic accumulation of experience and by deliberate investments in knowledge articulation and codification efforts. It is significant that these descriptions bear a strong semblance to the activities that the research firm engaged in as shown in the findings chapter of the thesis.

Therefore, to enrich the discussions in this chapter, the narrative provided will infuse together Zollo and Winter's (2002) conceptual work and the microfoundations of dynamic capabilities framework outlined by Teece (2007) to empirically apply both theoretical works. By doing so, the thesis will integrate two of the dominant approaches in the dynamic capabilities literature, thereby addressing the main criticism of fragmentation in the dynamic capabilities literature.

The chapter has four sections as follows; Section one will discuss the drivers for sensing and shaping opportunities & threats, and the nature of the IT security industry. Section two will cover the chronological timeline of events at the firm. Section three will build on section two and present the conceptual model developed in this thesis. Section four concludes the discussions chapter and will evaluate how well the principal aims of this study have been fulfilled in addition to proposing contributions which arise from the work.

7.1.2 AN OVERVIEW OF THE THEORETICAL MODEL DEVELOPED

The conceptual model of multi-level nature of dynamic capabilities developed in this work as shown in figure 17 demonstrates the multi-level nature of dynamic capabilities in the IT security industry as firms engage in capability renewal and reconfiguration. It describes firm's ability to sense and seize opportunities, and reconfigure tangible and intangible assets, alongside the learning mechanisms of experience accumulation, knowledge articulation and knowledge codification engaged in, and the challenges encountered along the way. The model was built upon extant theory and constructs that emerged inductively in the research. It is briefly introduced here to preview and help structure the findings represented in the model.

The model draws upon two dominant theories of dynamic capabilities; On the model the diagram on the right-hand side represents Zollo and Winter's (2002) deliberate learning and the evolution of dynamic capabilities while on the left-hand side is Teece's (2007) microfoundations of dynamic

capabilities represented across three levels of macro, meso and micro to elucidate how sensing, seizing and reconfiguring manifests at each level. Macro, meso and micro levels are the levels of analysis of the research. Macro level is broadly represented with the term, Industry. Industry covers industry factors, market competition, government, regulators, and other institutional factors and patterns of interactions at macro level. Meso level is denoted by the Firm and Groups and this includes the organisation, top management team, functions, project teams, and all organisational group interactions. Micro level is denoted by Individual and refers to individual actors in organisation. The unit of analysis at the macro level is extra-organisational aggregate actor, at meso level is aggregate actor within organisation, and at micro level is individual actor within organisation. The description of multi-level analysis is consistent with that presented in existing literature (Jarzabkowski and Spee, 2009; Devinney, 2013).

The model suggests that; the macro level sensing of opportunity is in the form of external dynamism and client opportunities, seizing opportunities to shape external dynamism and client opportunities, and reconfiguring/renewing capabilities to match external dynamism and client opportunities. The meso level sensing of opportunities is with regards to external dynamism and client opportunities, seizing opportunities by selecting the business strategy/model and implementation, and reconfiguring capabilities due to strategic organisational learning, and knowledge transfer. At the micro level, sensing opportunities takes the form of external dynamism and client opportunities, seizing opportunities by implementing the business strategy/model, and reconfiguring artefacts and improvement through experience, and knowledge transfer. In addition, the ability to sense, seize and reconfigure emerge from an actor's accumulated experience and deliberate knowledge articulation and codification efforts which in turn shape one another. On the model the red colour denotes dynamic capabilities and blue shows the interaction between levels.

The main contribution of the model is that it explicates the multi-level nature of dynamic capabilities. By demonstrating how dynamic capabilities exhibits at different levels, it provides a platform for advancing theoretical understanding at all levels and to articulate practical managerial interventions to directly enhance specific abilities of sensing, seizing and reconfiguring at levels to achieve superior outcomes. The chapter will explain how the model was constructed from the research findings that emerged inductively and are consistent with extant theory.

SECTION ONE: DRIVERS FOR SENSING AND SHAPING OPPORTUNITIES &THREATS

7.2 THE NATURE OF THE INFORMATION TECHNOLOGY SECURITY INDUSTRY

INTRODUCTION

There is general consensus in the literature that firms require dynamic capabilities to adapt to changes in the environment that include technological, competition, regulatory, and market or customer needs. However, there remains a debate about the nature of change in environments that would require dynamic capabilities with the two most prominent scholars in the field disagreeing on this. Teece et al. (1997) defines dynamic capabilities as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece et al., 1997: 516). Eisenhardt and Martin (2000) on the other hand suggest that dynamic capabilities exist in two market types; in high-velocity markets where changes are non-linear and less predictable and dynamic capabilities involves rapidly creating situation-specific new knowledge, and in moderately dynamic markets or relatively stable environments in which changes happen frequently but follow predictable linear paths with dynamic capabilities heavily reliant on a firm's existing knowledge, where designs of processes and activities typically follows a problem-solving approach. Teece et al. (1997) and many other scholars do not share this view that dynamic capabilities are relevant in relatively stable environments and this remains a source of contradiction in the dynamic capabilities literature. One way of addressing this contradiction is to empirically investigate the nature of change in certain contexts, what the changes lead to (that is, the outcomes caused by changes) and how firms respond to the changes (that is, whether they exhibit dynamic capabilities). In other words, by investigating whether an environment is stable or dynamic, and applying and exploring the microfoundations of dynamic capabilities framework (Teece, 2007) to that environment, we can ascertain if dynamic capabilities are relevant to that environment (be it found to be stable or dynamic). In addition, this endeavour supports the microfoundational thinking which calls for research in dynamic capabilities within firm/industry specific contexts due to the fact that dynamic capabilities are context- specific and path-dependent which are shaped by the nature of environment in that context. This section will discuss the nature of the IT security environment.

7.2.1 ENVIRONMENTAL DYNAMISM

The nature of the IT security environment is one of environmental dynamism. According to the firm's senior management, it is dynamic in terms of the changing nature of competition and the rate at which knowledge evolves. There are many IT security firms operating in the marketplace which makes it competitive, therefore firms have to keep on top of technological and industry knowledge to remain business relevant and be competitive. In recent years, IT has become commoditised and the pace of change/introduction of new technology has slowed down, however fundamental new developments in IT such as the cloud and cyber are presenting new challenges and opportunities for the IT security industry. Teece (2007) argues that being able to identify such structural evolution of industries and markets (what is termed here, environmental dynamism) allows a firm to sense opportunities and threats. This is because opportunities get identified by firms from two factors. First, firms can have differential access to existing information (Kirzner, 1973) and second, new information and knowledge (both exogenous and endogenous) can create opportunities (Schumpeter, 1934). A lack of ability to access to update knowledge and information means a firm may not identify opportunities which can even leave a firm disadvantaged, thus pose a threat to the firm. Director B shared this view with respect to the IT security industry *(see 2D1 in Appendix two).* It was evident that environmental dynamism in the IT security industry creates opportunities and threats to firms.

This importance of sensing new knowledge exogenous to a firm in the IT security industry aligns with the statement by Teece (2007: 1325) where he argued that, "Indeed, much of the information gathered and communicated inside the enterprise has minimal decision relevance. Even if relevant, it often arrives too late. Management must find methods and procedures to peer through the fog of uncertainty and gain insight". This involves gathering and filtering technological, market, and competitive information from both inside and outside the enterprise, making sense of it, and figuring out implications for action. One such implication is being able to recognise opportunities to exploit. A number of methods and procedures adopted by the firm to gain knowledge and insights and sense opportunities will be discussed in the section on knowledge dynamism.

7.2.2 INDUSTRY CHALLENGES

The nature of change in the IT security environment leads to both opportunities and challenges. Shortage of skills is a major challenge in the industry. One of the reasons for the skills shortage is that there are individuals who possess the required skills but do not have formal qualifications and the industry chooses not to employ individuals without qualifications. It is therefore argued that the industry requires a paradigm shift in their views regarding talent and skills-set and begin to recognise that people do not certainly need formal qualifications or a 'security badge' as it is

called, to perform IT security. It is the responsibility of actors in the IT security especially leaders to promote this argument and create the narrative needed for change. To address the general skills shortage, firms working alongside industry bodies, governments, universities and other stakeholders should invest in skills training and create the incentives to attract more professionals to the industry to increase the supply of talent. In addition, it is vital that IT security firms adopt appropriate resourcing/recruitment structures and processes that allow them to recruit and retain these scarce IT security talents.

Also, regulation often fails to keep pace with change in the industry such that regulation currently in place may not address today's IT security risks which create a problem for firms. Firms that merely comply with regulation may be vulnerable to IT security risks that exist. Major organizations and institutions often face multiple regulatory and business pressures such as severe reputational damage caused by IT security breaches, therefore these organizations are often up to speed with developments in the industry and the changing threat horizon, thus giving priority to implementing security solutions to keep safe. IT security firms can keep abreast with environmental and knowledge dynamism by latching on to these organizations through business working relationships or informal engagements with actors.

Furthermore, another challenge facing the industry is an ability to 'sell security' to business leaders and deliver security or what is termed, *connecting with a macro level discourse and delivery of solutions*. The ability to connect with and speak the business language with an organization's decision makers can be gained through practical experience and storytelling narratives to sell the security story. Also, experience, training and project management skills can improve security project delivery.

7.2.3 KNOWLEDGE DYNAMISM

As the environment experiences dynamism so also does the knowledge in the industry and engaging and interacting with external entities allows firms to acquire new knowledge needed to sense and shape opportunities and threats. Teece (2007) states that there are constraints on the rules by which competitive forces play out in an industry and these constraints are imposed by regulators, standard-setting bodies, laws, social mores, business ethics and being knowledgeable can create opportunities for firms. This is evident in the IT security industry where actors meet with the regulators to absorb information which can be a source of competitive advantage but also to 'set the bar' that shapes the industry and opportunities. In addition, the best way of acquiring new knowledge in the IT security industry is through intuitively working with actors in major, significant organizations. It is important to note that as sales director, C was often based at client organizations working with senior management and to 'get a foot in' to understand the

client's problems to seek to win business for the firm. His role is therefore very much outward-facing and he highlights the positives of working and learning from client organizations. Director A on the other hand is largely inward-facing, acts as the CEO of the firm and is usually located at the firm. One of the findings of this research is that he is very questioning in discussions and meetings, often plays the role of devil's advocate, quick to points out the negatives and internal challenges of the firm and highlights areas for improvement. For example, on the matter of gaining knowledge from client organizations, he stresses deficiency of the firm in using the external knowledge intuitively brought back into the firm as seen in (6P2) in appendix two. It is evident that the nature of the different roles the directors take at the firm contributes something different to the top management team. This view is supported by the literature on top management team diversity (Helfat and Peteraf, 2015; Heavey and Simsek, 2015).

Importantly, not only the Directors but other actors at all levels of the firm including project managers, analysts and SMEs that work at client organisations help to sense opportunities. The business development manager made this point when she commented as seen in (6a) in appendix three. In addition, staff working on client projects bring learning and new knowledge into the firm. For example, in an observation during a knowledge sharing session at the firm, the management team sought to exploit the knowledge of employees working at Lloyds bank who are experts in the DPL space, in order to develop new information asset protection offerings for the firm. Actors bring in new knowledge and experiences as Director B stated,

"Our guys [staff] also have worked out there they've got their own experiences. Their opinions and knowledge is valuable to us but we are not using that enough" (7V1)

Director B agrees with Director A that the firm is not doing enough to exploit employee's knowledge – there is a common theme that there is a gap in the firm's knowledge management framework in how they harness and exploit knowledge. One of the ways in which the firm has tried to address this is by introducing knowledge sharing sessions some of which the researcher attended. Also, having an organizational culture of open communication and open channels between employees and with the top management team promotes sharing of opinions and knowledge. New staff recruited to the firm also bring in new dimensions that helps to improve the firm's artefacts. The consulting industry usually has a fast rate of staff churn as people are often recruited on fixed contracts for project durations and leave firms at the end. On the flip side, the fast rate of staff churn means that firms can benefit from a wide range of new opinions and knowledge that a stream of new employees bring with them. In terms of recruitment, actively seeking to recruit a diverse range of people with skills set that adds/brings something new to the team or firm is a vital source of new knowledge.

There are other forms of external engagements that impact on ability to sense and shape opportunities. External events and workshops have a useful source of knowledge as people are very revealing about their experience and situations which provides good case narratives about successes and failures. Director C stated,

*"I more than anybody will go to events and workshops just to hear conversations going on … It could be through presentations or could be in conversations. People are very revealing about their experiences and vendors are very open about situations and incidents and **that gives very healthy war stories**" (7S1)*

The IT security industry pride itself with narratives about battles and wars in terms of protecting against information security breaches and defeating enemies, for example hackers who seek to compromise information security or data theft. It is common therefore to tell stories about incidents of success and failure or good and bad practices, this is used to give credibility to actor's expertise and the solutions they present. Director C, in that statement highlighted that he, more than any of the other directors goes to events and workshops. This again highlights the outward nature of his role and perhaps his personality trait associated with a sales person who 'gets out of the office' more.

However, employees at all organizational levels have the potential to attend external events such as workshops, conferences and vendor shows to get information and hear stories, for example about security threats and incidents. Storytelling is particularly useful when using artefacts by actors – it brings artefacts to life. Firms should have company policies, incentive systems, a learning culture, professional development and mentoring schemes to nudge employees to engage in external events as a source of new knowledge, to build networks and professional growth.

Social media especially Twitter, has become a valuable source of knowledge and information about the industry. There appears to be a shift from traditional sources of information. About 7-10 years ago, when the researcher worked as an IT security professional, professional magazines and websites such as SC Magazine, zdnet and Isaca websites were among the main sources to keep up to date with industry knowledge and they often required professional member associations and paid subscriptions. Today, information is social media driven, for example on twitter which is readily available and free. This means that actors at all levels can get this information and sense knowledge dynamism in this regard. Again, firm's managing this activity and encouraging employees to engage with social media from a professional point of view could be valuable.

It is evident that there are benefits to harnessing knowledge and knowledge management to firms, however the priority given to knowledge management is partly driven by client demand.

The tacit knowledge within a relatively small firm of its size could currently meet its client's knowledge demand but the firm would need to improve its knowledge management approach as it grows its client base. During the period of the research project, the firm's decision to improve its knowledge management to aid its replication efforts has made it possible to grow the firm.

7.2.4 EXPLOITING KNOWLEDGE AND EXPERIENCES

It has been discussed that harnessing knowledge and experience is important and how firms exploit that can be immensely valuable. For example, consulting experience and storytelling of success gives credibility and competitive advantage which helps to win business. Actors in the IT security industry take pride in presenting the narrative of a battle-field environment between the 'good guys' and 'bad guys' and being able to say, 'I have been there, done that and won' through practical fighting in the battle field. This differentiates actors and gives much credibility and trust to client that, 'I can protect your organization from harm.' At senior management level, such storytelling coupled with experience as consultants who have 'owned the obligation to protect organizations' helps the firm to win business because it allows the firm to compete with major consultancy firms. By successfully delivering projects the firm gains even more credibility and that also provides more stories of success which creates a snowball effect which helps to win and retain clients. It would therefore be in firm's interest to aspire for high performance to maintain success, credibility and to protect their business reputation.

As with experience, knowledge is exploited by the firm to its advantage in rather skilfully different ways especially among the top management team. Therefore, there is a need for the directors to have a shared common understanding of some core knowledge so that it can be used for different purposes. Director B who is very technically minded often shares knowledge with the other two directors who go off and use it in sales pitches to clients to win business. He comments,

"So, the process we are going through is a good process. Particularly A [director A] is very organised and focused on, let's get that stuff on the table so not only I can understand it, A will be able to understand it" (12AD2)

It is interesting to note that Director B credits Director A with instigating and articulating the knowledge sharing process between the directors. Again, that is evidence of the strength of Director A's personality as an organiser with a logical thought process. The technical strength of Director B, sales capabilities of Director C and management ability of Director A seem to complement one another and allows the top management team to leverage their individual knowledge and expertise. This makes it possible for the directors to have flexibility and interchange technical or sales roles as they all do a bit of everything even though they de-facto a place. It is argued that this transactive memory system of expertise, credibility and coordination within the top management team is an asset to the firm.

7.2.5 KNOWLEDGE TRANSFER IN TOP MANAGEMENT TEAM TO EXPLOIT KNOWLEDGE

The knowledge transfer within the TMT is not without challenges. A difficulty in transferring knowledge between actors is due to different levels of individual cognition as there is evidence of different 'managerial cognitive capability' amongst the directors. Whilst this can be expected, the challenge would be how to facilitate effective knowledge transfer which is necessary because each director requires that knowledge to individually 'dance' with clients – that is, the activity/meetings where the director works with clients in a common fashion to unpick their problems and the solutions needed. Director A noted, '*So, what we have to work out is how to slow the speed down to make sure it all comes out in a coherent fashion.*'

Tension within the team is what is used or created by the directors to 'get the conversations' needed for effective knowledge transfer between them. In Rau's (2005) study of the socio-political relations among members of a TMT, the author demonstrated the positive moderating effects conflict and trust has on team performance. Director A, in explaining how effective knowledge transfer is gotten from Director B states, *'We have to push B [Director B] until he gets excited'*. It can therefore be argued that tension puts (positive) needed pressure (an expectation) on the *knowledge transferrer* to articulate or 'package' the tacit knowledge in a format that is understandable to the *knowledge receiver(s)*. While this cognitive process might be tedious and time-consuming, it is necessary for effective tacit knowledge transfer. Rau (2005) states that the positive impact of conflict or tension also relates to wider teams not just top management teams. This was evident across other groups at the firm. Common goals and values between actors have a moderating effect on tension and align that towards a positive outcome in knowledge sharing efforts.

The next section will discuss how the firm sensed and seized an opportunity to renew and reconfigure its capabilities based on the outcome of a Royal London client project. It will provide a narrative and timeline of events and actors involved in the processes and activities of the firm.

Summary and Contributions to the Conceptual Model

To root the concluding discussions of this section in extant theory, it draws mainly on Teece (2007) microfoundations of dynamic capabilities and Zollo and Winter (2002) theory of dynamic capabilities which emerge from the co-evolution of experience accumulation, knowledge articulation and knowledge codification. First, the section shed light on the nature of the IT security industry in relation to sensing opportunities. Second, in line alignment with Teece (2007) argument that management must find methods and procedures to peer through fog of uncertainty and gain insight, it identified external engagement with client organizations and regulators, participation at workshops, conferences and vendor events, social media platform

twitter, and internal knowledge sharing sessions as processes and activities to acquire knowledge to sense opportunities. Third, it provided an overview of the firm's top management team in relation to sensing opportunities as well as the benefits and challenges of knowledge transfer. There are several key insights from the discussions in this section;

- Sensing at the **macro level** shows that actors have the potential to (can) **sense knowledge of external dynamism and client opportunities** in the industry, especially through external engagements. The term, external dynamism is used to cover both knowledge dynamism and changing industry challenges discussed. Examples of industry challenges are, the IT security marketplace is becoming increasingly crowded and competitive, and the problem of skills shortages in the industry. External dynamism creates opportunities and threats to firms, for example the rate at which knowledge evolves means that firms need to be up to date with knowledge to remain business relevant and competitive.

- **Seizing opportunities at macro level** manifests in the opportunity **to shape external dynamism and exploit client opportunities**. Leaders have a strong role in shaping knowledge and perceptions in the industry by delivering the narrative for the IT security industry to employ skilled individuals without formal qualifications, to address skills shortages. Opportunity can also be seized to 'sell the security story' through a macro level discourse to business leaders needed to achieve 'buy-in' into the IT security agenda and related to that, to improve IT security project delivery to improve performance in the industry. There is also opportunity at the macro level to shape regulation in the industry through actively engaging with regulators.

- **Sensing external dynamism and client opportunities at meso level** is achieved in group interactions. Sharing of knowledge within the TMT allows that knowledge to be used in different purposes during sales proposition and technical solutions to win business from clients. Meetings across functional teams and project teams, for example Royal London project meetings enables the firm to sense knowledge dynamism and client opportunities to exploit.

- **Sensing external dynamism and client opportunities at micro level** is achieved by individual actors. By working at client organisations (e.g. Director C 'gets a foot in' at client organisations to gain knowledge of client's needs, and analysts working at Lloyds Bank Plc identify the potential for the firm to exploit opportunities in the DPL space) individual actors identify client opportunities that the firm can benefit from. Individuals working with significant client organisations sense knowledge dynamism in the industry since such organisations often keep up with IT security developments. Also, through

external engagements such as events and conferences, actors are informed of knowledge dynamism and challenges present in the industry.
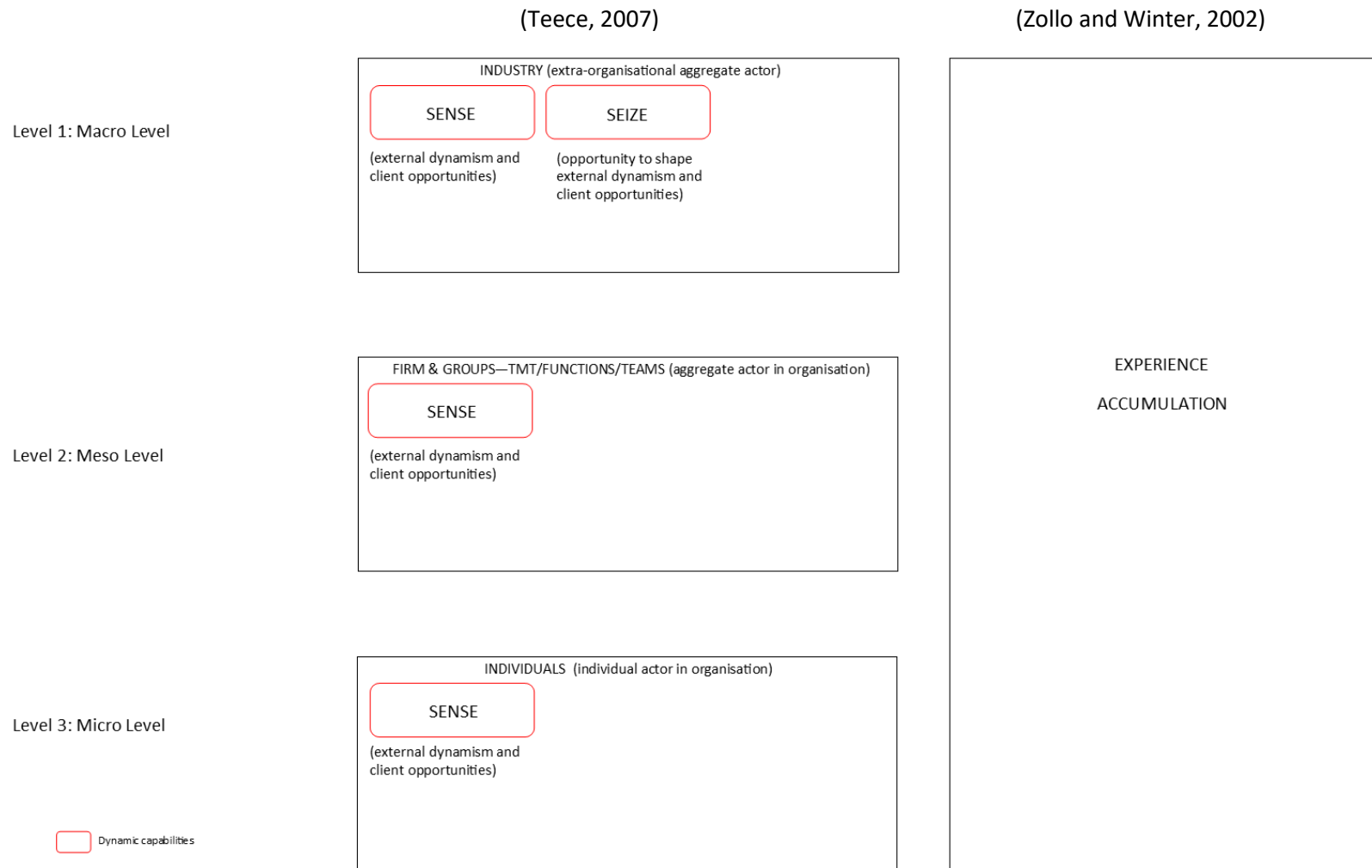
Teece (2007) microfoundations of dynamic capabilities framework indicate that, processes to tap exogenous developments as well as to identify changing customer needs, are aspects of sensing and shaping opportunities and threats. Importantly, this relates to the points summarised above, and thus demonstrates that the research contributions are supported by extant theory. In addition to that;

- **Experience accumulation** plays a vital role in how actors and teams exploit knowledge and experiences to sense and seize opportunities. For example, the top management team uses consulting experience to win business and credibility for technical propositions. Actors share tacit knowledge and experiences which are used for different purposes e.g. sales pitches, as well as knowledge about client opportunities which is exploited by the firm. Such knowledge and experiences continue to grow and evolve.

Zollo and Winter (2002) state that the learning mechanism of experience accumulation which emphasizes the importance of tacit knowledge, leads to the evolution of dynamic capabilities – this theory therefore supports the research contribution above.

These insights contribute to the first stage of the conceptual model which is populated with the key insights highlighted in bold as shown in figure 12. The next section will discuss how the firm sensed and seized an opportunity to renew and reconfigure its capabilities based on the outcome of a Royal London client project. It will provide a narrative of timeline of events between July 2015 to January 2016, including actors involved in the processes and activities at the firm.

Figure 12. STAGE ONE: BUILDING A CONCEPTUAL MODEL FOR THE MULTI-LEVEL MICROFOUNDATIONS OF DYNAMIC CAPABILITIES IN KNOWLEDGE-INTENSIVE DOMAINS (Adapted from the theoretical work in Explicating the Microfoundations of Dynamic Capabilities (Teece, 2007) and Deliberate Learning and the Evolution of Dynamic Capabilities (Zollo and Winter, 2002)

(Teece, 2007)   (Zollo and Winter, 2002)

Level 1: Macro Level

INDUSTRY (extra-organisational aggregate actor)

SENSE   SEIZE

(external dynamism and   (opportunity to shape
client opportunities)   external dynamism and
                              client opportunities)

Level 2: Meso Level

FIRM & GROUPS—TMT/FUNCTIONS/TEAMS (aggregate actor in organisation)

SENSE

(external dynamism and
client opportunities)

Level 3: Micro Level

INDIVIDUALS (individual actor in organisation)

SENSE

(external dynamism and
client opportunities)

Dynamic capabilities

EXPERIENCE

ACCUMULATION

SECTION TWO: CHRONOLOGICAL TIMELINE OF EVENTS AT THE FIRM

7.3 JULY 2015 TO JANUARY 2016 - SENSING AND SIEZING OPPORTUNITIES

This section will discuss how the firm sensed and seized the opportunity to renew and reconfigure its capabilities. It begins by providing an explanation for why the firm reconfigured its capabilities and capabilities framework as it sensed and seized an opportunity to do so. The narrative will seek to separate the firm's journey of sensing from that of seizing, however many aspects of the two will be intertwined. This is because, consistent with Teece's (2007) argument that in reality the two functions cannot be cleanly separated, and the activities are integrated inside a single enterprise (Teece, 2007: 1327), this was the case at the firm as seen in some of the integrated discussions in themes presented in the findings chapter. In the discussions here, priority is given to providing a clear narrative of how and why the firm engaged in capability renewal and reconfiguration rather than meticulously separating sensing and seizing activities.

7.3.1 REASONS FOR RECONFIGURATION

It is necessary to elucidate the reasons why firms align their capabilities to the environment and sometimes reconfigure the supporting capabilities framework as was the case for this company. In the findings chapter, it was discussed that in the IT security industry firm capabilities and framework are shaped by the changing industry as new industry standards such as NIST become leading the industry standards adopted by clients. More so, the alignment or mapping of the framework of the firm is necessary to support the firm's business strategy. Director B provided insights,

"The reason why we need to do that [mapping] perhaps with all the standards, we are trying to be more specific about, when somebody says do access recertification which is on this line item, should we check your access? **We actually go quite specific about the minimum thing you need to do is this and you should be doing that and that's a bonus** *… and* **the reason we do that is because what we are trying to do all in one go,** *is* **access the organization at that level so that we can tell them what they need to spend to fix it"** *(37CU1)*

There are two significant points here. By being specific about 'what needs to be done' in the artefacts allows actors to have the knowledge to perform the capability effectively and achieve tasks, related to *technical fitness*. It is important to mention that this statement was made by Director B who is the technically-minded director. The second point on 'we are trying to do all in one go… so that we can tell them [client] what they need to spend to fix it' is related to the firm's holistic approach which allows the firm to achieve its speed strategy. Speed is a differentiator for the firm and a source of competitive advantage which allows the firm to win business and earn

revenue (*evolutionary fitness*). Thus, the argument proposed here based on the insights is that technical fitness aligned with the appropriate business strategy i.e. speed in this case, could result to (enable) evolutionary fitness – this direct connection between technical fitness and evolutionary fitness is not as explicitly demonstrated in existing literature (Helfat et al., 2007; Teece, 2007).

Significantly, Director B (sales director) provides the client dimension arguably due to his sales-aligned mental cognition. Director B stated,

*"Ok, can I now give the client dimension. **If you can't map your proprietary framework which ours is, to something that the client is using, it's very difficult to sell**. So, we've seen clients decide to just fire their expenditure to align to international standards which have 15 or 16 families of things which we have as well but NIST has 50. **Therefore, you have to be able to sub-divide and map to go to those because** for us, as B [director B] says, **we want to accelerate through the first stage of assessing where you are currently at cuff the mark, where you need to be**" (37CV1)*

This therefore implies that to be sellable to generate revenue i.e. *evolutionary fitness*, the capability framework must align to the industry standards that clients adopt. Firms, especially those in knowledge-intensive industries, possess a portfolio of capabilities and solutions or services. Even though there might be a dominant industry standard in the industry or an emerging standard (e.g. NIST), it could well be the case that different clients will adopt different industry standards. Thus, the challenge and value for IT security firms providing solutions to different clients would be to break down (sub-divide) and align their solutions (capability framework) to map into the particular industry standard adopted by each client so that it is relevant and sellable to the client. **This ability to map efficiently is even more pertinent if you want to deliver solutions quickly or *accelerate through*, as is the speed strategy of this firm. Based on the insights shown here, the thesis posits that evolutionary fitness (mapping to generate income) incorporated with firm's strategy (speed strategy) is value enhancing. In addition, the fact that the two Directors are separately technically and client focused adds diversity and complimentary traits which is a strength of the firm's TMT.**

Furthermore, the literature review chapter highlighted that a bibliometric review of dynamic capabilities scholarship by Vogel and Guttel (2013) suggested that firms engage in strategic learning and change to improve firm performance. For example, the literature emphasized that the knowledge assets of firms are leveraged into human capital and organizational capabilities through learning mechanisms (Clougherty and Moliterno, 2010; Moustaghfir, 2009). This appears to resonate with the approach taken by the research firm. This is evident in a research observation of conversations between the directors presented below,

Director A. "We have updated our capabilities and offerings organically over time through learning and experience … we have done this, we see it works and we improve on it."

Director B. "It [capability renewal] is done in an ad-hoc way, there is no laid down procedure or process or periodic schedule which we implement to renew our offerings."

This illustrates that the firm renews its capabilities and offerings organically through learning and experiences and takes strategic decisions to enhance it to meet client or market demands.

In July 2015, after the firm completed the successful project work with Royal London Insurance company the senior management team decided that it was important to capture the positive experience of the project, therefore three meetings were organised with members of the project team. The meetings were held in August, September and November 2015. The researcher was invited and attended the meetings in August and November, but the meeting in September involved individuals from the client organization and for client confidentiality reasons, the researcher was not permitted to attend. During the August meeting, Director A spoke to the group,

"This is the most successful piece of work the company has done. How can the business leverage this success/learnings/experience and identify areas for improvement?"

Discussions that followed during the meeting focused on how the firm could leverage the collective power i.e. knowledge and experiences of the project. (These discussions were noted by the researcher in Observation data 2a-c). There were also discussions about how the firm could reuse the company's toolset used for the Royal London project and to create more similar project teams. Speaking metaphorically, Director A commented,

"How can we change the chefs but use the same ingredients and recipes and reproduce the same meals?"

This would suggest that the director (research later revealed that it was the entire management team) was thinking about engaging in replication of routines *(recipes)* by different actors *(chefs)* using artefacts *(ingredients)*. In response to the question, Gerry (SME) and Mike (project manager) spoke about their experience using the company's toolset i.e. artefacts during the Royal London project. These notes were captured by the researcher,

Gerry. "The gap analysis tool used for the project was that used for Sainsburys Bank which was bespoken and had to be tweaked a lot. It was not generic and not ready to use."

It was agreed at the meeting that a half-baked toolset will be created. That way users will need to plan ahead perhaps a month before it needed to be used so that they can do the tweaking before the gap analysis is done on projects.

Mike. "The project was not a project off-the-shelf so we lost our way. You can customise a toolset for a client but you have to continuously customise it."

First, what this demonstrated is that the company possess toolsets or artefacts which are routinely used for projects. Second, it highlighted some of the challenges of using and adapting generic artefacts during replication across different client organizations. A later part of the

discussions chapter will cover the challenges of knowledge codification and use of artefacts. It is important to point out here that the interactions that took place provides evidence that the directors had taken the decision to, or at the very least were contemplating the decision to engage the firm in knowledge codification for replication (i.e. strategic decision on replication). This appeared to be the genesis/trigger behind the second phase of the firm's strategic journey which was the Re-development of capabilities and knowledge articulation & codification from November 2015 to April 2016. Even though the decision had been taken by the directors to review the firm's strategy and to reconfigure its capabilities based on the specific successes of Royal London project, just prior to the researcher joining the firm in August 2015, the directors provided a rationale behind the decision in subsequent interviews with the researcher. In interviews conducted in April 2016 by the researcher to elucidate an explanation for the decision to reconfigure the firm's capabilities, the directors individually stated,

*Director A. "**We were subject to natural evolution** … So, as we spent more time thinking about what we were offering as services, it forced us to sharpen our thinking and reconfigure our offering" (18AS1)*

*Director C. "**A [Pointing to firm's old capability framework diagram] had a bit of complexity** and it was difficult to consistently articulate the difference between one stage of the process and the next and one aspect of the offering and the other, and **we reckoned that we could rationalise the number of things and it would be a clearer articulation of our offerings** to the client" (18AT1)*

*Director B. "**We evolved it [capability framework]. The top part of it was confusing to us and to our clients**. So, I think the big journey is what's underneath that in terms of the control framework in trying to make that more effective but also make it understandable** and we've definitely challenged ourselves and we're still wrestling with it to make it even better" (18AT2)*

Similarly, during a researcher observation at the director's meeting in April 2016, Director B said,

*Director B. "Over the last two years, our offerings have changed very little organically but **over the past six months we have thought in a more critical and structured way to upgrade our capabilities and offerings**." (6c)*

By highlighting some aspects of the texts which are in bold, what is evident is that the firm engaged in the process of natural evolution and learning to reduce the complexity of the capability framework and improve its articulation and effectiveness in the form of a new capabilities framework. This is a form of strategic learning and change to improve firm performance discussed in the dynamic capabilities literature (Vogel and Guttel, 2013) and supported here by empirical findings. It is significant to note that sensing the opportunity for capability reconfiguration was achieved by the top management team as a result of accumulated experience and natural evolution of the firm.

Alongside strategic learning and change of the capability framework, was a deliberate strategic decision of the directors to pursue knowledge codification and replication for the firm. The

directors explained how the reconfigured (well-articulated and consistent) capability framework supports the replication as a growth strategy. The codification and consistent framework has made it possible to scale the business by bringing new people in to perform replication even though at this stage the firm was still wrestling with some of the challenges involved. It is highlighted here that the strategic decision to seize opportunities by investing in knowledge codification was taken by the top management team.

In August 2015, in addition to the decision to reconfigure the firm's capabilities, the directors contemplated the idea of developing a service called Cyber Plus into the firm's portfolio of offerings, thus enhancing its capabilities. Since October 2014 Cyber Essential has been mandatory for suppliers of UK Government contracts which involve handling personal information and providing some ICT products and services. Having a Cyber Essentials badge enables a company to bid for these government contracts (cyberaware.gov.uk). Cyber Plus builds on Cyber Essentials and it helps Board of Directors and senior business leaders by adding a vital plus to their existing information and cyber security needed to evaluate the integrity of their organizations' cyber strategy to protect against reputational and operational risk (cyberplus.co.uk). During a researcher observation at top management team meeting in August 2015, the three directors deliberated on whether to develop Cyber Plus. Deliberations focused on; Should the firm adopt Cyber Plus next year because the government talks about it? Will their clients want the service and what will be the cost to the firm to build Cyber Plus offering?

Interestingly, Director B appeared to have more knowledge about the technical details of Cyber plus and explained the main differences between 'plus' and Cyber Essentials to the other directors. All three directors asked relevant questions about the implications of Cyber Plus to the firm. However, Director C appeared to focus most of his questioning from the client dimension and provided insights about the firm's clients he believed might need the Cyber Plus service – Legal & General and Worldpay. The final decision from the discussions was made by Director A and he requested that Director B produced an action plan on the implications which he will provide at a top management team meeting the following week. What was evident from the interaction at this meeting was, Director B appeared to be the most technically knowledgeable Director (at least on the issue at hand). Director C was more client-savvy and Director A held most sway in the administration of the company. It also gives credence to the de-facto roles the directors said they occupied. Significantly, it can be argued that the Directors contribute complementary strengths to the decision making at the firm which is an important element of the microfoundations of dynamic capabilities. Also significant is the fact that the decision to seize opportunities to renew the firm's capability was taken by the top management team.

7.3.2 THE PROCESS OF CAPABILITY RENEWAL

By end of November 2015, the firm had completed the development of the Cyber Plus offering and the service was at the testing stage at the firm. It took roughly four months (from August to November 2015) to develop the service and the individuals who participated in the development were; Director B who was the Lead SME (subject matter expert), 1 senior SME, 1 junior SME and 2 newly recruited SMEs that were recruited by the firm to help deliver the service. The breakdown of individuals shows that actors at all levels of the organization were involved in developing the Cyber Plus offering during the process of capability renewal.

At a management team meeting in August 2016, the researcher made observations on the discussions between the directors about the offering *(Observation data 4a,b in appendix three)*. The notes show that even though the decision had been taken to develop the service by the directors, there appeared to still exist the dilemma about whether clients would demand the service. That is, the ability of the offering (and capability behind it) to entice market demand needed to generate economic rent or what Helfat et al. (2007) termed 'evolutionary fitness' – how well a capability enables a firm to make a living. According to Director B, it was incumbent on the firm as a niche security consultancy to have Cyber Plus among its offerings to protect its brand. He stated,

Director B argues, "This is a branding issue. As a niche consultancy, what we do is whatever the client wants. We should be doing it by default." (4b)

In other words, it would hurt the firm's brand or reputation in a hypothetical situation that they had to tell a client who demanded Cyber Plus, that the firm did not offer that service – in his opinion, as a niche consultancy, the firm should have *'in stock'* the full array or portfolio of technical solutions. Interestingly, if Director B's comment is taking together with another of his statements provided below, it reveals some insights about Director B's personality and approach,

Director B. "If everyone was like me, we will have all these complicated propositions but one or two of them will be effective" (13AG3)

It can be drawn out that his more technically inclined background (compared to the other two Directors) shapes his world view in that solutions (offerings) and propositions need to be detailed and comprehensive (sometimes even leading to complications). Therefore, it seems reasonable to argue that his personality trait is naturally biased towards a focus on how effectively a capability (or aggregate of offerings) performs its function i.e. technical fitness perhaps without due regard for evolutionary fitness. It is very interesting to analyse Director C's response to Director's B earlier comment on Cyber Plus.

Director C quizzes. "Does the client want to just comply with regulation and regulation is always behind or do they want to be secure and be at the forefront of new technology and threats? We should drive this for the client."

The first part of the statement sounds very much like one that would be made to a client, a sales pitch. It provides argument for why a client should buy Cyber Plus. He goes on to say that the firm should be driving this argument to clients. It would be reasonable to draw out that Director B's thought process is from a perspective of how the value proposition of Cyber Plus can be sold to clients to enable the firm earn revenue from it i.e. evolutionary fitness. This would resonate with Director C's personality trait and cognition of an individual that assumes the role of sales director of the firm. More so, in that meeting Director A queried on the practical, operational workability of the offering and appeared to offer a more holistic, bigger perspective on issues. Director A's traits would fit with the expectations of his role as CEO of the company and his overall managerial experience and responsibilities. These individual traits exhibited by the directors would suggest effects of prior experience and path dependency. The dynamic capabilities literature and the wider strategic management literature consistently informs of the shaping effects of paths and positions on both organizational behaviour and managerial cognition (Zollo and Winter, 2002; Teece et al, 1997; Lavie, 2006). For example, Ericsson and Lehman (1996) provide evidence to show that the performance of various mental activities depends on prior experience in the particular domains (for example, reasoning in medical diagnosis) and these differences in the context in which practice and training takes place are likely to contribute to heterogeneity of cognitive capabilities as well. It is evident that from several of the research findings that the directors contributed complementary heterogeneous cognitive capabilities to the top management team due to their individual traits, experience and roles they perform at the firm.

In a study of transactive memory systems and firm performance in top management teams, Heavey and Simsek (2015) argue that TMTs can display a range of dysfunctions, for example functional turf wars, especially in smaller firms where individuals in TMTs may not have clearly defined roles and may share responsibilities. The evidence at the firm is not consistent with this argument, at least in the context of this firm. Even though the directors have de-facto roles or places, they share roles and functions as 'they do a bit of everything' for example, they individually 'dance' with clients. Rather than the presence of turf wars, the team exhibits 'positive tension' or conflict and consensus which enhances decision making and prevents decision errors which helps to purge bias. One reason for the absence of dysfunction between the directors could be a long history of working together for over twenty years which enables them to recognise and exploit each other's individual traits and complementary strengths which they contribute to the team. The research finding is littered with evidence of this fact.

On the evidence of this finding, this thesis contributes to the literature on transactive memory in TMTs by suggesting that history of working together helps to build credibility or trust on expertise and coordination among top management teams. Indeed, Heavey and Simsek (2015) conclude

that there is ample scope to further explore the productive (e.g., cognitive division of labour), unproductive (e.g., excessive reliance on others), and the destructive (e.g., baggage memory) transactive memory in TMTs. It is argued that this research has explored the productive cognitive division of labour in a TMT in some respects.

7.3.3 CONFLICT AND CONSENSUS ENHANCE DECISION MAKING

In addition to long history of working relationships, there are other features within a TMT that promotes transitive memory system within that group. The research findings suggest that conflict and consensus is a significant theme at the firm which helps to improve decision making and prevent decision errors. Allowing time (be it hours, weeks or even months) for deliberations allows actors to reconsider their positions and recognise and accept stronger arguments which leads to consensus and overall better decision making. Up and above that, shared common goals help to align actors towards achieving consensus and eliminate any destructive tension. Therefore, it can be said that having shared values and an organization culture that promotes a 'space' for healthy disagreements to avoid decision errors but ultimately to arrive at a consensus for progress is vital. This is consistent with literature on avoiding decision errors, values and culture as elements of microfoundations for seizing opportunities (Teece, 2007). The right balance between conflict and consensus is important. Teece (2007) states that competitive advantage can be gained by firms that adopt techniques to overcome decision biases and errors (Teece, 2007: 1333). It can be argued that the firm may have some advantage in this area.

Summary and Contributions to the Conceptual Model

To root the concluding discussions in this section in extant theory, it draws mainly on Teece (2007) microfoundations of dynamic capabilities and Zollo and Winter (2002) theory of dynamic capabilities which emerge from the co-evolution of experience accumulation, knowledge articulation and knowledge codification. It concludes the timeline for sensing and seizing opportunities at the firm based on the outcome of the Royal London project. There are several key insights from the discussions in this section;

- The sensing of the opportunity to capture the experiences of the Royal London project was achieved by the TMT – this reinforces **sensing of opportunity at meso level** achieved in stage one of the conceptual model
- Selecting the new business strategy of replication to exploit the captured experiences was done by the TMT – therefore, **seize opportunity** achieved through **selecting the business strategy/model occurred at meso level**

- Reconfiguration and renewal of firm capabilities was done to match changing industry standards and client needs – therefore, **reconfigure/renew capabilities to match external dynamism and client opportunities at macro level**

- Reconfiguration of capabilities at firm level was as a result of firm's natural evolution of strategic organisational learning and change (this view is emphasized in extant literature, Vogel and Guttel, 2013) – therefore, **reconfigure capabilities occurred at meso level**

- The strategic decision to **seize opportunity** to invest in knowledge codification as well as invest in renewal of the firm's capabilities was taken by TMT – **meso level**

- Actors at all organizational levels were involved in the process of capability renewal

- Balance of healthy conflict and consensus enhances decision making at all organizational levels. This is most vital at TMT level where poor strategic decisions can have detrimental effects on the entire organization

Importantly, Teece (2007) microfoundations of dynamic capabilities framework indicates that selecting firm's business strategy and model, and realignment (reconfiguration) of intangible assets (capabilities) are elements of the framework. This demonstrates the contributions of the research provided above are supported by extant theory. In addition, the sense-seize-reconfigure built up at the meso level at stage two of the conceptual model, is representative of Teece (2007) and Helfat and Peteraf (2015) depiction of microfoundations of dynamic capabilities as shown earlier in figure 2 in chapter four of this thesis. This demonstrates that the conceptual model is consistent with extant theory.

These key insights contribute to the second stage of the conceptual model built as in figure 13. The model is populated with the key insights highlighted in bold which add to the insights from stage one, as the model is being built up. The next section will discuss the reformation and implementation of the firm's business strategy. It will provide a narrative of timeline of events between August 2015 to October 2016, including actors involved in the processes and activities at the firm.

Figure 13. STAGE TWO: BUILDING A CONCEPTUAL MODEL FOR THE MULTI-LEVEL MICROFOUNDATIONS OF DYNAMIC CAPABILITIES IN KNOWLEDGE-INTENSIVE DOMAINS (Adapted from the theoretical work in Explicating the Microfoundations of Dynamic Capabilities (Teece, 2007) and Deliberate Learning and the Evolution of Dynamic Capabilities (Zollo and Winter, 2002)

(Teece, 2007)   (Zollo and Winter, 2002)

Level 1: Macro Level

INDUSTRY (extra-organisational aggregate actor)

SENSE	SEIZE	RECONFIGURE
(external dynamism and client opportunities)	(opportunity to shape external dynamism and client opportunities)	(reconfigure/renew capabilities to match external dynamism and client opportunities)

Level 2: Meso Level

FIRM & GROUPS—TMT/FUNCTIONS/TEAMS (aggregate actor in organisation)

SENSE	SEIZE	RECONFIGURE
(external dynamism and client opportunities)	(selecting the business strategy & model)	(reconfiguring capabilities due to strategic organisational learning)

Level 3: Micro Level

INDIVIDUALS (individual actor in organisation)

SENSE

(external dynamism and client opportunities)

□ Dynamic capabilities

EXPERIENCE

ACCUMULATION

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7.4 AUGUST 2015 TO OCTOBER 2016 - REFORMATION AND IMPLEMENTATION OF FIRM BUSINESS STRATEGY

Business strategies and models are plans for the organizational and financial architecture of a business which articulates how the firm would earn a profit from its solutions and capabilities. For example, Chesbrough and Rosenbloom (2002) summarise the essence of a business model when they state that the function of a business model is to articulate the value proposition, select the appropriate technologies and features, identify target market segments, define the structure of the value chain, and estimate the cost structure and profit potential. Similarly, the microfoundations of dynamic capabilities literature recognises these functions as core components of elements for seizing opportunities – i.e. delineating the customer solutions and the business model, selecting the technology and product architecture, and designing mechanisms to capture value (Teece, 2007). Teece, (2007: 1330) goes on to argue that 'selecting adjusting, and/or improving the business model is a complex art and often involves investment priorities'. The research firm, like every firm, has its existing business model and strategies. The journey the firm went on to reform and implement its business strategy during the research project provided an opportunity to unpack the complexities of why and how this is achieved. This section will first discuss the firm's strategy already in place and go on to discuss new aspect of its business strategy and the rationale, processes and implementation.

The directors of the firm started to evaluate its business strategy in August 2015 and the implementation of this process was an ongoing activity which covered the timeline, August 2015 to October 2016 period. Even though the activity of selecting the business model and strategy is situated within the microfoundations of dynamic capabilities framework for seizing opportunities, its implementation overlaps across the functions of sensing and seizing opportunities, and reconfiguring assets in a firm.

7.4.1 ORGANIZATIONAL STRATEGY

As with any marketplace, firms in the IT security industry pursue different strategies for revenue and the research firm adopts a cost-leadership strategy. In fact, one of the firm's marketing slogan is 'we attract a rate card to be materially cheaper than the Big Four consultancy firms' which are its main competitors. The 'rate card' refers to the rate that IT security consultancy firms charge client for each day for the duration of a project. This simply means that the firm could complete a similar project in fewer days compared to the Big Four, thus the client pays less for the project.

By taking a fast, holistic approach to projects, the firm is able to deliver projects faster hence cheaper than the competitors, and this also ties into a second element of its business strategy

which uses speed as a differentiator for the firm. Employees have questioned the cost-leadership strategy of the firm as Katy (an SME) quizzed in (9a) seen in appendix three. In response, the directors argue that the benefit of being cheaper than competitors is that the strategy helps to win repeat business from clients, which is vital because the firm does not employ a dedicated sales team that can go out to consistently win new clients. More so, the firm can afford to be cheaper (and earn less profits) as a privately-owned company since they do not have massive shareholders or sales targets like the Big Four consultancy firms. This advantage private companies have over publicly listed companies is widely stated in business and management literature (Amit and Schoemaker, 1993). It can be argued that the holistic approach which results to faster (cheaper) projects is a direct consequence of the firm's complementary speed strategy.

The speed strategy is a key differentiator for the firm in the industry. In research interactions with the TMT during the research project, the Directors were very quick to point out the differentiating factor of speed in conversations and the findings chapter is littered with evidence of this. However, the firm began to question the merit of its speed strategy. By September 2015, in the process of re-evaluating its business strategy, the Directors where facing a serious dilemma about whether to maintain its speed strategy or change strategy to a long project duration to increase billing revenue as competitors do. Director C commented,

"Therefore, the reason we might be naïve is, we should maybe be designing more into our offering that keeps us around in volume, billings, while they have a state of hiatus within the client, the way that our competitors do" (20BC1)

More so, it was pointed out earlier that the client does not always take advantage of the speed and is slow at decision making maintaining a state of hiatus such that the overall project length duration might not necessarily be quicker whilst the research firm will not be generating revenue by not being deployed at the client site during the period of hiatus. Why achieve a speed strategy then? Such tensions and complexities regarding strategic decision making is common to organizations and it is important that management teams get decisions right because that can shape not just current paths but also shape and restrict future paths of the organization, for example due to investments committed to.

In December 2015, the three Directors agreed to continue with the firm's speed strategy for a number of reasons. First, the decision to maintain speed strategy was to protect the firm's brand in the marketplace. Speed is a key differentiator for the firm and eliminating that would affect what it is known for in the eyes of clients - its brand. Second, speed is the means through which it achieves the firm's cost leadership strategy by accelerating through the client project stages of 'where they are' and 'where they need to be' in a holistic manner with shorter project durations and a cheaper rate card. Therefore, giving up speed strategy will negatively impact on its ability to maintain a cost leadership strategy which has it benefits as discussed earlier e.g. repeat custom.

Interestingly, this shows that the speed strategy and cost leadership strategy are interrelated and complimentary. Third, and linked to the second point, speed which is a cornerstone of its holistic approach in turn manifests as a sales strategy. Director B explained,

*"You've [the client] got that reducibility. We tell you the problem, we know how to fix it, this is the solution.' **It is the way we sell, we don't have salesmen**" (10a)*

Not investing in a dedicated sales team reduces the overall cost-base of the firm which means it can afford to charge cheaper than competitors (price competitive) which in turn supports its cost-leadership strategy. Giving up a speed strategy would be detrimental to its sales strategy and its cost leadership strategy. Again, it is interesting to note how the firm's business strategies are interrelated in reality - the speed, cost-leadership and sales strategies are complimentary to one another. The literature on cospecialization in dynamic capabilities states that cospecialization can be of one asset to another, or a strategy to structure, or of strategy to process (Teece, 2007: 1337). The argument advanced here in this thesis is that cospecialization could also be of strategy to strategy and could be a source of competitive advantage because the complexities of the interconnectedness and complementary nature of the strategies as shown in this case, makes it difficult for outsiders to discern and imitate. In addition, some elements of strategies are built and sustained over time (e.g. brand) creating path-dependent effects, thus are extremely difficult for competitors to create over a short period of time.

7.4.2 THE FIRM'S NEW STRATEGIES

Replication Strategy

In July 2015 following the success of the Royal London project, the top management team considered the idea of capturing the knowledge and experience of the Royal London project to build reusable methods and tools i.e. replication. The first real steps of putting this idea to fruition was the Royal London post-project meetings for actors which was organised from August to November 2015. In November 2015 after the second of those meetings to capture learnings and experiences, the three Directors took the decision to invest and commit to a replication strategy. In the past, the firm has always employed reusable processes and artefacts in an ad-hoc, less structured manner (as evident in discussions by employees during the Royal London project meetings in the observation data) but the new replication strategy was an expansive, formalised approach across the organization and driven by the TMT – it was a new journey. The main activities involved in the implementation of the replication strategy were the knowledge articulation, codification and knowledge transfer processes which are covered in great details in this chapter. Therefore, this section will present some of the benefits of the firm's replication strategy.

Replication has led to growth of the size of the firm from about 80 to 120 employees within a two-year period. Replication has been a deliberate growth strategy for the firm. Also, the skill-sets of employees have been increased during the mental processes of knowledge articulation and codification, and especially through the workshops and sessions organised for knowledge transfer. Employing new people to perform replication using the artefacts has increased the skills and talent pool in the firm since new staff bring in their own knowledge and experiences to the firm. In addition, investment in codification to create the artefacts has increased business confidence, reduced business risk and increased client satisfaction. The removal of dependency on the directors to perform certain tasks such as risk management and sharing that with other employees reduces risk to the business should the directors become unavailable for extended periods of time. The codified artefacts are used 'off the shelf' by actors to accelerate through projects (the use of artefacts is pitched to clients as part of the firm's speed strategy with the marketing slogan, 'sell as an accelerator') and they also have valuable intellectual property which are sold to clients as part of the firm's cospecialized assets strategy. Having tested, replicable methods and artefacts also reduce the business risk of project failure and client dissatisfaction which can negatively affect repeat custom.

Furthermore, the granular language in the artefacts helps actors to communicate in a common language which creates and promotes the firm's brand. The thesis has emphasized the importance of language as a differentiating factor as the firm 'has a different spin or take on language and sells that take' and this plays a significant part during storytelling by the firm.

Cospecialization of Assets

Arguably the biggest change to the firm's strategy during the period of research was the area of cospecialization. Traditionally, the firm sold its offerings (underpinned by its capabilities) and its people – clients purchase an offering/service from the capabilities framework and pay a rate card for the project staff employed to deliver the offering. In February 2016, the Directors took the strategic decision to move from that to a cospecialization strategy of selling its offerings, people and its artefacts. A strategy of cospecialization is more sustainable and revenue-enhancing for the firm by means of replication using artefacts and artefacts sale. In the past, the firm had always used artefacts when accomplishing tasks and had some appreciation of the value of these artefacts. However, a major turning point in the realization of the enormous value and potential of exploiting artefacts occurred in January 2016 when director B was presenting a newly codified artefact to a director at HSBC. The HSBC director said that the framework artefact was unique, and he would not give out that artefact for free as the firm was doing, as shown in (9c) in appendix three. Director B goes on to state that the HSBC director probably values that artefacts at ten thousand pounds. Following that incident and discussions amongst the Directors and the

success of the knowledge codification process at the firm, the decision was made to sell the artefacts along with offerings and staff augmentation. As a new strategy, the initial implementation has been to sell the artefacts at a discount price (but inform the client about the full price otherwise the client would not recognise the value of the artefact) with a plan to increase the price as the artefacts are improved further.

The concept of cospecialization in the strategy literature was introduced in Teece (1986) and Teece (2007) states that value-enhancing investments in the knowledge-based enterprise (e.g. IT security consultancy firms) are often cospecialised to each other creating complementary assets where the value of an asset is a function of its use with another particular asset i.e. joint use is value enhancing. The significant value in cospecialization is that it results in 'thin' markets, i.e. the assets in question are idiosyncratic and cannot be readily bought and sold in a market (Teece, 2007). Teece (2007) also states that the ability of management to identify needs and opportunities to invest in, develop and utilize cospecialized assets is an important dynamic capability but it is not always present or uniformly distributed in all firms.

This thesis argues that the 'trinity' of offerings/capabilities, artefacts and people is a cospecialised asset in the IT security industry. It goes on to posit that this form of cospecialization is applicable to knowledge-intensive domains or services-dominated industries (e.g. telecommunications, finance, insurance) where services or solutions can be captured into artefacts and are accomplished by skilled, knowledgeable actors. It is important for firms to possess a portfolio of capabilities that meet the needs of the market, that there is continuous alignment of capabilities (and accompanying capabilities framework) to the changing industry and industry standards, and that through organizational learning, capabilities are reconfigured and renewed for better articulation of the offering for ease of integrating new capabilities. People are arguably the most valuable arm of the 'trinity' of cospecialized assets because they are responsible for creating and deploying capabilities and artefacts – the other two arms would not exist without people and the reverse argument does not hold. The need for firms to have skilled, knowledgeable individuals is even more pertinent in the IT security industry where there is a shortage of skilled labour. In fact, the research firm argues that its people are a key differentiator and a source of competitive advantage for the firm. There are two key reasons why the firm is able to recruit and retain scarce talent in the industry. First, is the resourcing/recruitment process and model that is adopted at the firm. Second, is the leadership and expertise of the top management team in resourcing and recruitment activities. Good leadership also helps to build loyalty and commitment in employees which in turn leads to staff retention, thus helping to create an identity with the firm – this is relevant to 'speaking' the firm's language as a differentiator and 'living' and demonstrating its

values to clients. The ability to entrench loyalty and commitment in employees is an important element of the microfoundations of dynamic capabilities for seizing opportunities (Teece, 2007).

Summary and Contributions to the Conceptual Model

To root the concluding discussions in this section in extant theory, it draws mainly on Teece (2007) microfoundations of dynamic capabilities and Zollo and Winter (2002) theory of dynamic capabilities which emerge from the co-evolution of experience accumulation, knowledge articulation and knowledge codification. These discussions conclude the timeline for reformation and implementation of business strategy of the firm. It has covered the existing and new strategies of the firm and how they are value enhancing to the firm. The thesis has demonstrated that the firm's speed strategy is a key differentiator and supports its cost-leadership strategy in a seamless manner. Its replication strategy has captured value in artefacts and has led to growth of the firm. Similarly, the firm's resourcing and recruitment model is a source of competitive advantage which supports its cospecialised assets of people, offerings and artefacts. Lastly, it is argued that the combination of the firm's cospecialized assets and business strategies and models are value-enhancing, idiosyncratic to the firm, hard to imitate and a source of competitive advantage. There are several key insights from the discussions in this section;

- The top management team is responsible for creating the business strategies and models – therefore, reinforces that **selecting the business strategy/model occurs at meso level**
- Implementation of business strategy is directed from top to bottom in organizational hierarchy across the TMT, functions and teams, and individuals at lower organisational hierarchy – therefore, **implementation of business strategy/model is at meso level and micro level**

These insights contribute to the third stage of the conceptual model built in figure 14. The model is populated with the key insights highlighted in bold which add to the insights from stage two, as the model is being built up. The next section will progress on to the knowledge articulation and knowledge codification processes at the firm. It will provide a narrative of timeline of events between August 2015 to April 2016, including actors involved in the activities at the firm.

Figure 14. STAGE THREE: BUILDING A CONCEPTUAL MODEL FOR THE MULTI-LEVEL MICROFOUNDATIONS OF DYNAMIC CAPABILITIES IN KNOWLEDGE-INTENSIVE DOMAINS (Adapted from the theoretical work in Explicating the Microfoundations of Dynamic Capabilities (Teece, 2007) and Deliberate Learning and the Evolution of Dynamic Capabilities (Zollo and Winter, 2002)
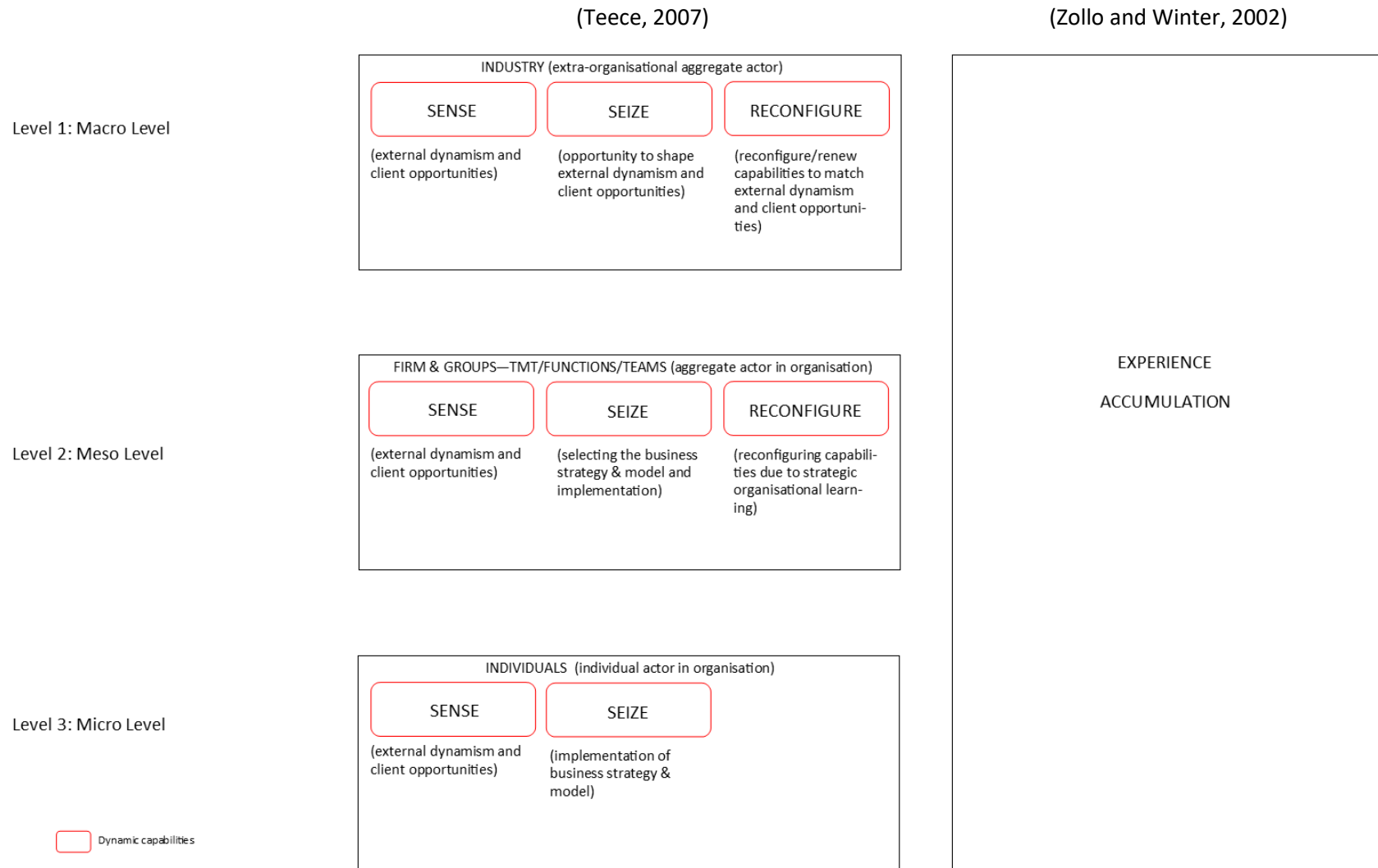
7.5 AUGUST 2015 TO APRIL 2016 – KNOWLEDGE ARTICULATION AND KNOWLEDGE CODIFICATION

Integrated alongside the process of reformation and implementation of its new business strategy, the firm began a reconfiguration of its capabilities (and accompanying capability framework) in August 2015 and that was completed in January 2016. The actors involved were mainly the three Directors who designed the capability framework and had a holistic understanding of how the firm's offerings (and underlying capabilities) all fitted together and how one stage progressed to the other. As earlier discussed in the thesis, the reconfiguration of the capabilities was the result of natural evolution and organizational learning due to experience accumulated at the firm. After the first stage of rationalising at high level of reconfiguration, at the second stage of the process the directors were assisted by six SMEs and four project managers in meetings and workshops. These are individuals who run and implement the offerings with their teams so have the practical knowledge in terms of articulating the detailed processes behind the high-level capabilities. Significantly, the processes of accumulated experience and knowledge articulation activity at the firm supports Zollo and Winter's (2002) assertion that dynamic capabilities emerge from the coevolution of tacit experience accumulation processes with explicit knowledge articulation and codification activities. However, these activities are not without challenges which are empirically investigated in this work.

The first main challenge arose in terms of achieving a shared understanding between actors involved in the knowledge articulation process which was required to modify the underlying processes and routines. Modifying operating routines through deliberate cognitive processes of articulation and codification of knowledge derived from reflection upon past experiences is vital because failure to do so in changing context of technological, regulatory and competitive conditions turns core competences into core rigidities.

7.5.1 NOVEMBER 2015: CHALLENGES OF KNOWLEDGE ARTICULATION AND CODIFICATION

By November 2015, the firm was facing some challenges in knowledge articulation between the Directors, SMEs and project managers. The first challenge related to making it understandable to all actors involved (a shared understanding) where value lies in the firm's capabilities in comparison to industry-known capabilities. One of the reasons for the lack of understanding is that the firm's bespoke capabilities were tailored around widely known industry solutions, so actors use them as a measure of something else whereas it is the nuances or micro-aspects of how and why the firm accomplishes the solution in a certain way that is value creating. Director B explained,

*"So, if I say to you [company name] thinks good external vulnerability scanning looks like this and we use some language, because Gordon is trying to use that as a measure of something else … he just wants me to be really crisp about what my good and bad is. We all know what external vulnerability scanning is, but what is it to [company name] because **this whole framework is our view of what's important and what's not important**"* (25BP1)

Gordon, an SME stated,

"I know what all the sort of real world if you like things are, I just don't know what you mean in [the company's name] and that makes it really hard for me. It is that last 10% that's stopping me from being effective" (25BN1)

Therefore, it would appear actors (non-directors) had the same performative understanding of industry routines and capabilities but different ostensive understanding of bespoken capabilities. Interestingly, Director A who often has the predisposition to point out how the firm can improve, stresses to Director B why it is vital for actors to know the contrast with the firm's capabilities and the value is doing it in a certain way. He pointed out,

*There is a takeaway for us in that B [director B] which is, **we know how we do recert at [firm name] and lots of people know what is a gap analysis … we've got to give them the right tools**. So, I think there's something in there for us to think about. **There is a lot of insight there in terms of the contrast**"* (25BM2)

It is argued here that value creation and firm competitive advantage might lie in the micro entities of practice involving industry wide routines and capabilities.

A second difficulty for actors was to understand the complexity of the capability framework and how the different offerings and processes interrelate due to causal ambiguity. An actor's level of experience has a bearing on their ability to understand the complexities of capabilities such that greater levels of actor's experience aids understanding of bespoken capabilities and how routines interrelate. Director B explains,

*"The reason why it is more difficult for [capability name] and not recert is [capability name] … the fruit bowl is quite big with lots of things in it and the fruit in there you've seen it before but you just don't know how it's lined up and set up. **So, we've got 500, 600 things you kind off at least have to go through and you need some time to get familiar with it even if you are an SME. If you are a strong SME you might get it faster than a weaker SME**"* (25BQ1)

This demonstrates a direct link between experience accumulated, complexity of knowledge, and knowledge articulation. Even though Zollo and Winter (2002: 340) state that 'deliberate cognitive processes involving articulation and codification of knowledge [is] derived from reflection upon past experiences' the argument presented here shows a more explicit dependency between experience, knowledge complexity and knowledge articulation.

Thirdly, and related to the complexity challenge, is the problem of language. Director A commented on the language challenge,

"Our flavouring, we are not making clear enough" (26BS2)

Clarity of language was a significant challenge at the firm.

Furthermore, Zollo and Winter's (2002) conceptual literature on knowledge articulation informs that collective learning and competence improves when implicit or tacit knowledge is articulated by individuals or groups through collective discussions and performance evaluation processes to ascertain what works and what doesn't in executing routines and capabilities. Organizational processes often have significant causal ambiguity with respect to their performance implications (Lippman and Rumelt, 1982) and high-level cognitive efforts and a more deliberate collective focus on the learning challenge can help to penetrate the ambiguity (Zollo and Winter, 2002). These often require significant efforts and commitments by actors in organizations.

The arguments in the literature above seem to be supported by evidence at the firm in terms of motivations of the firm and efforts made. First, the firm sought to improve an actor's competence of using the capabilities framework in terms of what's important and what's not, during deliberate knowledge articulation efforts. Second, it recognised the challenge to demystify a complex capability framework and processes to reduce causal ambiguity and improve actor's understanding. Third, this research posits that language is a significant element of knowledge articulation and codification in delivering solutions to clients, more so in knowledge-intensive domains because it differentiates a firm and helps create a brand. Discussions on language will be expanded on when dealing with solution to tackle the language challenge at the firm.

Lastly, consistent with the literature, the knowledge articulation at the firm involved high-level cognitive efforts of actors at top management team (directors) and management (senior SMEs and project managers) and individual actors at the firm.

Knowledge Codification

The knowledge codification stage began in November 2015 in parallel with the knowledge articulation activities. It proceeded into full swing as senior SMEs and project managers achieved a better understanding of the newly reconfigured capabilities framework and processes during the knowledge articulation activity. At the top organization level, the codification effort was led by Directors A and B who provided guidance having achieved a good level of articulated knowledge. Senior SMEs and Project Managers oversaw the codification of knowledge into artefacts by the actors who run the services in their teams.

Even though the codification was done by certain individuals, it was important that there was a collective understanding and agreement on the language to be used in the artefacts, especially at governance level (director level). There were significant challenges in this regard in both the knowledge articulation and codification activities. Overcoming such language challenges to create the right language to suit the firm's brand was necessary. A second challenge the firm faced was

finding an effective approach to codification and documentation as the new focus on replication as growth strategy meant a drastic increase in the levels of codification and documentation of artefacts. The third challenge of knowledge codification related to the costs to the firm. Zollo and Winter (2002) argue that direct costs include the time, resources, and managerial time invested in developing and updating artefacts. All these are costs that were present at the firm. The literature also states that indirect costs include a possible increase in the risk of "misfire" or inappropriate replication of the routine (Cohen and Bacdayan, 1994) if codification is poorly performed, and the more general increase in organizational inertia consequent to formation and structuring of task execution (Zollo and Winter, 2002: 343). During the length of period of engagement at the firm, the researcher did not discover any evidence of these indirect costs.

Summary and Contributions to the Conceptual Model

These discussions conclude the timeline for the initial knowledge articulation and knowledge codification stage at the firm. It discussed the actors involved in the activities and the challenges encountered at the firm.

There are several key insights from the discussions in this section;

- The TMT performed the high-level reconfiguration of the capability framework since they designed the framework so importantly, had the knowledge and accumulated experience of how the firm's capabilities and offerings interlinked at a high level – therefore, **reconfigure occurs at meso level**

- The TMT provided leadership in reconfiguring intangible assets – leadership in knowledge articulation and codification activities – therefore, **reconfigure occurs at meso level**

- Functional teams (led by SMEs and Project Managers) were strongly involved in knowledge articulation to reconfigure the detailed underlying framework as they possess the knowledge of how the various routines and teams interrelate – therefore, **reconfigure occurs at meso level**

- Individuals at all organizational level (TMT, Management and Analysts) partook in reconfiguring intangible assets by creating artefacts although Analysts who run the services were more strongly involved in knowledge codification – therefore, **reconfigure at micro level**

- **Accumulated experience** of actors shaped **knowledge articulation and knowledge codification** (Zollo and Winter, 2002) in the process to **reconfigure intangible assets** (capability framework and artefacts) which is a microfoundations of dynamic capabilities (Teece, 2007).

This is consistent with the literature that states that dynamic capabilities emerge from the co-evolution of experience accumulation, knowledge articulation and codification activities. Specifically, Zollo and Winter (2002: 342) stated that, 'Building on accumulated experience… articulation efforts can produce an improved understanding of the new and changing action-performance links, and therefore result in adaptive adjustment to the existing set of routines or in enhanced recognition of the need for fundamental change.' Simply put, experience and knowledge articulation support reconfiguration, thus this backs up the research contribution. Likewise, Zollo and Winter (2002: 342) argue that, 'knowledge codification is a step beyond knowledge articulation and it is used to uncover the linkages between actions and performance, and to provide guidance for the execution of future tasks.' That is, knowledge codification is useful to determine what is important and what is not in performing tasks, and to replicate tasks. This again demonstrates that the research contributions are consistent with extant theory.

These insights contribute to the fourth stage of the conceptual model built in figure 15. The model is populated with the key insights highlighted in bold which add to the insights from stage three, as the model is being built up. The next section will explain how the firm overcame the knowledge articulation and knowledge codification challenges it faced. It will provide a narrative of timeline of events between August 2015 to April 2016, including actors involved in the activities at the firm.

Figure 15. STAGE FOUR: BUILDING A CONCEPTUAL MODEL FOR THE MULTI-LEVEL MICROFOUNDATIONS OF DYNAMIC CAPABILITIES IN KNOWLEDGE-INTENSIVE DOMAINS (Adapted from the theoretical work in Explicating the Microfoundations of Dynamic Capabilities (Teece, 2007) and Deliberate Learning and the Evolution of Dynamic Capabilities (Zollo and Winter, 2002)

(Teece, 2007) (Zollo and Winter, 2002)

Level 1: Macro Level

INDUSTRY (extra-organisational aggregate actor)

SENSE	SEIZE	RECONFIGURE
(external dynamism and client opportunities)	(opportunity to shape external dynamism and client opportunities)	(reconfigure/renew capabilities to match external dynamism and client opportunities)

Level 2: Meso Level

FIRM & GROUPS—TMT/FUNCTIONS/TEAMS (aggregate actor in organisation)

SENSE	SEIZE	RECONFIGURE
(external dynamism and client opportunities)	(selecting the business strategy & model and implementation)	(reconfiguring capabilities due to strategic organisational learning)

EXPERIENCE

ACCUMULATION

KNOWLEDGE CODIFICATION   KNOWLEDGE ARTICULATION

Level 3: Micro Level

INDIVIDUALS (individual actor in organisation)

SENSE	SEIZE	RECONFIGURE
(external dynamism and client opportunities)	(implementation of business strategy & model)	(reconfiguring artefacts)

Dynamic capabilities

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7.6   AUGUST 2015 TO APRIL 2016 - OVERCOMING KNOWLEDGE ARTICULATION AND CODIFICATION CHALLENGES

By January 2016, the firm had begun to get to grips with the challenges it faced by working through the problems among the directors and the management teams. This process was mainly through organizational learning, activities and deliberate cognitive efforts to come up with ways to address the challenges and good progress was made. Director C explained,

*"On the journey you've [researcher] lived through with us, **we've got more conscious, and in some instances we've got a lot better and in some instances we know where we want to get better, we are not getting better as fast as we desire"** (27BW2)*

This section will discuss how the firm overcame the knowledge articulation and codification challenges its faced.

There were a number of solutions implemented to address the challenges of capability complexity, language, actor's level of experience needed to understand bespoke capabilities, and costs.

First, clarity on capability and language was required. Demystifying the hierarchy of routines and processes within capabilities and achieving clarity of language aids knowledge articulation and codification.   Director C explained,

"If you would think of a hierarchy, we've got something up here that is a sentence. Do you do X? Do I do it for this and that or just this? For this and that. OK, do you mean, do I do it for this percent or that percent? … and it drills down and therefore there is always going to be clarification, and what we've defined now to a few levels is, that granular definition that we think makes it material or the stuff we need to understand for the materiality to be there" (26BU1)

Having the granular details is more time consuming and resource-intensive, however it was successful in addressing the complexity and language problem. The clarity of the firm's unique language is particularly important because it is a differentiator and value creating.

It was previously identified that a lack of adequate experience might affects an actor's understanding of complex capabilities. Director A spoke about addressing this challenge,

"We understand the problem and we've said, we've got two SMEs [names mentioned] and we want to drop them into the conidium of doing the recert reviews to see if they can cope with the framework. Partly we're doing that which I think it's a good thing in an indirect way because they are helping us to develop it as they are getting familiar with it" (26BT1)

This would suggest that practical experience gained by actors as they use codified artefacts aids understanding of capabilities and with added advantage of improving the artefacts. This appears consistent with literature on codification which states that, 'by going through efforts of

codification and use of artefacts, individuals are likely to emerge with a crisper understanding of what works, what doesn't work, and why' (Zollo and Winter, 2002: 342). The literature also states that codification is an important supporting mechanism for a firm's entire knowledge evolution process since the actors involved can identify strengths and weaknesses in the current set of routines. Also, on individual learning when performing routines, Feldman & Pentland (2003) argue that routines are 'generative systems' with ostensive and performative aspects dually updating each other as actors perform routines, thus creating new knowledge and the potential to improve routines. These arguments in literature are supported by the research findings at the firm.

Second, to deal with the problem relating to finding an effective approach to codification and documentation, the senior management team assigned that function to an individual who took ownership and coordinated the activities in the firm. The business development manager was given the role of 'champion for documentation'. As champion, the manager orchestrated the activities of the actors involved in knowledge articulation and codification, managed a library of artefacts, and was responsible for the control and release of artefacts to employees and clients to maintain intellectual property protection.

Third, the Directors took the decision to commit to the direct costs of knowledge articulation and codification. They saw it was a strategic investment decision to enable the firm's replication as a growth strategy as well as the other benefits of replication e.g. diversifying business risks by getting other actors to perform risk management capability aided by use of the artefacts. The directors remained confident that the investment in codification paid off with evidence of increased client satisfaction and success. This view is supported by the literature where Zollo and Winter (2002: 342) state that, 'the principal benefits to codification efforts is seen as coming from the successful use of the manual or tool to facilitate replication and diffusion of knowledge.' On costs of codification, Zollo and Winter (2002) argue that in most cases articulated knowledge is never codified and this bears witness to additional costs incurred when progressing learning efforts from a simple sharing of individual experience to developing manuals and artefacts. This is true with the firm as it has borne significant costs in its knowledge articulation and codification journey. These authors further state that under certain conditions the learning and diffusion advantages attached to codification more than offset its costs. Again, the statement of the Director seems to provide evidence at the firm regarding cost implications that is in line with that proposition. Therefore, the challenge for a firm would be to balance the costs of creating artefacts with ensuring the successful use of the artefacts to generate revenues that exceeds the costs to achieve a profit. By having an outcome of increased client satisfaction and growing the firm from 80 to 120 employees on the back of its codification and replication strategy, it is suggested that the firm has got that cost-profit balance right.

However, there still exist outstanding challenges relating to costs and the practicality of getting associate staff members up to speed to use the codified artefacts. The organization's staff structure of permanent employees and associates pose a challenge for the firm's replication efforts. Director B explains,

"One of the challenges we are having is that with our permanent members of staff we can carve out a bit of time for them to come on the journey with us. With our associate members of staff we can't do that and so far we haven't found an effective way to cross that river. It is difficult for us to say we are going to sink 50k on those guys to be up to speed on it and go off and do it because that is a financial consideration and because they are actually in the client most of the time and trying to get them out of the client for a bit and putting them back in the client, to do that is actually very hard" (23BH1)

The permanent employees-associates (i.e. fixed term contracts) staff structure mentioned here is commonplace in consultancy firms so it is argued that consultancy firms engaged in replication activities will experience this challenge to some degree or the other. The problem is perhaps more prominent in small firms who may not have the 'slack' to bear the direct cost of 'sinking resources' on associates who may not remain at the firm long enough to generate a return on the investment, or the indirect costs (non-working time) and practicality of pulling staff out of client organisations so that they can be trained to use the artefacts. This issue remains a challenge at the research firm.

Meetings and workshops were the activities organised at the firm to facilitate the knowledge articulation and codification processes. They were attended by the Directors, SMEs, project managers, business development manager and analysts. Also, training workshops on the use of codified artefacts were led by Director B as the technical-lead and senior SMEs. Knowledge transfer sessions led by the Directors were the main method of disseminating knowledge across employees at the firm.

Summary and Contributions to the Conceptual Model

These discussions conclude the timeline for overcoming knowledge articulation and knowledge codification challenges at the firm. It discussed the actors involved in the activities and shed light on how the firm resolved the challenges it faced. There are several key insights from the discussions in this section;

- Demystifying hierarchy of routines and processes within a capability by providing granular details aids actor's understanding of complex capabilities
- All actors require clarity of language during knowledge articulation and knowledge codification, more so at lower level hierarchy who are largely responsible for creating artefacts

- Individual actors **improve and reconfigure artefacts** as they achieve better understanding of routines **through practice experience**

These insights contribute to the fifth stage of the conceptual model built in figure 16. The model is populated with the key insights highlighted in bold which add to the insights from stage four, as the model is being built up. Having reconfigured its capabilities framework and engaged in knowledge codification to create artefacts, the next phase of activities at the firm was transfer of the knowledge and use of codified artefacts for replication. The next section will discuss the timeline of this event which occurred between April 2016 to October 2016, including actors involved in the activities at the firm.

Figure 16. STAGE FIVE: BUILDING A CONCEPTUAL MODEL FOR THE MULTI-LEVEL MICROFOUNDATIONS OF DYNAMIC CAPABILITIES IN KNOWLEDGE-INTENSIVE DOMAINS (Adapted from the theoretical work in Explicating the Microfoundations of Dynamic Capabilities (Teece, 2007) and Deliberate Learning and the Evolution of Dynamic Capabilities (Zollo and Winter, 2002)

(Teece, 2007)   (Zollo and Winter, 2002)

Level 1: Macro Level

INDUSTRY (extra-organisational aggregate actor)

SENSE   SEIZE   RECONFIGURE

(external dynamism and client opportunities)
(opportunity to shape external dynamism and client opportunities)
(reconfigure/renew capabilities to match external dynamism and client opportunities)

Level 2: Meso Level

FIRM & GROUPS—TMT/FUNCTIONS/TEAMS (aggregate actor in organisation)

SENSE   SEIZE   RECONFIGURE

(external dynamism and client opportunities)
(selecting the business strategy & model and implementation)
(reconfiguring capabilities due to strategic organisational learning)

EXPERIENCE

ACCUMULATION

KNOWLEDGE   KNOWLEDGE

CODIFICATION   ARTICULATION

Level 3: Micro Level

INDIVIDUALS (individual actor in organisation)

SENSE   SEIZE   RECONFIGURE

(external dynamism and client opportunities)
(implementation of business strategy & model)
(reconfiguring artefacts and improvement through experience)

Dynamic capabilities

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7.7 APRIL 2016 TO OCTOBER 2016 – KNOWLEDGE TRANSFER OF RECONFIGURED CAPABILITIES FRAMEWORK AND USE OF CODIFIED ARTEFACTS FOR REPLICATION

By April 2016, the firm had completed the reconfiguration of its capabilities and achieved the knowledge codification required to support its replication strategy. The next phase of the firm's activity was to transfer knowledge to actors on how to use the codified artefacts. This stage began in earnest in April 2016 and was at full maturity at the time the research ended in October 2016.

7.7.1 KNOWLEDGE TRANSFER ON USE OF ARTEFACTS

After completion of framework reconfiguration and knowledge codification, workshops and knowledge training sessions were held at the firm from April 2016 to October 2016. Workshops were used to train actors on the more practical, detailed use of artefacts while knowledge sharing sessions covered a general approach to using the reconfigured capabilities framework and explaining how that fits within the overall business strategy. During the period of research engagement, 12 workshops and 5 knowledge sharing sessions were held and these were orchestrated by the business development manager as champion for documentation. The workshops were used to train SMEs, analysts and project managers on the technical capabilities using artefacts. Four workshops were led by Director B (and supported by Directors A and C) to teach actors on the use of higher-level tools and artefacts of risk management capability, which are iAccess and iDecide. iAccess is the capability that opens up an organization to determine its current overall IT security risk situation and where it needs to be to become secure (a gap analysis). iDecide is the capability that ascertain the risk priority of an organization, its agreed acceptable risk and budget spend decision to achieve a pre-determined acceptable risk position with senior management of the organization.

Training on the technical non high-level capabilities was delivered by senior SMEs for members of their teams (which include project managers, SMEs and analysts) on the use of artefacts and that was more successful than the risk management delivered by the Directors. Director B provided insights on why that was the case.

*"The reason why that is the case for iDecide and maybe not for re-cert is that **iDecide, the fruit bowl is quite big** [referring to the bundle of solutions in that capability] **with lots of things in it and the fruit in there you've seen it before but you just don't know how it's lined up and setup** so we've got 500, 600 things you kind off at least have to go through that **you need to have some time to get familiar with it even if you are an SME. If you are a strong SME you might get it than a weak one** and we've got various guys **so we are now trying to work out ways of doing this"** (39CZ2)*

There are significant points here about why the knowledge transfer of high-level risk management capability (iDecide) is not as successful as the technical capability (re-cert). First, is the increased level of complexity which increases the difficulty of knowledge transfer in the same way it does for knowledge articulation discussed previously. Second, the experience level of actors has an impact on this ability to gain an understanding of higher level capabilities during knowledge transfer efforts. This shows that accumulation of experience has a positive impact on knowledge transfer as it does for knowledge articulation and codification presented earlier in the thesis.

The literature on knowledge transfer states that the effectiveness or success of knowledge transfer depends on a number of significant factors, one of which is the recipient's background knowledge. A lack of absorptive capacity, that is an individual or organizational unit's existing stock of knowledge and ability to embed new knowledge (Cohen and Levinthal, 1990; Zahra and George, 2002), may be detrimental to knowledge transfer efforts (Maritan and Brush 2003; Szulanski 1996) and this factor is often overlooked in organizations. With regards to the research firm, Director B commented,

"From a knowledge management perspective, up until the one [workshop] we just went through that didn't go that well, we thought that if you are an SME … because [names mentioned] are SMEs you can just pick it up. But hang on a minute, [same names mentioned] are SMEs but they have been working on it for three years now so they are steeped in it, we just completely forgot that [laughter]. It's just not the same with every SME" (26BT2)

It is evident from the above statement that an actor's absorptive capacity and the effect of accumulated experience during knowledge transfer was taken-for-granted at the firm. Despite the enthusiasm for its replication strategy and excitement of successfully achieving knowledge articulation and codification, this period became an awakening moment for the firm where it recognised the enormity of the challenged it faced to achieve knowledge transfer success. To overcome the challenge, the Directors took the decision to invest in holding many workshops and knowledge sharing sessions at the firm where actors were coached on the approach of, and how to use the artefacts to deliver the capabilities. The directors also emphasized at the session that actors would require on-the-job learning in addition to coaching.

7.7.2 KNOWLEDGE TRANSFER OF RISK MANAGEMENT CAPABILITY AND INTELLECTUAL PROPERTY PROTECTION OF CODIFIED ARTEFACTS

Risk Management

Information technology security is about managing the cyber trinity, that is, people, processes and technology in an integrated approach to keep organizations safe. A problem in the industry is that there is often an imbalance in the three arms whereby there becomes an obsession with technical knowledge to the detriment of process knowledge and the implementation of operational

effectiveness. The Directors argued that demystifying processes and operational effectiveness is more valuable than having excessive technical knowledge, to keep organizations safe and that the complementary skills-set and different expertise of the directors is vital to achieve the right balance of the three arms. Converting the technical security language to business language for decision makers is of immense value albeit challenging. This fits into the narrative earlier presented about the challenge of the industry to speak a language the Board (i.e. organisation's Board of Directors) understands and taking the business along on the journey of security. For this firm, they believe that speaking the business language and demystifying processes is a strength of the organization and they exploit that in the marketplace. Director A explains,

"Being able to demystify [processes/operational knowledge and technical/business language] is a strength of our organization and we trade on that" (13AJ2)

But how does the firm trade on that to get revenue? An IT security firm that delivers risk management provides value to client organisations and this could differentiate it from its competitors. There are two very insightful comments from Director B below,

"So, in our world, the business proposition for security for an organization at the senior level is risk management. We, unlike a lot of security companies, we trade on that. If your perimeter is good, like a lot our clients achieve … the big clients they spend the money on that, we'll say you're good on that, actually spend the money on a risk management tool" (14AK1)

"We have lived in and worked in a space where we try to turn security into risk management … complex security in terms of what processes you need to put in place as well as technology. We turn it into a risk management thing because security is the cost of doing business. It has crept up on everybody. It didn't used to be the cost of doing business, it used to be something you just sort of did because it was the right thing to do" (14AL1)

Demystifying complex security in the form of processes and technology allows effective management of risks. Businesses need to manage IT security risks as a matter of priority because IT has become central to business operations. Actors that have worked as seasoned practitioners have acquired the knowledge and experience needed to understand complex IT security in a manner that they can decipher the threat horizon and solutions needed so that organisations can manage the risks to their business. The firm through its directors has 'earned through experience' the risk management capability and delivers that to clients. During the research project, one of the goals the firm embarked on was to grow its risk management capacity by getting more staff to learn the risk management capability and the thesis has provided a narrative of this journey.

There are several insights from the Director's statements. The phrase, *"So, in our world, the business proposition for security for an organization at the senior level is risk management. We, unlike a lot of security companies, we trade on that"* suggests a perception about where value lies - the perception that there is value is in turning complex security into the concept of risk management. The literature on

dynamic capabilities proposes that perception is an element of dynamic capabilities. For example, Denrell et al. (2003) argue that the differences between managers in the cognitive capacity for perception and attention can affect how they accurately sense new opportunities (and threats). In this regard, the Director stated, '*We, unlike a lot of security companies, we trade on that*'. – This illustrates valuable ability of perception.

Furthermore, the director tells us where the perception originates from in the phrase, *"We have lived in and worked in a space where we try to turn security into risk management …"* This would suggest that the individual capacity to perceive and articulate the value proposition of risk management is developed through learning and experience of being in the right physical and/or mental space or environment. That learning and experience is gained by being situated in a context. Denrell et al. (2003) and Helfat and Peteraf (2015) state that individuals differ in their cognitive capacity for perception and such differences are further amplified by the effects of differences in situated practice, training, and path-dependent heterogeneity in managerial cognitive capabilities. Perception of individuals is shaped by prior knowledge, expectations, beliefs, values, context-specific knowledge/experience for pattern recognition, and perception in turn affect the sensing of opportunities. Emerging themes in recent literature on dynamic capabilities stress the importance of enablers of dynamic capabilities or the ability of latent DCs to be realized in the most appropriate circumstance, which can be contingent on environmental turbulence, that are needed to sense and shape opportunities (Protogerou et al., 2011; Wilden et al., 2013; Wilden & Gudergan, 2015). This thesis posits here that the perception about the value in turning complex security into risk management to achieve evolutionary fitness (i.e. to trade on it) is an enabler of dynamic capability. More so, it further argues that the ability to articulate the value proposition of risk management to clients and being able to turn that into value-capturing economic rent to seize that opportunity enables dynamic capability. Being able to turn complex security into risk management and to trade on that unlike other companies is a differentiator for the firm and a possible source of competitive advantage.

To grow the firm and reduce business risk of reliance on the directors, the firm needed to replicate its risk management capability and the challenge for the firm was how to transfer the knowledge to management staff in an effective way. By April 2016, the directors recognised that many workshops and knowledge sharing sessions will be needed to train and coach actors on risk management artefacts to overcome the identified problem of lack of absorptive capacity and accumulated experience. Therefore, from July 2016 to October 2016, the directors delivered 6 workshops and 3 knowledge sharing sessions on risk management some of which the researcher was invited to attend. The observation research data provides details of the researcher's notes and reflections at the sessions.

The findings chapter discussed that achieving risk management by consultancy firms has both a scientific and artful element to it. Scientific with respect to measuring and costing risks in a metrics form, and artfully skilfully delivering risk management in a nuanced and crafted approach to clients. Information technology changes at a slower rate compared to IT security threats. This is because advances in new technology in IT are not as rapid as a few decades ago, meaning that IT has been commoditised in many respects. On the contrary, IT security threats change rapidly because the 'bad guys' keep evolving their tactics and methods of attack. The solution therefore, is effective risk management is to keep abreast of the changing threat horizon and the prioritization of required security controls at organizations to deal with these risks. This can be enhanced by working with major, significant clients and external engagement at events with other security professionals and vendors. Social media platform such as Twitter is another way for actors to acquire new knowledge about the evolving risks in the industry to manage them effectively. The training of actors on risk management and learning-by-experience are also essential to achieving the know-how of risk management capability.

Intellectual Property Protection

Intangible assets are valuable organizational assets to protect, especially so when a firm has invested heavily on knowledge articulation and codification and knowledge transfer of artefacts. The literature on microfoundations of dynamic capabilities state that a firm's governance mechanisms that enable the flow of knowledge and technology while protecting intellectual property rights from misappropriation and misuse are fundamental to dynamic capabilities in many sectors today (Teece, 2007: 1339). At the research firm, the firm's complex capabilities are hard for competitors to decipher therefore that helps to achieve some intellectual property protection, but this is not the case for less complex solutions. In addition, the firm has implemented methods and processes to restrict access to artefacts to both staff and clients on a 'need to know' basis to prevent misuse and IP theft.

Storytelling performed when using artefacts and tacit know-how of using the artefacts is difficult to imitate and provides IP protection. Teece (2007) argues that tacit know-how is difficult to imitate and has a certain amount of 'natural' protection, the directors at the firm are of the same view. They argue that the value of the artefacts is enhanced by the stories told by actors when using them. For example, director A stated,

"Half of the value [of the artefacts and documentation] is the story we tell with it" (44DC1)

Similarly, director B commented,

"The nick-able IP is only a fraction" (44DC3)

Interestingly, in the findings of this research, storytelling has featured as a significant theme of value in the IT security industry in the way in which actors legitimise their views. First, it was shown that storytelling of experience as consultants and narrating the firm's success allows the directors to give meaning to their views, propositions and actions (for example, proposed technical solutions) to achieve credibility from clients which the firm trades on that to win business. Second, as discussed in this section, stories bring 'artefacts to life' and enables actors to legitimise their knowledge when using artefacts to perform tasks on client projects. There is an interesting contribution made here. In the literature on knowledge codification, Zollo and Winter (2002) argue that actors that are involved in the process of writing a manual or creating an artefact are likely to reach a significantly higher degree of understanding of what makes a certain process succeed or fail, compared to simply telling "war stories" (Zollo and Winter, 2002: 342). While this might hold true, it is argued in this thesis that telling of war stories is necessary and perhaps equally as important, at least in the context of IT security where informing of battlefield experiences of defeating 'enemies' is vital to achieve credibility. Such credibility is even stronger when individuals have experience of been in positions of accountability and leadership in the past to protect organizations from IT security threats (in the words of Director C, 'have owned the obligation' to deliver security). More so, there is only a very few limited number of times in an organization that artefacts are written from scratch and subsequently reviewed for improvements, where actors involved get the opportunity to 'reach a significantly higher degree of understanding' compared to non-creator of artefacts, as argued by Zollo and Winter (2002). Most use of artefacts in organizations is for individual reuse and replication purposes. It is therefore argued that 'loss' due to a lack of reaching a significantly higher degree of understanding by actors using artefacts, is compensated for by the benefits of telling healthy war stories during use.

There are two ways in which the power inherent in storytelling can be exploited. First, by creating the awareness in actors about the value of storytelling and imploring actors to draw on their experiences and those of others during storytelling. Second, by creating the right artefacts that align with the overall narrative of the organization and fits within its own business strategies. An example in the case of the research firm is the risk management artefact that clearly presents risk metrics and costs to clients and supports the firm's 'holistic clients-solutions' business strategy. There are practical managerial interventions that are achievable in organizations such as creating awareness programmes, artefacts creating processes, training and mentorship, and promoting an organizational culture that supports storytelling. There will be subtle or profound differences in the way every individual organization deploys these activities leading to path dependency effects and variations in the way effective storytelling using artefacts is achieved across firms.

Furthermore, the size of a firm and the nature of competition in the IT security industry might shape a firm's concerns regarding IP protection of knowledge assets. The directors hold the view that the huge and growing market opportunities in the IT security industry makes the problem of intellectual property theft less of a concern to them as a small player in the industry. It can be argued that the reverse argument might hold true. In fact, the directors state that bigger, direct rival firms such as Accenture and Deloitte management consultancy firms might be more concerned about preventing the loss of its intellectual property to its competitors. This view about competition rivalry is consistent with that stated in strategy literature. The strategic conflict approach in strategic management argues that moves and countermoves of closely matched rival firms such as Pepsi Co and Coca Cola is pronounced and most relevant when such competitors do not possess deep rooted sources of sustainable competitive advantage (Teece, 2007). Then marginal gains by a rival over the other become magnified. This thesis posits that in knowledge-intensive domains, theft of knowledge assets can be a valuable weapon in strategic conflict manoeuvring for big rival firms, so it is vital that firms ensure their intellectual property protection. Furthermore, franchise firms (for example sandwich eatery SUBWAY) that receive franchisee payments would be very concerned about protecting its artefacts or 'recipes' from intellectual property theft or unauthorised use. The strategic management literature on replication of routines and use of templates support this argument about the importance of protecting intellectual property of knowledge assets (Maritan and Brush, 2003; Szulanski, 1996; Winter and Szulanski, 2001) The directors at the research firm state that the firm is not currently adopting a franchising business strategy, therefore are not concerned with intellectual property protection in this regard.

The combination of factors discussed means that the firm is not overly concerned about its intellectual property protection. First, complexity of its capabilities and mechanisms to control access to knowledge assets provides some protection against IP theft. Second, nuances of storytelling and tacit know-how provide some 'natural' protection to artefacts. Third, the firm's size and the industry growth potential (growing market size), nature of its competition, and a non-franchising strategy means that the firm will not suffer any significant loss of financial revenue or dissipation of economic rent from knowledge assets because of intellectual property theft. Based on these discussions, this thesis advances a few propositions; First, the market growth potential of an industry to enable new sources of economic rent on a firm's knowledge assets has a moderating effect on levels of concerns for intellectual property protection of knowledge assets. Second, the stronger the rivalry and intensity of competition between rival firms, the greater the need to guard intellectual property of knowledge assets from rivals. Third, the nature of the

business strategies firms adopts such as replication strategy or franchise strategy influences the levels of intellectual property protection adopted.

Summary and Contributions to the Conceptual Model

To root the concluding discussions in this section in extant theory, it draws mainly on Teece (2007) microfoundations of dynamic capabilities and Zollo and Winter (2002) theory of dynamic capabilities which emerge from the co-evolution of experience accumulation, knowledge articulation and knowledge codification. These discussions conclude the timeline for knowledge transfer on reconfigured capabilities framework and the use of codified artefacts for replication. There are several key insights from the discussions in this section;

- Knowledge transfer of capabilities and use of artefacts propagates across teams and functional groups, and between individuals in the organization – therefore, **knowledge transfer is at meso level and micro level**
- TMT were responsible for knowledge transfer of high-level capabilities including risk management capability
- Management e.g. Lead SMEs were responsible for knowledge transfer of technical non high-level capabilities
- Knowledge transfer of complex capabilities is more challenging and less successful than technical capabilities
- Workshops, meetings and knowledge sharing sessions were activities used for knowledge transfer between actors
- Tacit knowledge and storytelling provide some 'natural protection' of intellectual property for codified artefacts

Teece (2007) microfoundations of dynamic capabilities framework identifies knowledge transfer as an element of continuous alignment and realignment of specific tangible and intangible assets (i.e. reconfigure) as illustrated in figure 10. Therefore, this demonstrates that the concluding discussions on knowledge transfer above are consistent with extant theory.

These insights contribute to the final stage of the conceptual model built in figure 17. The model is populated with the key insights highlighted in bold which add to the insights from stage five, as the model is being built up. Having reconfigured its capabilities framework and engaged in knowledge codification to create artefacts, the last phase of activities at the firm was knowledge transfer of the capability framework and use of codified artefacts for replication which have been narrated in this section. The next section will discuss the role of structure on dynamic capabilities. It will conclude by presenting an aggregate conceptual model based on the timeline of events and output of the entire research.

7.8   ROLE OF STRUCTURE IN DYNAMIC CAPABILITIES

Structures determine the way people function and interact, and the way work is organised in organizations. For example, structures determine how routines are performed and this in turn could shape how routines develop or change over time. Literature on organizational routines state that routines are a source of stability and efficiency but could create inertia which could be detrimental to changing environments where the adaption of routines is necessary (Zollo and Winter, 2002). Nevertheless, there is consensus in the literature that structure plays a role in routine change. Research on organizational structures have provided valuable insights on their effect on routines and capabilities, however there remain room for more exploration of this microfoundation in certain contexts (Felin et al., 2012). The thesis has provided an insight into how the research firm organises its people and activities to achieve work. This section will draw on that to explicate the role structure plays in routines and dynamic capabilities within that firm and industry.

The IT security industry presents an interesting case. The industry has a number of recognisable standards, currently the dominant standard is The Basic – ISO/IEC 27013: 2015 Information Technology Security techniques which is focused on the integrated implementation of an information security management system (ISMS). These industry standards including ISO 27013 are great at informing "what you should have" but does not detail "the how" - they specify needed controls to limit information security compromise but do not inform of how organizations can achieve having those controls in place. To address this, the industry is populated with best practice solutions and routines adopted by firms to achieve these controls. Examples of such best practice routines are, access recertification and vulnerability scanning mentioned in the thesis. Also, related to this, the industry has several professional certifications such as Cisco Certified Network Associate Security (CCNA Security), Certified Information Systems Auditor (CISA) and Certified Information Security Manager (CISM) which recognises individuals (by providing accreditations) that possess the knowledge that is required to deliver these routines and capabilities. These best practices and standardised knowledge seek to address the challenge of how to achieve the industry standards controls.

Despite the availability of industry-wide best practices, superior value creation might lie in the intricacies of how firms deploy these routines in practice. First, there is value in identifying what routines are important in a given organizational context due to the fact that every organization has processes that are specific to the way they operate, thus that determine the particular security processes needed (demystifying processes); second, how routines are structured and combined hierarchically to create bespoke capabilities for IT Security firms or firms may possess

their own unique toolsets; and third, the manner in which they are deployed – These are significant because information technology security is about managing people, processes and technology in an integrated approach. It is argued that there will be differences in approaches adopted across every IT security firm which will be idiosyncratic in details resulting in firm heterogeneity in value creation.

Significantly, the literature in dynamic capabilities regarding best practices supports the arguments advanced here. Eisenhardt and Martin (2000) state that dynamic capabilities 'actually consist of identifiable and specific routines' (2000: 1107) that are common, well recognised activities that firms engage in which are best practices and that dynamic capabilities exhibit commonalities across firms (Eisenhardt and Martin, 2000). The authors further state that such dynamic capabilities are idiosyncratic in their details and path dependent in their emergence, hence accounts for dissimilarities and differential firm performance. Also, importantly, that dynamic capabilities are a source of competitive advantage if they are applied 'sooner, more astutely, and fortuitously' than competition to create resource configurations (Eisenhardt and Martin, 2000: 1117).

Therefore, the arguments made here in the thesis propose two key contributions to literature. First, it supports the literature on dynamic capabilities regarding best practices (Eisenhardt and Martin, 2000) with empirically collaborated insights about the IT Security industry best practices and goes further to propose that the ability to apply capabilities sooner, more astutely (for example, speed), and more fortuitously is, indeed, at the heart of dynamic capabilities in the IT security industry. More so, dynamic capabilities, if suitably aligned with firm's strategies can be a source of competitive advantage.

Secondly, it contributes to the debate about where dynamic capabilities reside in organizations. There is a large consensus in literature that dynamic capabilities reside mainly within a firm's top management team and Teece (2012) state that dynamic capabilities may be based on the entrepreneurial skills and knowledge of one or a few executives through sui generis strategic acts that neither stem from routines nor create new routines. While this might be true for some forms of dynamic capabilities in certain contexts, the work in this thesis contributes to the dynamic capabilities literature by arguing that dynamic capabilities in relation to routines exhibit at all levels of an organization, more so at lower levels with practitioners who largely operate the services. Senior management have a greater role in creating routine/resource combinations and bespoke capabilities framework – '*We all know what external vulnerability scanning is, but what is it to [company name] because **this whole framework is our view of what's important and what's not important**" (25BP1)*

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Therefore, dynamic capabilities in this sense reside in the entire firm including at top management team, groups and individual actors in an organization i.e. meso level and micro level.

Furthermore, the nature of work at consultancy firms also impacts on the way routines are structured. Evidence from this research shows that consultancy firms typically adapt their solutions and routines as well as the accompanying artefacts to suit multiple client environments so that they can be deployed effectively. It is vital that some artefacts are customisable or 'half-baked' so that they can be tailored to clients without having to 'first dismantle completely built artefacts' before use – prototype artefacts are also needed for similar client environments or projects. It is therefore argued that the structural composition of routines in consultancy firms supports the potential for routine change and adaptability, and more so in fast changing industries where it is desirable to incorporate new knowledge and organizational learning into routines as the environment changes, to prevent obsolete best practices becoming core rigidities.

The structure of routines could also relate to the level of complexity. Evidence from the research suggests that simple routines, capabilities and the accompanying capability frameworks are easier to achieve knowledge transfer for actors but are difficult to guard against intellectual property theft from outsiders. The reverse argument is also true - complex routines are challenging to achieve knowledge transfer internally, however are harder for outsiders to discern and copy so possess some 'natural protection' from intellectual property theft. Where possible, it is in firm's interests to decide where to structure simple and complex routines so that on the balance, they can take advantage of the positives of knowledge transfer and IP protection to their advantage.

In addition, the form of organizational structure impacts on its ability to sense, seize and reconfigure as microfoundations of dynamic capabilities. Structure is viewed as a microfoundation of routines and capabilities because different forms of organizational structure specify the conditions that enable or constrain individual behaviour or collective action as well as establish the contexts for interactions, which ultimately shape routines and capabilities (Foss, 2003). Research has shown that the degree of complexity of an organizational structure or form (for example, tall vs. flat; matrix, virtual matrix, network form, etc) influences various activities such as information processing, knowledge transfer, routine replication, and capability development. As stated earlier in the thesis, there remains room for more exploration of this microfoundation of routines in certain contexts (Felin et al., 2012).

Typically, consultancy firms like the research firm have a flexi, virtual matrix structure whereby individuals at all organizational levels are partly situated in their employer organization and partly based in the client (host) organization where they might spend most of their working day (remote working means individuals may not be physically located at client site all the time). Similarly,

individuals report in a virtual hierarchy to their superiors in both client and employer organizations often organised around project teams. With exception of actors that perform mainly administrative functions e.g. recruitment manager, this structure applies to most individuals at consultancy firms. The evidence from the PhD research suggests that this structure has implications for firm's ability to sense, seize and reconfigure. First, the structure in consultancy firms allows for strong external engagement by actors with numerous clients which creates the potential to enable superior sensing ability for firms. This includes gathering information on environmental and knowledge dynamism as well as recognition of opportunities at client organizations for the firm to exploit. Also, accumulation of diverse experience and learning by actors achieved from an exposure to different project experiences and interactions with multiple individuals on projects enhances sensing abilities.

Second, consultancy firm structure supports modest seizing ability for firms. Related to sensing, firms benefit from gathering knowledge externally which is relevant to seizing opportunities. There are however significant challenges relating to 'getting individuals out' of client organizations and 'putting them back in' either physically or time-wise, to seize opportunities e.g. to train them for replication. Also, creating a shared understanding for actors of industry-known solutions pose a challenge for knowledge articulation efforts.

Third, the potential for reconfiguring is less favourable compared to sensing and can be regarded as modest in comparison. The structure provides benefits relating to acquiring external knowledge but challenges for reconfiguring knowledge assets with respect to knowledge articulation, codification and transfer as argued for sensing. These challenges become even more prominent with associate/partner staff structure where firm's decision to invest in knowledge management for such employees must be weighed against the possibility of achieving long term returns on that investment. It is argued that larger firms might be better placed with the financial slack to accommodate that investment risk compared to smaller firms. A positive impact of the fast churn and wide variety of staff at consultancy firms is that it provides the benefit for breadth of knowledge and new perspective in knowledge management efforts and reconfiguring artefacts.

Lastly, it is posited that consultancy firms could possess enhanced superior sensing, seizing and reconfiguring abilities simultaneously. The judgement of superior and modest made here is a relative comparison between the three functions based on the degree to which structure supports the potential to achieve the abilities.

7.9   A CONCEPTUAL MODEL FOR MULTI-LEVEL MICROFOUNDATIONS OF DYNAMIC CAPABILITIES IN KNOWLEDGE-INTENSIVE DOMAINS

The PhD research has sought to answer the central research questions and the outcomes of the research work has been developed into a conceptual model for elucidating the multi-level microfoundations of dynamic capabilities in organizations with theoretical implications for scholars and practical relevance for managers. The main contributions from the research questions which are built into the model are;

How do microfoundations of dynamic capabilities impact on firm capability renewal and reconfiguration in IT security industry? The research demonstrates the role of sensing, seizing and reconfiguring to capability renewal and reconfiguration.

What is the multi-level nature of microfoundations of dynamic capabilities in the IT security industry? The thesis empirically analyses actions and activities that macro, meso and micro levels and the actors involved in dynamic capabilities.

What are the processes and activities that sustain or enable dynamic capabilities in firms? The research illuminates detail of the processes of experience accumulation, knowledge articulation and knowledge codification and challenges involved. It also highlights firm activities that support superior sensing, seizing, and reconfiguring abilities in firms.

Does structure enable or constrain dynamic capabilities in organizations? The work explicates how structure affects sensing, seizing and reconfiguring, as well as routine change to match the environment.

This section will provide a concise explanation of the conceptual model developed in this work and its practical relevance and applicability within certain contexts. First, it will present the model and proceed to discuss it.

Figure 17. A CONCEPTUAL MODEL FOR THE MULTI-LEVEL MICROFOUNDATIONS OF DYNAMIC CAPABILITIES IN KNOWLEDGE-INTENSIVE DOMAINS (Adapted from the theoretical work in Explicating the Microfoundations of Dynamic Capabilities (Teece, 2007) and Deliberate Learning and the Evolution of Dynamic Capabilities (Zollo and Winter, 2002)
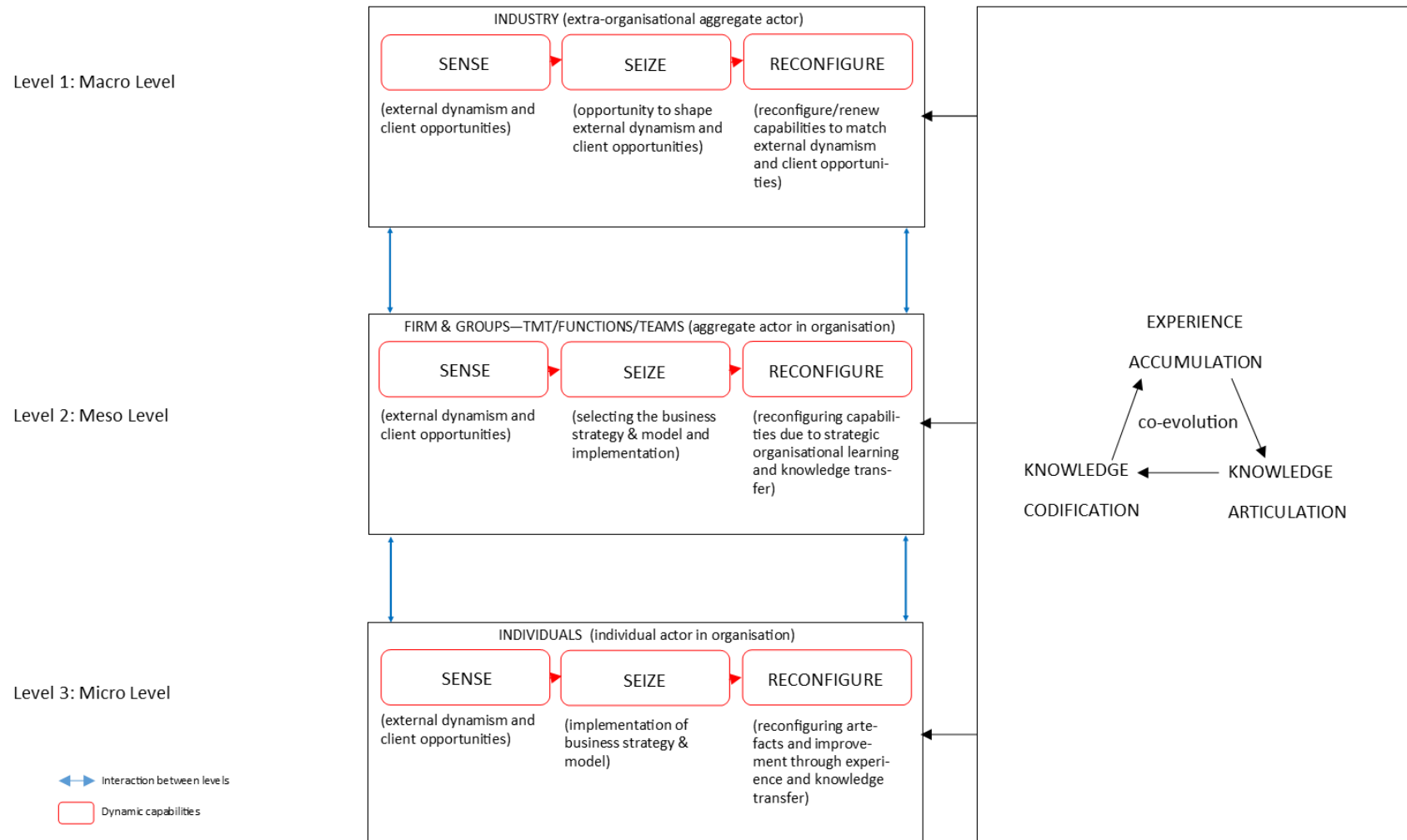
7.9.1 DESCRIPTION OF THE CONCEPTUAL MODEL

The main body of the model on the left-hand side (LHS) encapsulates the theoretical concepts in Explicating the Microfoundations of Dynamic Capabilities (Teece, 2007) and on the right-hand side (RHS), is the Deliberate Learning and the Evolution of Dynamic Capabilities (Zollo and Winter, 2002) which includes the learning mechanisms of accumulated experience, knowledge articulation and codification which shape dynamic capabilities. On the LHS, the top segment of macro level (Level 1) represent Industry. Industry covers industry factors, market competition, government, regulators, and other institutional factors and patterns of interactions existing at macro level. The middle segment of meso level (Level 2) represents the Firm and Groups and this includes the organisation, top management team, functions, project teams, and all organisational group interactions. The bottom segment of micro level (Level 3) is denoted by Individual and refers to individual actors in organisation.

A unique contribution of the model is that it uncovers the interactions across and between the levels from which dynamic capabilities emerge concurrently in practice. Sensing of opportunities at the macro level is in the form of sensing external dynamism and client opportunities. External dynamism includes knowledge dynamism in the industry as well as industry challenges. In parallel to macro level, at meso level the firm and groups in the firm can sense opportunities with regards to external dynamism and client opportunities through internal organisational group interactions such as meeting and workshops, to collectively articulate external opportunities. In parallel to macro and meso levels, at micro level individual actors sense opportunities about external dynamism and client opportunities especially through external engagements such as working with significant client organisations and attending external events, for example conferences and vendor exhibitions. Seizing of opportunities at macro level takes the form of seizing opportunities to shape external dynamism and to exploit client opportunities. An example is actively engaging with regulators to shape regulation in the industry. In parallel to macro-level seizing opportunities, seizing of opportunities at meso level by the firm and team includes selecting the business strategy and model, and implementation. For example, top management team play a strong role in articulating the business model to capture value and economic rents. In parallel to macro and meso-level seizing, at micro level individuals can seize opportunities by engaging in the implementation of firm's business strategy and models. Furthermore, reconfiguring at macro level takes the form of reconfiguring and renewing capabilities to match external dynamism and client opportunities. For example, reconfiguring capabilities to align with the dominant IT security standards in the industry. In parallel to macro-level reconfiguring, reconfiguring at meso level deals with reconfiguring capabilities due to strategic organisational learning and knowledge transfer of reconfigured capabilities/artefacts across teams. Similarly, at micro level individuals

reconfigure artefacts and improve them through experience and engage in knowledge transfer of artefacts.

It should be noted that there is an overlap across levels and the model does not suggest a clear-cut distinction between levels – it would be illogical to make that claim. To illustrate this point, an individual actor (micro level) can sense opportunity and at the same time be part of a project team (meso level) that collectively articulate knowledge to sense opportunity. Rather, the strength of the model is that it illustrates this multi-level nature of dynamic capabilities and the multi-level connections and aggregation which is a gap in the literature. The model represents the interconnection between the macro, meso and micro levels with blue arrows in the diagram.

The model also demonstrates connections across levels. At macro level, sensing of opportunity is followed by seizing opportunity to shape external dynamism and exploit client opportunities, and then reconfiguring/renewing capabilities to match external dynamism and client opportunities. Similarly, at meso level sensing of opportunities presented from external dynamism and client opportunities is succeeded by seizing opportunity by selecting the business strategy and model and implementation to exploit opportunities, then reconfiguring capabilities due to strategic organisational learning, and knowledge transfer of reconfigured intangible assets. At the micro level, sensing of opportunity is followed by seizing opportunity in implementation of the business strategy and model, then reconfiguring artefacts and improvement, and knowledge transfer. The sense – seize – reconfigure processes evolve continuously in tandem with one another. Interaction across levels, represented by red arrows in the model, is supported by depiction of dynamic capabilities in extant literature (Teece 2007; Helfat and Peteraf, 2015).

 Furthermore, the model demonstrates that the learning mechanisms of experience accumulation, knowledge articulation and knowledge codification are vital to building and sustaining dynamic capabilities in the ability to sense, seize and reconfigure. For example, accumulated experience by actors enables the ability to sense, seize and reconfigure. Knowledge articulation amongst actors helps to uncover the linkages between actions and performance in the process of seizing opportunity to develop artefacts for implementation of replication strategy. In addition, knowledge codification is integral to creating and reconfiguring artefacts to provide guidance for the execution of tasks through replication. The model represents these interactions between the theory of learning mechanisms (Zollo and Winter, 2002) on the RHS of the model and the theory of microfoundations of dynamic capabilities (Teece, 2007) on the LHS, with black connecting arrows. This is supported by existing literature which states that dynamic capabilities are shaped by the co-evolution of tacit experience accumulation processes and explicit knowledge articulation and codification activities (Zollo and Winter: 344) and this has been collaborated by

the findings of the empirical research in this work. The co-evolution of experience accumulation, knowledge articulation and knowledge codification are represented by the diagram in the model.

The main contribution of the conceptual model is that it explicates the multi-level nature of dynamic capabilities. By demonstrating how dynamic capabilities exhibits at different levels, it provides a platform for advancing theoretical understanding at levels and to articulate practical managerial interventions to directly enhance specific abilities of sensing, seizing and reconfiguring at levels to achieve superior outcomes.

7.9.2 RELEVANCE AND IMPLICATIONS OF THE MODEL

A theoretical contribution of the model developed is that it makes a unique contribution to literature by integrating insights from two of the most influential papers in the dynamic capabilities literature. The dynamic capabilities field is fragmented, and this work answers the call for an integrated conceptual approach in dynamic capabilities scholarship. In addition, the model provides an analytical tool to be used by academics and researchers to analyse and gain insights into the contributions of individual and aggregate actors to dynamic capabilities that exhibit as firm level capabilities. In other words, it provides a micro-level tool to help explain macro-level firm phenomenon i.e. dynamic capabilities and its importance to firms.

In addition to its use as an analytical tool to gain insights for scholars, the model has specific practical relevance for practitioners in the industry. The model can be used to assign roles and responsibilities relating to sensing, seizing and reconfiguring functions, to individuals and groups and to analyse their performance. For example, a Chief Information Security Officer (micro level) could be assigned the remit of providing strategic direction in an organization to ensure the firm keeps aligned/responds to the changing industry and to provide governance for reconfiguration of intangible assets. Similarly, the model can also be used by managers to design specific activities that will enhance abilities to sense, seize and reconfigure by a project development engineering team (meso level). Examples would be promoting external conferences, events and professional networks to sense opportunities; facilitating internal workshops and meetings to discuss and seize identified opportunities, and workshops and training sessions to orchestrate reconfiguration of assets and knowledge transfer on artefacts.

The generalisability and replicability of the model is that it is applicable to organizations in knowledge-intensive domains due to its focus on knowledge and intangible asset orchestration. Information technology, information technology security, telecommunications, financial, and insurance industries are examples – industries where knowledge is created and exploited to a large degree for efficiency and growth purposes. It would be most relevant to firms operating in industries experiencing strong environmental dynamism where it is vital to continually sense,

seize and reconfigure to match or shape the environment. Consultancy firms that typically have large external interactions with numerous clients will also benefit from the model. It is suited to large and medium sized organizations that normally have well-developed knowledge processes and activities as well as assigned roles and responsibilities for individuals. Small firms without defined roles and processes who engage in ad-hoc problem solving or one-off activities do not exhibit dynamic capabilities in the sense described in literature and in this thesis, therefore may not be best suited to this model.

7.9.3   WEAKNESSES OF THE MODEL AND ITS APPLICATION

The model integrated mainly theoretical work in Teece (2007) and Zollo and Winter (2002). Teece (2007) deals with individual and firm's ability to sense, seize and reconfigure assets. Zollo and Winter (2002) is primarily focussed on organizational processes and activities that involve experience accumulation, knowledge articulation and knowledge codification. By integrating these two theoretical approaches, the model begins to address the fragmented literature in the dynamic capabilities literature. The work makes contribution to addressing the issue of fragmentation, however it does not claim to have entirely overcome the fragmentation challenge in the dynamic capabilities scholarship. An endeavour to more holistically address the numerous fragmentation would go beyond the scope of a PhD research and it is argued that further development of the model could be an interesting avenue for further research. Therefore, since the model addresses only a part of the many fragmentations in scholarship albeit a meaningful contribution made, this can be regarded as a weakness of the model.

The model has a strong emphasis on knowledge and intangible asset orchestration since Zollo and Winter (2002) aspect of the model deals largely with knowledge articulation and codification, so the model may be biased towards knowledge-intensive domains and may be most applicable in that domain. However, dynamic capabilities are relevant to a wide range of industries that experience rapid change, for example fast fashion industry in the retail sector (Winter, 2003) and such industries may not be as heavily centred on knowledge as compared to industries like telecommunications and banking. Therefore, such industries might not enjoy the same level of benefits from use of the model in those contexts. The knowledge focus of the model can be viewed as a weakness in the applicability of the model. In addition, the model is mostly beneficial to organizations that typically have large external interactions (e.g. consultancy firms) as well as large and medium sized organizations. Firms that do not fit these descriptions may not be best suited to the model. This can be regarded as another weakness in the application of the model.

7.9.4 CONCLUSION

Firm's ability to sense opportunities and threats is enhanced through external engagement with the business ecosystem. Interactions with regulators help to achieve timely response to regulatory changes and to shape the industry. In addition, engaging with clients especially major institutions enables superior sensing of business opportunities and knowledge regarding the evolving IT security threat horizon. Sensing exhibits at all levels. Seizing of opportunities sensed from the business ecosystem occurs at all levels in the organization. Senior management determine the business model and strategies, and the implementation spans across both the meso and micro levels at firms. Reconfiguration of intangible assets including capabilities and capabilities framework is done to align with new and changing industry standards and client needs. Reconfiguration also occurs from natural evolution of organizational learning to better articulate firm's offerings to client and improve firm performance. TMT provides leadership in reconfiguring intangible assets and practical reconfiguration of knowledge artefacts through the process of knowledge codification is achieved bottom-up in firms by practitioners who are responsible for delivering a firm's offerings.

The nature of the IT Security environment has proven to be one of external dynamism and fast changing client needs and opportunities. In order to adapt, firms in the industry exhibit dynamic capabilities as shown by the research firm discussed in this thesis. Therefore, it can be concluded that dynamic capabilities are indeed relevant and vital in fast changing environment for firms to survive and prosper.

SECTION FOUR

This section will conclude the chapter by evaluating how well the principal aims of this study have been fulfilled in addition to proposing contributions which arise from the work.

7.10 RETURNING TO THE AIMS OF THE STUDY

In chapter one, four aims were established for the study. First, by performing a case study research of how a firm renews its strategy and capabilities, it seeks to explore the processes involved and organizational wide issues, engaging in multi-level analysis from case study research. Second, it aims to answer the calls by microfoundations research scholars for more empirical, in-depth small N case study research, to supplement current research approaches as this will address the major challenge to the microfoundations research agenda in strategy – to provide practical advice to managers on strategy and organizational issues which are grounded on empirically corroborated insights. Third, related to the second aim, the research adopts

microfoundational thinking to dynamic capabilities research, thus aligns itself with the emerging and growing microfoundations research theme in dynamic capabilities research. In that respect, it aims to answers the call for research in dynamic capabilities within firm/industry specific contexts since dynamic capabilities are context- specific and path-dependent. Fourth, it adopts a social constructivism lens to seek to advance our understanding of routines and dynamic capabilities by unpack the micro-aspects of these constructs, particularly the role of structure in firm behaviour and dynamic capabilities.

Following a review of the dynamic capabilities literature and the collection of background information on the industry and the firm, empirical work was undertaken. Conducting interviews with respondents across all levels of the organization allowed the researcher to access rich perceptions from actors in relation to the reformation of the firm's strategies and capabilities. Field notes during observations at the company's activities complemented and enriched the interview data and enabled new insights to be drawn on how the organisation functions and its interaction with clients and the external environment.

In fulfilment of the first research aim, analysis was performed across macro, meso and micro levels and this included interview and observation data from individuals and groups in relation to sensing, seizing and reconfiguring activities. Similarly, organizational wide processes dealing with experience accumulation, knowledge articulation and codification, and knowledge transfer were explored. The second aim sought to engage in empirical, in-depth small N case study research to provide practical advice to managers which are grounded on empirically corroborated insights. Ultimately, this aim was achieved through a 15-month empirical study of an IT security firm. The firm is typical of a consulting firm operating in the IT security industry and this makes the findings generalizable. The study of successful firms helps to unpack what accounts for firm's performance which can be useful to make recommendations for other firms. Based on the outcome of this work, practical advice for practitioners is provided. The third aim (and related to the second aim) is, by adopting a microfoundational thinking to dynamic capabilities research it aims to answers the call for research in dynamic capabilities within firm/industry specific contexts due to the fact that dynamic capabilities are context- specific and path-dependent as mentioned. This goal was fulfilled alongside the second research aim through applying a microfoundations framework to a case-specific research context. The forth aim sought to advance our understanding of routines and dynamic capabilities, and particularly the role of structure in firm behaviour and dynamic capabilities by adopting a social constructivism lens. The research has drawn on Pentland and Feldman (2012) conceptualisation of ostensive and performative aspect of routines, as well as Felin et al. (2012) representation of structure as a microfoundation of routines and capabilities, to

analyse routines in the organisation and organizational structure at the firm. In doing so, the work makes specific contributions on the role of structure in dynamic capabilities.

From the discussions above, it can be concluded that the overall research aims of the PhD research were fulfilled which are directly linked to the research questions.

7.11 CONTRIBUTIONS TO THE DYNAMIC CAPABILITIES FIELD

Geletkanycz and Tepper (2012: 257) claim that strong theoretical contributions serve as a "bridge between a study's findings and the larger literature". The contextual and industry focus taken in this thesis has led to opportunities to make linkages between the dynamic capabilities literature, and the findings regarding the Information Technology Security field. It is within these linkages that the bridge between the findings and larger literature are found. This section discusses the contributions made by the study in the endeavour to answer the four research questions stated in the thesis.

Applying Teece (2007) microfoundations of dynamic capabilities framework to unpack dynamic capabilities in the IT Security industry is advanced as an overall contribution of the study which connects the study to wider theory on dynamic capabilities. The model built in the work can be used to explore firm-level outcomes and could serve as a useful theoretical platform for dynamic capabilities scholars who may seek to further explore some specific outcomes, for example how firms respond to the industry challenge of skills shortage. It is also relevant to the practice of firms in the IT security industry, as, effectively, their success is highly contingent on ability to anticipate structural changes in the industry and respond timely or shape the business ecosystem.

The first research question relates to; how do the microfoundations of dynamic capabilities impact on capability renewal and reconfiguration in the IT security industry? By applying the microfoundations of dynamic capabilities framework (Teece, 2007) to investigate capability renewal and reconfiguration in the IT security industry, the research informs that firms sense external changes in the industry and the evolving dominant industry standards and renew and reconfigure their capabilities (and accompanying capability framework) to match them. The industry standards specify industry best practices to achieve information technology security controls. Thus, by aligning their capabilities/framework to industry standards (the details of how this is achieved, and levels of success is idiosyncratic to firms) they become 'fit for purpose' or achieve 'technical fitness'. Simultaneously, firms sub-divide or 'map' their capabilities/framework to the different industry standards that different client adopt so that it meets a client's unique needs. This makes the capabilities/framework sellable to clients allowing firms to earn a revenue or achieve 'evolutionary fitness'. In addition, there are internal factors that impact on firm

capabilities renewal and reconfiguration. Firms renew and reconfigure capabilities and framework due to strategic organisational learning and change, to achieve a more effective articulation of the firm's offerings and ease of integrating new offerings – this relates strongly to technical fitness. Such reconfiguration of capabilities/framework to create artefacts is also required to align with firm's business strategies e.g. speed strategy and replication strategy – this relates strongly to evolutionary fitness. These arguments presented here make a significant contribution. Elucidating the duality of internal 'technical and evolutionary fitness' and external 'technical and evolutionary fitness' occurring in synergic relationship is advanced as a specific contribution of this work to the literature on dynamic capabilities. Furthermore, the work highlights eleven significant outcomes in the data structure from the empirical application of the microfoundations of dynamic capabilities framework (Teece, 2007) which are value enhancing and a potential source of competitive advantage for firms. These include cospecialization and operations risk management. Managing strategic fit is vital so that cospecialization of business strategies and assets creates value that is idiosyncratic to firms, difficult to imitate and a source of competitive advantage. Speed and cost-leadership strategies and use of artefacts are factors that are responsible for the firm's strategic success. Information technology security is ultimately about efficiently managing IT security risks to organizations and this responsibility lies with an organisation's senior management. An IT security firm's ability to deliver IT security solutions in an integrated risk management approach and engage in a macro-level discourse with organisation's senior management to gain their commitment to IT security investments, is value creating and a differentiator in the industry.

The second research questions sought to explore the multi-level nature of dynamic capabilities and investigate at what levels dynamic capabilities reside. Using Teece's (2007) microfoundations of dynamic capabilities framework to investigate how a firm goes about its processes of renewing its business strategies and capabilities, it explored the individuals and activities involved across multiple levels in relation to sensing, seizing and reconfiguring, thus informs of how theses microfoundations exhibit at levels. The research informs that at macro level sensing involves external dynamism and client opportunities, seizing opportunities to shape external dynamism and client opportunities, and renewing/reconfiguring capabilities to match external dynamism and client opportunities; at meso level sensing relates to external dynamism and client opportunities, seizing opportunity to select the business strategy & model and implementation, and reconfiguring capabilities due to strategic organisational learning, and knowledge transfer; while micro level involves sensing external dynamism and client opportunities, seizing opportunity to implement business strategy & model, and reconfiguring artefacts and improving them through experience, and knowledge transfer. These insights from the multi-level analysis are built into the

conceptual model developed in this work. Therefore, it is advanced here that the thesis makes a contribution to literature by demonstrating that dynamic capabilities exhibit at multiple levels, based on empirically collaborated insights. In a related, parallel analysis, the work integrates the deliberate learning and evolution of dynamic capabilities theoretical work (Zollo and Winter, 2002) into the analysis of the firm's dynamic capabilities (microfoundations – Teece, 2007) to demonstrate the role of experience accumulation, knowledge articulation and knowledge codification in dynamic capabilities. The contribution of the thesis in this regard is that it further advances literature by integrating two dominant theoretical work; microfoundations of dynamic capabilities (Teece, 2007) and deliberate learning and the evolution of dynamic capabilities (Zollo and Winter, 2002) in the conceptual model developed. Geletkanycz & Tepper (2012) warn authors to the Academy of Management Journal against over-reaching in establishing theoretical implications that outstrip the data. This must be borne in mind in relation to the contributions of the model. Importantly, the thesis does not argue that details of the model is representative of all industries and every firms. Rather, this thesis advocates that overall framework could be relevant in analysing organizations in knowledge-intensive domains, particularly suited to consultancy firms. For practitioners, the model is useful for allocating sensing, seizing, and reconfiguring duties and/or knowledge articulation and codification activities that are most appropriate to individual or group actors as demonstrated in the model. In this way, it can serve as blueprint for managers when allocating and analysing responsibilities.

To address the third research question, the thesis sought to investigate the processes and activities that enable dynamic capabilities influencing how firms go about sensing, seizing and reconfiguring in the IT security industry. Firm's engagement with external entities is vital to superior sensing capability. Teece (2007) microfoundations framework identifies several external processes and analytical systems to learn and to sense, filter, shape and calibrate opportunities and threats. These include processes to tap supplier and complimentor innovation and processes to tap developments in exogeneous science and technology (for example, engagement with research and educational institutions). This work advances the framework by positing that processes to engage with client organisations are significant to sensing opportunities in dynamic environments. The thesis recommends that firms should actively engage with significant client organizations to keep on top of industry and knowledge dynamism and to sense client business opportunities to exploit. In addition, engagement with industry regulators helps to anticipate and shape regulatory changes which can help firms gain early mover advantages.

Furthermore, to accumulate valuable experience and knowledge at firms, an effective recruitment model and processes is important in recruiting and retaining scare talent in the industry and leader's role in recruitment and resourcing is value enhancing. New employees bring in new

dimensions and experience to firms which improves firm's artefacts. Exploiting experience as consultant and storytelling of success is vital to gaining credibility with clients to win business. In addition, sensing and seizing activities need to be integrated in firms. It is advocated that firms should actively seek to harness knowledge and information sensed by actors so that opportunities can be calibrated and seized upon. One of way of achieving this is by creating feedback mechanisms and incorporating feedback responsibilities into job requirements so that there is an expectation that individuals will gather and share sensed opportunities with colleagues and superiors. Meetings and knowledge sharing activities can facilitate this knowledge exchange. Activities for knowledge articulation are required for managers to make sense of identified opportunities, act on them or feedback leads to senior management to exploit. To improve knowledge articulation efforts, demystifying hierarchy of routines and capabilities, and clarity of language enhances shared understanding and improves actor's knowledge of performance implications of tasks. This is particularly important to enable knowledge codification.

The thesis contributes to the microfoundations of dynamic capabilities literature by demonstrating the role language plays in knowledge codification efforts when creating and reconfiguring knowledge assets. First, language helps to create a firm's brand which the firm can 'sell' or 'trade on' as a differentiator in the marketplace. Second, granular language contained in artefacts enhances actor's understanding of how to perform routines. It is argued that the language used in a firm is often determined by its founder(s), top management or socially constructed through interactions of individuals. The emphasis is on a consistent language being propagated throughout the organization so that the firm 'speaks to itself and outsiders' in a common language. This helps to build a firm's brand. Storytelling is a persistent strong theme with practitioners in the industry. It is highly desirable when exploiting knowledge and experiences to articulate the firms' value proposition to win business (achieve *evolutionary fitness*) and when using artefacts to deliver IT security solutions (achieve *technical fitness*). On-the-job experience is valuable to continually improve codified artefacts.

The final research question sought to investigate whether structure enables or constrain dynamic capabilities within certain organizational settings. First, the way industry best practices and routines are structured and deployed differs across firms and contributes to heterogeneity in firm performance and dynamic capabilities. Second, the structuring of routines to create simple or complex capabilities impacts on internal knowledge transfer and IP protection from outsiders which are both elements of the microfoundations of dynamic capabilities framework (Teece, 2007). Lastly, organisational structure in consultancy firms enable superior sensing ability but challenges for seizing and reconfiguring ability for firms.

This section has laid out the contributions of the thesis to literature and practical implications. It is argued that overall, the research makes two most significant contributions. The first main contribution of the research is the fieldwork. It applied the theoretical frameworks of dynamic capabilities within a certain industry context to provide insights to advance our understanding of dynamic capabilities. Specifically, based on the literature review performed in this work of current empirical studies in dynamic capabilities literature, the PhD research has contributed to the study of dynamic capabilities in the IT security industry which is an understudied area in the literature. The literature in the thesis was comprehensive and the empirical work was tested against existing theories and models. The research did not set out to specifically develop a new theory. Rather it sought to apply existing theories to empirically explore the nature of dynamic capabilities within the context of information technology security industry and to make practical recommendations based on the findings. The second major contribution is that it has produced a conceptual model of dynamic capabilities based on findings from the research. Practical prescriptions have also been drawn out from the model based on empirically collaborated insights which are detailed in the conclusions chapter of the thesis. This concludes this section of the thesis and table 10 provides a summary explanation of how the research questions in the thesis have been addressed.

Table 10. Summary and explanation to show how the research questions in this work have been addressed

Q1	How do the microfoundations of dynamic capabilities impact on capability renewal and reconfiguration in the IT security industry?
	The first research question answers the call for study on dynamic capabilities in certain contexts since dynamic capabilities are context-specific and path dependent. The research informs that firms sense external changes in the industry and evolving dominant industry standards that clients adopt and renew/reconfigure their capabilities and capability framework to achieve technical and evolutionary fitness. Firm's also renew/reconfigure their capabilities and framework due to internal strategic organisational learning and change, for more effective articulation of their offerings, ease of integrating new capabilities and to align with firm's business strategies to achieve technical and evolutionary fitness. Elucidating the duality of external 'technical and evolutionary fitness' and internal 'technical and evolutionary fitness' occurring in firms is a significant contribution made in this work.
Q2	What is the multi-level nature of dynamic capabilities in the IT security industry?
	The research question answers the call from multi-level analysis and theory development to overcome fragmentation in the dynamic capabilities literature. The research performs multi-level analysis on macro, meso and micro levels as well as analysis of individual actor, aggregate actor within organisations and extra-aggregate actor and the findings inform that sensing, seizing and reconfiguring as microfoundations of dynamic capabilities (Teece, 2007) exhibit at all three levels. The contribution of the work to literature is the conceptual model developed which first, demonstrates the nature of sensing, seizing and reconfiguring at the three levels and second, integrates two dominant theoretical works in dynamic capabilities literature – Teece's (2007) microfoundations of dynamic capabilities and Zollo and Winter's (2002) deliberate learning and evolution of dynamic capabilities.
Q3	What are the processes and activities that sustain or enable dynamic capabilities in firms?
	The research question answers the call for dynamic capabilities scholarship to provide practical empirically collaborated advice to managers on how to build and sustain dynamic

	capabilities. Drawing on practice-based case study research, the thesis identifies processes and activities that enable dynamic capabilities in the IT security industry. External engagement with regulators and significant organisations enable superior sensing ability. Effective recruitment/resourcing strategies and processes are required for firms to acquire and retain scare talent and accumulate experience. Exploiting consulting experience and storytelling of success gain credibility to win business. Meeting and workshops facilitate knowledge sharing to sense and calibrate opportunities to seize upon. Clarity of language is required during knowledge articulation and codification efforts as it improves actor's understanding of routines/capabilities and creates a firm's brand which is differentiator. Storytelling when using artefacts enhances its value and provides 'natural' intellectual property protection from outsiders. The contribution of this work is that it provides practical advice to firms on processes and activities that enable dynamic capabilities in the IT security industry. Section 8.5 details practical advice given to organisations on dynamic capabilities.
Q4	**Does structure enable or constrain dynamic capabilities in organisations?**
	The research question answers the call to investigate the role of structure, as a microfoundation of routines and capabilities, on dynamic capabilities. The research informs that the manner and nuances in the way industry best practices and routines are structured and deployed differs across firms and contributes to heterogeneity in firm performance and dynamic capabilities. In addition, the structuring of routines to create simple or complex capabilities impacts on internal knowledge transfer and IP protection from outsiders which are both elements of the microfoundations of dynamic capabilities framework (Teece, 2007). In addition, organisational structure in consultancy firms enable superior sensing ability but challenges for seizing and reconfiguring ability for firms. The contribution to literature is that it explicates the significant role structure plays in dynamic capabilities in organisations.

The next chapter is the conclusion chapter which will cover the replicability of the research, the research limitations and avenues for further research.

CHAPTER 8: CONCLUSION

8.1 INTRODUCTION

The background to the researcher's interest in the research stemmed from a thinking that an organizational theory approach rather than an economic perspective to studying individual and organization behaviour could throw more interesting light on how organizations behave in terms of the evolution of routines and capabilities. Building on that view, the PhD started on the premise that a microfoundations approach to studying dynamic capabilities could unpack firm-level outcomes and how organizations respond to and/or shape the changing external environments. This research has examined dynamic capabilities in the IT security industry by applying the microfoundations of dynamic capabilities (Teece, 2007) and other theoretical frameworks and the Gioia methodology as the empirical approach. Discussions regarding how well the principal aims of this study have been fulfilled and significant contributions which arise from the work were presented at the end of the discussions chapter. This conclusion chapter will build on that to discuss the replicability of the research performed and the inherent limitations of the research will also be addressed. Finally, practical advice for organisations on dynamic capabilities and avenues for further research resulting from this study will be discussed.

8.2 REPLICABILITY OF THE RESEARCH

The outline of the research design process implemented in the work is based on a respectable, published academic source (Quinlan, 2011). This makes the research process repeatable and replicable in the same or different research contexts. In addition, the theoretical frameworks and concepts explored are significant, highly referenced scholarly works in the dynamic capabilities literature meaning that they are credible for exploration in the research and practical contexts and can be re-employed in future research or explored further. Similarly, the Gioia methodology adopted in the research is replicable to empirical case study research and has formed the basis for many articles in the business and management field (Balogun and Johnson, 2004; Rerup and Feldman, 2011; Stigliani and Ravasi, 2012). Table 11 provides a list of studies that have used the Gioia methodology or variations of the approach. The literature review, data collection and analysis, and presentation of findings demonstrated rigour in qualitative research. Overall, it is argued that the research design and approach taken ensured the replicability of the research.

Because the research investigated actors, processes and activities involved as the firm went about renewing its strategies and capabilities, it was important to select research participants involved as the processes unfolded rather than identifying and pre-selecting all participants at the

beginning of the PhD research. This ensured that the research enjoyed richness of data from relevant participant and unpack processes at the firm they took place.

Table 11. Examples of studies that have used Gioia Methodology or variations of the approach (source: Gioia et al., 2013)

Author(s)	Year	Journal
Anand, Gardner, and Morris	2007	Academy of Management Journal
Anand and Jones	2008	Journal of Management Studies
Balogun and Johnson	2004	Academy of Management Journal
Clark, Gioia, Ketchen, and Thomas	2010	Administrative Science Quarterly
Corley	2004	Human Relations
Corley and Gioia	2004	Administrative Science Quarterly
Dacin, Munir, and Tracey	2010	Academy of Management Journal
Gioia, Price, Hamilton, and Thomas	2010	Administrative Science Quarterly
Gioia and Thomas	1996	Administrative Science Quarterly
Gioia, Thomas, Clark, and Chittipeddi	1994	Organization Science
Harrison and Corley	2011	Organization Science
Kjaergaard, Morsing, and Ravasi	2011	Journal of Management Studies
Labianca, Gray, and Brass	2000	Organization Science
Maguire and Phillips	2008	Journal of Management Studies
Maitlis	2005	Academy of Management Journal
Maitlis and Lawrence	2007	Academy of Management Journal
Mantere, Schildt, and Sillince	2012	Academy of Management Journal
Nag, Corley, and Gioia	2007	Academy of Management Journal
Poonamallee	2011	Journal of Management Inquiry
Pratt, Rockmann, and Kaufmann	2006	Academy of Management Journal
Ravasi and Phillips	2011	Strategic Organization
Rerup and Feldman	2011	Academy of Management Journal
Rindova, Dalpiaz, and Ravasi	2011	Organization Science
Stigliani and Ravasi	2012	Academy of Management Journal
Thomas, Sussman, and Henderson	2001	Organization Science

8.3 RETURNING TO THE BACKGROUND TO RESEARCH INTERESTS

The PhD study stemmed from interests and questions about routines and capabilities which progressed into specific research questions that have been answered. Some of the initial curiosity and questions that sparked the research have also been addressed:

- Organizational routines are indeed generative systems that evolve by mechanisms of individual and organizational learning through accumulation of experience
- Routines and capabilities are shaped through response to external environmental dynamism or entrepreneurial acts of shaping of the business ecosystem

- Routines in organizations are socially constructed through collective knowledge articulation and codification processes
- Language is fundamental to the way actors in organizations perform routines and legitimise or give meaning to their views and actions

For market-driven firms in the IT security industry, the research evidence shows that firms create new capabilities and evolve their capabilities (and underlying routines) and capabilities framework to match to new/changing industry standards, particularly the dominant standards in the industry at a given time. The challenge for firms therefore would be to readily sub-divide their capabilities framework to align with various standards adopted by different clients, more so if they want to gain a speed advantage over competitor firms. The decision to reconfigure capabilities rests largely with senior management, however all levels of the organization have a significant role to play in achieving reconfiguration.

With regards to market-driving firms, the research findings did not uncover entrepreneurial activities by the research firm. Teece (2012) states that entrepreneurial management involves not merely the practice and improvement of existing routines or even the creation of new ones. Rather, in dynamically competitive enterprises, there is also a critical role for the entrepreneurial manager in both transforming the enterprise and shaping the ecosystem through sui generis strategic acts that neither stem from routines (or algorithms) nor need give rise to new routines (Teece, 2012). These dynamic capabilities may be based on the skills and knowledge of one or a few executives. The research did not uncover entrepreneurial actions by individuals at the firm's top management team or entrepreneurial activities by the firm in general, however this does not imply that Teece (2012) argument does not hold true. Rather, research about the IT security industry showed that there are indeed entrepreneurial firms in the industry demonstrating dynamic capabilities by creating solutions that are shaping the ecosystem. Examples are firms providing tools and solutions to unlock smart phones and bypass encrypted data, which have created a new market for such solutions and capabilities.

The DCV has been valuable to enhancing our understanding of how firms create value and gain competitive advantage. As a relatively nascent field in strategic management, there is ample room to theoretical and empirical advance the field. Information technology security will continue to play a dominant role in individual and organizational life and the dynamic capabilities thinking could be a useful paradigm to aid our understanding of how this industry continues to evolve.

8.4   RESEARCH LIMITATIONS

Like most research, this study is subject to limitations that should be borne in mind when interpreting its outcomes.

This research is located within the naturalistic paradigm and such a naturalistic study aims to understand relationships, mechanisms and interpretations within particular contexts, therefore it cannot make law-like generalisations about dynamic capabilities. This study can only give practical advice within a certain context and give rise to interesting questions about some of the outcomes. The conceptual model developed serves as a guide to scholars and practitioners and is not meant to be generic to every context or industry. The naturalistic approach has other merits as argued by leading academic sources, for example the Academy of Management Journal has begun to accept to a greater degree, with 11% of articles between 2001 and 2010 using purely qualitative data (Bansal and Corley, 2011). The main merit is the "intimacy with the phenomenon of interest" which qualitative methods permit, with greater proximity to the "ideas, the people and the events that stimulated the researcher's curiosity (Bansal and Corley, 2011: 235). This is the case with the PhD research in this work.

The research firm is the object of this study and this could lead to suggestions that the findings are context-specific and have limited application/generalisation out with this context. It is argued here that, although the research was a single case study of an organization which may have unique characteristics, the findings are likely to contain useful insights for other similar firms in the industry. This is because the firm represents a typical firm in the IT security consulting industry. Certainly, similar challenges in terms of responding to industry dynamism and protecting intellectual property of intangible assets will be common to firms in the industry. The findings about the specific way in which the firm delivers value in risk management capability can be promoted as a successful replicable approach to other firms in the industry. Moreover, the fact that consultancy firms in the industry have similar a staff-structure and organise work around project teams, it is argued to be a sufficient basis to lend the findings substantial scope and impact. The researcher sought to gain research access to another company but that was unsuccessful. It may have proved beneficial to have used, as a comparison, another case study. This may have thrown up interesting issues, for example differences in the way firms respond to industry challenges or the unique way dynamic capabilities are built and sustained for each firm. Unfortunately, granting research access to a second research company was initially delayed and ultimately unsuccessful.

A naturalistic study as that performed in this research aims to understand relationships, mechanisms and interpretations, including those of actors. The multi-level research involved macro level analysis including the actions and interpretations of extra-organisational aggregate actors at institutional level such as government, regulators and industry professional accreditation bodies. A limitation of the research is that the researcher had no direct research engagement with those institutional actors, rather relied on secondary data sources available on the internet. This is

because it may have been challenging to gain access to those actors and the researcher was mindful of investing valuable limited PhD research period in the process of gaining access and considering that they were not the main object of the research, the researcher made the decision to spend precious research time at the research firm. First-hand account from institutional actors would no doubt have enriched the research, however the availability of a large amount of secondary data available on the internet was invaluable to the research and supplemented the primary data collected in the research. Similarly, having first-hand client narratives about the working relationship with the firm and their interpretation of actions and project events engaged with the research firm, would have provided another perspective to enrich the research data. However, the researcher had no formal research interaction with the firm's clients – the only interactions with clients were at two informal social events as presented in Appendix three. This is because the confidential non-disclosure agreement signed between the researcher and the firm did not permit the researcher to engage formally with the firm's clients. Research access approval and non-disclosure agreements would have been needed from client organizations to be involved in the research. It is therefore argued that a minimal client dimension in the research is a limitation of the study. Nevertheless, the insights gained from key participants at the research firm who provided some client perspective was highly valuable despite the limited client interaction during the research.

Furthermore, there were some mitigating factors that came into play during the research. One is that there were some restrictions placed on the researcher on access to data. The researcher was not permitted to attend some client meetings at the firm (for example, a number of Royal London post-project meetings) during the course of the research project because of confidentiality agreements between the research firm and client organisations. Also, at some top management team meetings and workshops attended, the researcher was not allowed to record conversations that took place because of the sensitivity of business information discussed. However, the researcher was always permitted to makes notes which were further developed into detailed fieldnotes that were extremely useful. The richness of the data would perhaps have been improved with a full recorded conversation which the researcher would have transcribed and reflected on to gain deeper research insights. In addition to that, the researcher was privileged to be included in the company email communications and had access to vast amounts of company documents and information which provided research insights and some of these documents were produced in the thesis and the appendix section. However, there are a host of extremely insightful company documents made available to the researcher but were not permitted to be produced in this work due to firm confidentiality reasons. These would have enriched the thesis context and provided a deeper trail of evidence to further support the discussions and

conclusions arrived at in the thesis. This therefore is regarded as a mitigating factor in the research. Another mitigating factor relates to adjustments made to the interview schedule during the period of research. As events that were part of the empirical focus of the research unfolded at the firm, the researcher sought to interview actors involved (as research participants) immediately after to capture their experiences and interpretations of 'why' and 'how' while events remained at the forefront of actor's memory. In some instances, soon after events, research participants were occupied in their normal work or were away working at client organisation so were not available to the researcher immediately. This meant a rescheduling of interviews for a future date. The researcher made attempts to accommodate for the interview delay by preparing the event-related interview questions immediately and where possible, emailed them immediately to research participants to get a response to the questions. However, some interviews or responses did not happen immediate which to some degree may not have fully captured the richness of the narratives of actor's experiences as compared to if the interviews had happened much closer to the time of the event. This is regarded as perhaps a mitigating factor in the research. Notwithstanding, many of the mitigating factors discussed here are common to empirical research and the researcher employed good research skills and research ethics to accommodate for them in the research.

The point of research termination at the firm can be considered as one of the limitations of the study. The research started in August 2015 and from April 2016 to October 2016, the firm engaged in knowledge transfer of created artefacts and implementation of its new replication strategy. By October 2016 when research at the firm concluded at the end of the PhD data collection period, the replication strategy was beginning to grow into full maturity. The decision to conclude interviews and all data collection at that stage was primarily because the researcher had reached the point of theoretical saturation with regards to the research questions and also because of the limited period allocated for data collection in a PhD study. It is reasonable to argue that further engagement with the firm may perhaps have illuminated a host of interesting issues relating to performing replication by actors, for example challenges encountered or indirect costs of 'misfire' or poorly performed replication as argued in the literature about the use of codified artefacts (Zollo and Winter, 2002). More so, it is quite possible that a new concept or phenomenon may have emerged post-replication that would provide new theoretical insights and a meaningful contribution to scholarship. In this regard, a longitudinal study may have accommodated for a longer research engagement. Despite the fact that the research questions were overwhelmingly answered by the time the research at the firm ended, it is recognised that it can be seen that the point of termination of research is a potential limitation of the study.

Lastly, the weaknesses of the model developed from the research is regarded as one of the research limitations. The main shortcomings of the model are that it is highly favoured to knowledge-intensive domains and it may be particularly useful within certain contexts, for example for consultancy firms that typically have strong external interactions as well as the need to constantly adapt to various clients. Detailed discussions about the relevance and limitations of the model can be seen in section 7.9.3 of the discussions chapter presented earlier in the thesis.

8.5   PRACTICAL ADVICE TO ORGANISATIONS ON DYNAMIC CAPABILITIES

Building on insights from the research findings, the thesis proffers practical advice to organisations on how to build and sustain dynamic capabilities. During the 15-month research engagement at the research firm from August 2015 to October 2016, the researcher delivered many presentations during research visits at the firm to provide advice. The advice specifically related to how firms can achieve superior abilities to sense and seize opportunities and threats and renew and reconfigure capabilities as well as processes and activities that enhance experience accumulation, knowledge articulation and codification efforts. A summary of key advice to organisations is based on the research is presented here.

Practical advice to company on actions that support the ability to sense opportunities and threats

- Firms should have company policies, incentive systems, a learning culture, professional development and mentoring schemes to nudge employees to partake in external engagements such as networking events, conferences and vendor exhibitions to gain new knowledge, build networks and for professional growth and development. These are vital sources knowledge about opportunities and threats in the industry which firms can sense and act upon to remain business relevant and competitive in the fast-changing industry.
- Firms should actively seek to work and collaborate with significant organisations since such organisations are often abreast with current developments in the industry, including the changing IT security threat horizon. They are a valuable source of new knowledge.
- An engagement with social media especially twitter, from a professional point of view, is a valuable source of new knowledge and up-to-date information. Firms should promote this.
- Firms are encouraged to actively engage with regulators in the industry. That allows firms an opportunity to gain first-hand knowledge about regulatory matters including anticipated regulatory movements which the firm can quickly act on to gain first mover

advantages over competitors. Engagement with regulators may also afford the opportunity to influence regulation to the benefit of the firm.

Practical advice to company on actions that support the ability to calibrate and seize opportunities

- Organising regular knowledge sharing workshops in firms is important to sense opportunities and threats emerging and to calibrate those to ascertain those that the firm will seize to act upon. Promoting a culture of open communication between and across organisational levels and teams helps to facilitate knowledge sharing efforts.

- Project management training and experience is essential for individuals to overcome the problem of poor IT security project delivery in the industry. The improvement in a firm's project delivery will enhance its reputation allowing it to seize opportunity to win business.

- Firms especially through its leaders have opportunity to 'sell the security story' to business leaders to convince of the importance of investments in IT security needed to protect their organisations. That will also create more business opportunities for firms.

- Firms especially through its leaders should deliver the narrative for the industry to employ skilled individuals that may not possess formal qualifications. This would help to alleviate the problems of skills shortages in the IT security industry.

- Firms should seek to work with stakeholders including the government, educational institutions and professional bodies to create policies, incentives and training to increase the talent pool in the industry. This would help to address the problems of skills shortages.

- Firms should develop effective human resource strategies including an active role of leaders in recruitment, implementing a referral system through a network of colleagues and favourable work incentives and organisational culture. This helps to recruit and retain scare talent in the industry as people are a key source of competitive advantage.

- Firms should seek to recruit a diverse range of individuals with skills set that adds a new dimension to teams or the firm as this provide an essential source of accumulated experience and new knowledge to the firm.

- Firms should actively seek to exploit experience as consultant because consulting experience and storytelling of success or 'healthy war stories' provides credibility and is a differentiating factor in the IT security industry which is vital to winning business from clients.

- Firms should develop a common language during internal and external communications and in firm artefacts as this creates and promotes the firm's brand. This serves a differentiating factor which the firm can exploit in the marketplace.
- Firms should promote good values and leadership as this helps to build loyalty and commitment in employees which leads staff retention. This is significant because it facilitates 'speaking' the firm's language and 'living and demonstrating' its values to clients which helps to create the firm's brand.

Practical advice to company on actions that support the ability to reconfigure intangible assets and achieve intellectual property protection of assets

- Firms should continuously renew and realign their capabilities and accompanying capabilities framework to match the changing industry and industry standards that clients adopt and engage in strategic organisational learning to reconfigure their capabilities framework to facilitate ease of integrating new capabilities.
- Firms should develop capabilities that simultaneously achieve technical competences and match the needs of client's environment as this makes it easier to sell the capabilities to clients.
- Firms should integrate a combination of business strategies that are closely complementary to one another because that is value-adding, and the interrelationships is harder for competitors to discern and imitate, thus provides a source of competitive advantage.
- An investment in the direct costs for knowledge articulation and codification and knowledge transfer on use of artefacts is required to support a successfully replication strategy. This includes the costs or organising meetings and workshops and time of individuals involved.
- A clear articulation of the hierarchy of routines and processes within capabilities as well as clarity of language is required during knowledge articulation and codification efforts to create artefacts to be used for replication.
- Individuals, under the guidance of managers, should be tasked to improve and reconfigure artefacts based on valuable practical experience gained when using them.
- Storytelling when using artefacts enhances its value and the tacit know-how of using artefacts is difficult to copy by outsiders so provide intellectual property protection. Firms should also develop artefacts that fit within the narrative of firm, create awareness programmes, trainings and mentorship, and promote an organisational culture that values and support storytelling.

- Firms should structure simple routines/capabilities for ease of internal knowledge transfer and complex routines/capabilities which though provide a challenge for knowledge transfer, are harder for outsiders to discern and copy so provide some 'natural protection' from intellectual property theft. This would ensure that on the balance firms can take advantage of the positives of knowledge transfer and IP protection.

- The conceptual model developed in this thesis can be used to assign roles and responsibilities relating to sensing, seizing and reconfiguring to suit individuals and functions at firms. A Chief Information Security Officer (CISO) could be assigned the remit of strategic direction to keep the firm aligned to the changing industry and provide guidance on the reconfiguration of intangible assets whereas a product development team could be responsible for seizing opportunities arising from knowledge sharing initiatives to innovate products that renews a firm's offerings and capabilities.

8.6   AVENUES FOR FURTHER RESEARCH

Since the dynamic capabilities view (DCV) remains a relatively nascent field, there is scope for additional research to be done. Specifically emerging from this study, the research avenues discussed below are advanced as being of particular promise.

This study provided eleven firm level outcomes in the data structure presented in the thesis. Whilst it can be argued that some of the outcomes are distinctive to the firm since dynamic capabilities are path dependent and are rooted to a firm's unique history and activities, there are outcomes that will be common to and relevant to firms in that industry - for example, industry challenges and knowledge management. Valuable work could be exploring any of these outcomes within the context of dynamic capabilities. For example, Teece (2012) states that wealth will flow to firms that exhibit innovation in a dominant paradigm and own its strong intellectual property position in critical technologies. The challenges associated with know-how and IP protection from a dynamic capabilities perspective as discussed in this work could be an interesting research case.

Future research could also test the conceptual model produced in this work in a specific domain (for example, in the same IT security consulting industry) or within broader knowledge-intensive domains. To be useful, a theoretical framework must be general enough to provide guidance in a variety of situations, but the theory must not be so general and academic that it has little to do with practical management problems. The framework developed in the thesis along with the practical recommendations proffered, were done in such a way as to achieve this balance and be relevant to big-picture issues. To advance the model and refine the work, future research could empirically test it and provide further recommendations based on empirically collaborated insights.

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APPENDICES

APPENDIX ONE

List of Key Articles on Dynamic Capabilities

Reference	Method	Main Approach	Summary
Adner & Helfat (2003)	Quantitative	ANOVA decomposition of variance; hierarchical regression	Conceptualization of dynamic managerial capabilities as underpinning heterogeneity in managerial decisions and firm performance in the face of changing external conditions
Ambrosini et al. (2009)	Conceptual	Literature review; illustrative examples	Hierarchy of dynamic capabilities related to managers' perception of environmental dynamism: incremental, renewing and regenerative DC
Anand et al. (2010)	Quantitative	Heckman probit model	Theory development around how technological and complementary capabilities affect firms' abilities to enter emerging technologies
Aragon-Correa & Sharma (2003)	Conceptual	Literature review; hypothesis/proposition development	Integration of perspectives from the literature on contingency, dynamic capabilities, and the natural resource-based view
Arend (2015)	Conceptual	Theoretical discussion	Linkages between the infinite hierarchical levels that form the paths to the origins of sustainable competitive advantage in both the resource-based view and dynamic capabilities view
Arend & Bromiley (2009)	Conceptual	Literature review	Criticism regarding how the dynamic capabilities view can add to management research
Athreye et al. (2009)	Qualitative	Case Study	Impact of regulatory changes on strategy and the evolution of dynamic capabilities
Athreye (2005)	Qualitative	Case Study	Analysis of the evolution of dynamic capabilities in the Indian software industry
Augier & Teece (2009)	Conceptual	Literature review	Investigation of the role of managers in the economic system
Augier & Teece (2008)	Conceptual	Literature review	Discussions of the intellectual roots of the dynamic capability view
Barrales-Molina et al. (2003)	Quantitative	Hypothesis development, surveys,	Development of a multi-indicator, multi-cause model

		exploratory and confirmatory analysis	to explain dynamic capability generation
Barreto (2010a)	Conceptual	Literature review	Development of new conceptualization of dynamic capability as an aggregate multidimensional construct
Benner & Tushman (2003)	Conceptual	Literature review; proposition development	Contingency view of process management's influence on both technological innovation and organizational adaptation
Bingham & Eisenhardt (2011)	Qualitative	Multiple case, case study	Theory development clarifying that heuristics are central to strategy
Bingham et al. (2015)	Qualitative	Extended case study	Emergent theoretical framework that develops the concept of 'concurrent learning'; insights about managing growth and the utility of distributed practice
Blyler et al. (2015)	Conceptual	Literature review; proposition development	Identification of the specific role of social capital in a dynamic capability
Bock et al. (2012)	Quantitative	Hypothesis development, survey, regression analysis	CEO perceptions of the drivers of strategic flexibility during business model innovation
Bowman & Ambrosini (2003)	Conceptual	Literature review	Dynamic capability view can be used to extend resource-based view to inform our understanding of strategy
Bruni & Verona (2009)	Qualitative	Case study	Conceptualization of dynamic marketing capabilities as a complementary source of competitive advantage
Buenstorf & Murmann (2005)	Qualitative	Case study	Drawing a parallel between Ernst Abbe's management principles at Carl Zeiss and resource- and capabilities-based views of the firm
Capron & Mitchell (2009)	Quantitative	Interviews, survey and longitudinal data	Influence of firms' selection capability on their ability to renew their capabilities
Carpenter et al. (2001)	Quantitative	Ordinary least squares (OLS) multiple regression analysis	Using a dynamic capability framework, study analyses whether CEOs with international assignment experience create value for their firms and themselves through their control of a valuable, rare, and inimitable resource
Chen et al. (2012)	Quantitative	Hypothesis development, secondary data, panel regression analysis	Examination of how entrepreneurial entry by diversifying and de novo firms in new industries lead

			to different levels of performance
Coen & Maritan (2011)	Conceptual	Computer simulation; agent-based modelling	Investigation of the role of dynamic capability of resource allocation to invest in operational capabilities
Danneels (2008)	Quantitative	Longitudinal and cross sectional data regression	Analysis of how dynamic capabilities used to build new competences affect marketing and R&D capabilities
Danneels (2010)	Qualitative	Case study	Investigation of resource alteration process by which dynamic capability operates
Delmas (1999)	Quantitative	Multinomial logit regression	Complements transaction cost economics with dynamic capabilities approach
Di Stefano et al. (2010)	Quantitative	Bibliometrics/co-citation analysis	Structure of the dynamic capabilities research domain
Dixon et al. (2010)	Conceptual	Literature review; hypothesis development	Theoretical framework of organizational transformation
Doving & Gooderham (2008)	Quantitative	Linear regression (OLS)	Differences in the scope of related diversification in firms can be accounted for by differences in their dynamic capabilities
Dunning & Lundan (2010)	Conceptual	Literature review	Institutional underpinnings of dynamic capabilities
Easterby-Smith et al. (2009)	Conceptual	Literature review	Evolution of the concept
Easterby-Smith & Prieto (2008)	Conceptual	Literature review	Conceptual connection between dynamic capabilities and knowledge management
Eggers (2012)	Quantitative	Hypothesis development, OLS regression analysis	Contingencies relating firm experience to product development capabilities, focusing on experience type (breadth vs depth) and timing (prior vs concurrent)
Eisenhardt & Martin (2000)	Conceptual	Literature review; theory development	Explication of nature of dynamic capabilities which are specific and identifiable processes; commonalities of dynamic capabilities exist across firms
Eisenhardt et al. (2010)	Conceptual	Literature review	Microfoundations of performance in dynamic environments – balancing efficiency and flexibility in dynamic environments
Forrant & Flynn (1999)	Qualitative	Case study	Analysis of how enterprises successfully develop

			dynamic capabilities
Foss (2003)	Conceptual	Literature review; proposition development	Investigation of how organizational structure affects dynamic capabilities
Galunic & Eisenhardt (2001)	Qualitative	Multiple case study	Presentation of microsociological patterns of architectural innovation and theorization of an organizational form term "dynamic community"
George (2005)	Quantitative, qualitative	Mixed methods – Case study (Qual); OLS regression (Quant)	Effects of experiential learning on the cost of capability development
Gilbert (2006)	Qualitative	Multi-level; longitudinal case study	Identification of threat and opportunity frames as part of a broader class of competing processes that lie at the root of dynamic capabilities
Guiduci & Reinmoeller (2012)	Conceptual	Literature review and theoretical discussion	Investigation of the process of reification of dynamic capabilities as the basis of reconciling divergent views in the literature
Hahn & Doh (2006)	Conceptual	Bayesian model approach	Usefulness of Bayesian approaches in strategy research that integrates micro- and macro-phenomena within a dynamic and interactive environment
Hart & Dowell (2011)	Conceptual	Theoretical discussion	Reevaluation of Natural Resource-Based View (NRBV) linking with dynamic capabilities perspective
Heimeriks et al. (2012)	Quantitative, qualitative	Hypothesis development, interviews, surveys, OLS regression analysis	Underlying mechanisms and deliberate learning in the context of post-acquisition integration; successful acquirers develop higher-order routines that prevent the generalization of zero-order routines
Helfat (1997)	Quantitative	Tobit regression	Investigation of role of complementary technological knowledge and physical assets in dynamic capability accumulation
Helfat (2000)	Conceptual	n/a	Provision of overview of how dynamic capabilities emerge
Helfat & Peteraf (2009)	Conceptual	n/a	Discussion of the development path of dynamic capabilities research
Helfat & Peteraf (2015)	Conceptual	Theoretical discussion	Identification of specific types of cognitive capabilities underpinning dynamic managerial capabilities for sensing, seizing and reconfiguring,

			and their potential impact on strategic change in organizations
Hodgkinson & Healey (2011)	Conceptual	Literature review	Discussion of psychological and behavioural foundations underpinning dynamic capabilities
Hsu & Wang (2010)	Quantitative	Bayesian regression analysis	Development and test of theoretical model on how dynamic capability mediates the impact of intellectual capital on performance
Hsu & Wang (2012)	Quantitative	Hypothesis development, Bayesian regression model	Explanation of dynamic capabilities mediates the impact of intellectual capital (human, relational and structural capital) on performance
Jenkins (2010)	Qualitative	Grounded theory approach	Explore the dynamics between firm level performance and technological discontinuities
Jiang et al. (2010)	Quantitative	Generalized least squares (GLS) regression analysis	Comprehensive alliance portfolio diversity construct – partner, functional, and governance diversity and relationship with firm performance
Kale (2010)	Qualitative	Case study	Analysis of learning processes involved in the development of innovative R&D capabilities
Kale and Singh (2007)	Quantitative	Confirmatory factor analysis; structural modelling	Analysis of alliance learning process that involves articulation, codification, sharing, and internalization; theorizing of how alliance management know-how positively relates to a firm's alliance success
Karim (2006)	Quantitative	Akaike information criterion (AIC) model	Investigation of the reconfiguration of internally developed vs. acquired units; exploration of what forms of unit recombination are common
Karim (2009)	Quantitative	Negative binomial regression model	Examination of how business unit reorganization affects innovation, and explores how the learning process may mediate this relationship
Karim (2012)	Quantitative	Hypothesis development, logistic regression model	Examination of the simultaneous effects of activity and unit reconfiguration on activity retention to gain insight on structural embeddedness
Karna et al. (2015)	Quantitative	Hypothesis development, Meta-analysis	Relationship between the ordinary and dynamic capabilities and the financial performance of firms in relatively stable versus changing environments
Katkalo et al. (2010)	Conceptual	Review	n/a

Kay (2010)	Conceptual	Literature review	Discussions on how dynamic capability view links to strategic decisions, structures and systems
Kim (2010)	Conceptual	Literature review	Application of property rights theory to dynamic capabilities
King & Tucci (2002)	Quantitative	Random-effects logistics regression	Analysis of organizational structures and their reconfiguration using a dynamic capabilities framework
Kor & Mahoney (2005)	Quantitative	Fixed-effects regression	Discussion of how firms can successfully deploy and develop their strategic human assets while managing the tradeoff in their service and geographical diversification strategies
Lampel & Shamsie (2003)	Quantitative	Regression	Analysis of evolution of capabilities (mobilizing and transforming capabilities)
Lavie (2006)	Conceptual	Literature review; hypothesis development	Theorizing around substitution, evolution, and transformation as three mechanisms of capability reconfiguration
Lazonick & Prencipe (2005)	Qualitative	Case study	Theory of innovative enterprise by analysing the roles of strategy and finance in sustaining the innovation process
Lee et al. (2010)	Quantitative	Longitudinal ordered logistics regression	Analysis of how dynamically changing complementarity relationships between markets increase industry hypercompetition
Lee et al. (2002)	Quantitative	Genetic algorithm-based simulation model	Examination of conditions under which strategic groups emerge and their performance differences persist
Leiblein (2011)	Conceptual	n/a	Discussion of RBV and dynamic capability view
Lichtenthaler (2009)	Quantitative, qualitative	Semi-structured interviews; structural equation modelling (SEM)	Identification of technological and market knowledge as two critical components of prior knowledge in the organizational learning processes of absorptive capacity
Lichtenthaler (2010)	Quantitative	OLS and logit regression	Development of the concept of "not-sold-here (NSH)", its antecedents and consequences
Lichtenthaler & Lichtenthaler (2009)	Conceptual	n/a	Discussion of knowledge management, absorptive capacity, and dynamic capabilities to arrive at an

			integrative perspective as a framework for open innovation
Macher & Mowery (2009)	Quantitative	Econometric modelling	Investigation of dynamic capability 'development and introduction of new process technologies'
Makadok (2001)	Conceptual	Literature review; theory and hypothesis development	Examination of nature of the interaction between resource-picking and capability-building
Makadok (2002)	Conceptual	Literature review; theory and hypothesis development	Inclusion of rational-expectation assumptions in the previous theoretical models
Malik & Kotable (2009)	Quantitative	OLS regression	Analysis of model of the dynamic capability development mechanisms in emerging markets
Marcus & Anderson (2006)	Quantitative	Regression	Investigation of whether a general dynamic capability affects both firms' skills in supply changing management and competence in the environment management
Mathews (2003)	Conceptual	Theoretical discussion	Development of model for blending internal resource accumulation with external resource leverage
Mathews (2010)	Conceptual	Theoretical discussion	Discussion of strategizing as capture of resource complementarities, activities reconfiguration and reconfiguration of routines
McKelvie & Davidsson (2009)	Quantitative	Hierarchical regressions	Analysis of how dynamic capability development is affected by access to firm-based resources and changes to these
Moliterno & Wiersema (2007)	Quantitative	Cross-sectional time series regressions	Investigation of resource divestment capability (dynamic capability) as a two-step organizational change routine
Moller & Svahn (2006)	Conceptual	Theoretical discussion	Investigating the role of knowledge in intentionally created business netwroks
Morgan et al. (2009)	Quantitative	Structural equation modelling, Hierarchical regression	Analysis of the effects of market orientation and marketing capabilities on firm performance
Narayanan et al. (2009)	Qualitative	Narrative analysis	Investigation of the process of dynamic capability development
Newey & Zahra (2009)	Qualitative	Iterative inductive and deductive theory building; process research method; longitudinal case study	Theorizing shows how interactions between dynamic and operating capabilities build the adaptive capacity of the organization

Ng (2007)	Conceptual	Literature review; theory and hypothesis development	Unrelated diversification is explained by an organization's 'three pillars'-strength of dynamic capabilities, absorptive capacity, and weak ties
Oliver & Holzinger (2008)	Conceptual	Literature review; theory and proposition development	Development of framework investigating how particular dynamic capabilities are associated with the effectiveness of alternative political strategies
Pablo et al. (2007)	Qualitative	Inductive grounded theory building	Development of strategic approach through use of an internal dynamic capability (learning through experimenting)
Pandza & Thorpe (2009)	Conceptual	Literature review; theory and hypothesis development	Conceptualization and analysis of complementary effects of creative search and strategic sense-making
Pentland et al. (2012)	Conceptual	Theoretical discussion	Development of a generative model of organizational routines and their change over time; variation and selective repetition of patterns of action as the basis for macro-level dynamics of routines
Peteraf et al. (2013b)	Conceptual	Co-citation analysis	Reasons for the contradictory understandings of the core elements of the dynamic capability construct in the two seminal articles; suggestions of a way to unify the field through a contingency-based approach
Pierce (2009)	Quantitative	OLS and Cox hazard models	Examination of shakeouts in the context of business ecosystems
Pil & Cohen (2006)	Conceptual	Literature review; theory and hypothesis development	Investigation of the link between product architecture, imitation and dynamic capabilities
Pitelis & Teece (2010)	Conceptual	Literature review; theory and hypothesis development	Investigation of the role of entrepreneurial management in orchestrating system-wide value creation
Powell (2014)	Conceptual	Theoretical discussion	Exploration of the causes and consequences of impersonalism and advocating a personalist rebalancing in strategic management research
Protogerou et al. (2011)	Quantitative	Structural equation modelling	Analysis of the relationship between dynamic capabilities and firm performance
Rahmandad (2012)	Quantitative	Simulation experiments	Examination of firm-level capability development trade-offs in the context of a firm's market level competition and growth

Ridder et al. (2014)	Conceptual	Theoretical discussion	Three ways of positioning to demonstrate a theoretical contribution through case study research in the field of management
Rindova & Kotha (2001)	Qualitative	Inductive grounded theory building	Examination of how organizational form, function, and competitive of firms dynamically coevolve; conceptualization of continuous morphing
Romme et al. (2010)	Quantitative	Simulation model; system dynamics modelling	Analysis of differential effects of articulated knowledge, codified knowledge and operating routines on dynamic capability at different levels of environmental dynamism
Rosenbloom (2000)	Qualitative	Case study	Identification of the importance of learning and processes in the context of dynamic capabilities to achieve transformation
Rothaermel & Hess (2007)	Quantitative	Regression	Identification that antecedents of dynamic capabilities lie in organizational and individual levels
Saalge & Vera (2013)	Quantitative	Hypothesis development, panel data analysis	Antecedents, moderators and consequences of incremental learning capabilities conceptualised as a dynamic capability
Salvato (2009)	Quantitative, qualitative	Case study, cluster analysis	Exploration of the role of capability evolution in achieving organizational renewal taking a process perspective
Schepker et al. (2014)	Conceptual	Literature review	Synthesis of existing literature on interfirm contracting, identification of research gaps and avenues for future research
Scheyogg & Kliesch Eberl (2007)	Conceptual	Literature review; theory and hypothesis development	Establishment of a separate function ('capability monitoring') to overcome potential rigidities of organizational capability building
Shamsie et al. (2004)	Quantitative	Econometric modelling	Examination of the difference in the ability of late movers to penetrate the market
Shamsie et al. (2009)	Quantitative	Time series, cross section regression	Identification of replication and renewal as two types of strategies that firms use to add a dynamic component to their capabilities
Schilke (2014b)	Quantitative, qualitative	Qualitative field interviews, large scale survey, OLS regression analysis	Examination of the effect of dynamic capabilities on firm competitive advantage as contingent on the

			level of dynamism of the firm's external environment
Slater et al. (2006)	Quantitative	Regression	Development of a comprehensive model of strategy formation in the context of the firm's strategic orientation
Song et al. (2005)	Quantitative	Structural equation modelling	Effects on performance of marketing capabilities, technological capabilities, and their complementarity (interaction)
Standler et al. (2013)	Quantitative	Hypothesis development, Tobit regression analysis	Impact of dynamic capabilities on the amount and success of activities directed towards accessing resources and developing resources to make them commercially usable
Tang & Liou (2010)	Quantitative	Inductive Bayesian interpretation; discriminant function analysis	Development of theoretical framework to understand the relationships among (1) sustainable competitive advantage, (2) configuration, (3) dynamic capability, and (4) sustainable superior performance
Taylor & Helfat (2009)	Qualitative	Case study	Analysis of the linkages between complementary assets managerial linking activity, ambidexterity
Teece (2002a)	Conceptual	Literature review; theory and hypothesis development	Discussion of the nature and microfoundations of the capabilities in the context of open innovation
Teece et al. (1997)	Conceptual	Literature review; theory and hypothesis development	Dynamic capabilities resting on positions, paths and processes
Tripsas (1997)	Quantitative, qualitative	Industry analysis; in-depth analysis of three firms	Exploration of the process of creative destruction; Identification of importance of absorptive capacity and organizational structure
Vergne & Durand (2011)	Conceptual	Theoretical discussion	Development of evolutionary perspective on path dependences and dynamic capabilities
Verona & Ravasi (2003)	Qualitative	Exploratory case study	Dynamic capabilities are made up of: knowledge creation and absorption, knowledge integration and knowledge reconfiguration
Wang & Rajagopalan (2015)	Conceptual	Literature review and conceptual framework development	Review of literature on alliance capabilities; development of an integrative framework distinguishing alliance capabilities in terms of value creation and value capture; methodological

			suggestions and theoretical themes for future research
Wang et al. (2015)	Quantitative	Hypothesis development, survey, structural equation modelling	Effects of success traps on dynamic capabilities and consequently firm performance, taking into account firm strategy and market dynamism
Wilhelm et al. (2015)	Quantitative	Hypothesis development, survey, structural equation modelling	Role of dynamic capabilities in the differences in operation-routine performance
Winter (2003)	Conceptual	Theoretical discussion	Strategic substance of capabilities involving patterning of activity; zero-level and higher-order capability
Witcher & Sum Chau (2012)	Conceptual	Literature review and theoretical discussion	Examination of the varieties of capitalism thesis and its implications for an integrated approach to strategic management
Zahra & George (2002)	Conceptual	Proposition development	Deduction of key dimensions of absorptive capacity and development of reconceptualization of this construct
Zahra et al. (2006b)	Conceptual	Proposition development	Definition of dynamic capabilities, separating them from substantive capabilities as well as from their antecedents and consequences
Zollo & Winter (2002)	Conceptual	Hypothesis development	Discussion of the mechanisms through which organizations develop dynamic capabilities (organizational routines)
Zott (2003)	Conceptual	Simulation study	Analysis of how the dynamic capabilities are linked to differential firm performance within an industry
Zuniga-Vicente & Vicente-Lorente (2006)	Quantitative	Cluster algorithm, Probit regression	Examination of the effects of 'strategic moves' (strategic change) on the likelihood of organizational survival

APPENDIX TWO

INTERVIEW DATA – Dimensions, Themes, Categories, and Data

Second-order themes and first-order categories   **Representative data**

Overarching dimension:

Analytical Systems to 'Sense' Opportunities: Environmental Dynamism	
1. IT Security industry is competitive and dynamic	
A. IT Sec industry is a competitive and dynamic marketplace so there is a need to constantly evolve	A1. "One of the drivers is that we operate in a competitive marketplace and dynamic marketplace … so competitive in terms of there are lots of people now doing what we are doing therefore we need to remain current and up to speed, and dynamic because the marketplace we operate in is changing and fast changing. Therefore, knowledge of yesterday is not current tomorrow" (Director A).
B. IT Security moves at a much faster rate than general IT	B1. "We are not selling cars, we are selling into a space that moves … IT doesn't move at that rate anymore [fast], IT has slowed down. IT is more commoditised but security isn't because of the bad guys … the bad guys are getting worse and worse, there's more and more things people are taking advantage of, in terms of putting information where it is convenient … like the cloud and things, it's made things worse" (Director B).
2. Dynamism creates new opportunities and threats to firms	
C. Fundamental new developments in IT such as the cloud and cyber are presenting new challenges and opportunities for IT security	C1. "When we started [the company] the cloud wasn't talked about in the way the cloud is talked about today … that many years on, and that's the fundamental difference. Cyber wasn't talked about the way it is today, the very big things are changing in our industry. So, because of that and because of the competition we need to be knowledgeable" (Director A).
D. Knowledge Management is an opportunity internally to most firms to be effective, however in IT security it is external and a threat to business if not renewed	D1. "So, I guess for a lot of companies, knowledge management is an opportunity inside to some extent, certainly with the client … inside in terms of sharing knowledge internally so you are effective. But I think in our business, in our industry you can get left behind such that it because a threat to your business if you don't know what is going on" (Director B).
3. Opportunity recognition to exploit it	
E. Businesses migrating processes and data to IT systems have increased IT security risks exponentially leading to a challenge for the IT sec industry to meet this need	E1. "In the world … in the last 30 years, putting all these business processes and critical data into IT systems to reduce costs. We've been doing that for 30, 40 years, in the last 5 years the security risk on doing that has doubled, tripled, gone exponential and it's going up all the time. So, the challenge for the security industry is

		to try and basically fill that gap" (Director B).
F.	There is a huge opportunity to help businesses to keep them safe and secure	F1. "It's a huge opportunity to help people [businesses] sort out their world but they can't see it or they don't understand it" (Director A).
G.	The big challenge is for the IT sec industry to recognise this opportunity	G1. "The big challenge for our industry is to realise this opportunity … it's not a downside, it's an opportunistic side" (Director B).

Analytical Systems to 'Sense' Challenges

4.	Problems of skills shortage	
H.	Skills shortage is a challenge in the industry especially in spheres of new, leading-edge technologies	H1. "Ok, another one [challenge] that I think is a downside is a shortage of skilled resource. I saw an estimate that said globally there is a shortage of 600,000 information security specialists and even greater shortage of particular specialisms within it which tends to be at the more leading edge applications of technical solutions. So, there is a tool that came on the market about 4 years ago, which I think is called CyberArk. In the first two years, the only people that had CyberArk skills were CyberArk [the company] and one agent they had in the UK. Now if you search you might find 40 or 50 people in the UK that have worked with it or a hundred … and it's become the market leader that lots of big companies want to use. So, shortage of skills and that's in general terms but also in very focused spaces as well" (Director C).
I.	The industry discriminates against talent who do not possess formal academic qualifications even though they might have the job skills	I1. "And I think the skills shortage thing … part of the problem there is the industry is its own worst enemy. Most of the people in the industry from the old days think that the only way you can do security is if you've got some security badge. When there wasn't much to doing security, people had a lot of time to go and get qualifications … engineering qualifications in security and so they did all that … and so the guys who lead on that have got all those qualifications" (Director B).
		I2. "There is a whole load of people who we see when we are trying to put own guys [staff] in [in client organizations] who won't accept them" (Director A).
J.	IT security skills may not require not require formal academic training	J1. "Now it's a bit more real. Sure, there is some basic things you need to know but it isn't like rocket science. If you are a good IT practitioner or you're a good risk practitioner or whatever, you can quickly come across into the space" (Director B).
5.	Connecting with a macro level discourse and delivery are significant challenges	
K.	The industry has a difficulty converting the security story into a business language that the Board understands	K1. "I think another one [challenge] is, the industry has a difficulty converting the security story into a language that the Board is comfortable with" (Director C).
L.	Taking the business on the journey of security is a big challenge	L1. "Taking the business on the journey of security is a big challenge for the industry of security" (Director A).
M.	Successful delivery of IT security solutions requires and understanding and integration of people, processes and technology	M1. "… and maybe associated with that, the industry is not very good at implementing what it promises. Two things; not good at implementing projects generally but if you look at the business case that was written … if we buy this tool we can do these ten things, and three years later two of the things are working and the other eight there is no view of how they will ever make it work. Because again the industry is populated with people that think security and aren't really very good at solutions which involves people and process as well as

Analytical Systems to 'Sense and Shape' Opportunities: Knowledge Dynamism		technology" (Director C).
6.	External engagements impact on ability to sense and shape opportunities	
N.	Engaging with regulators helps shape industry and to gain industry intelligence which is a source of competitive advantage	N1. "C [Director C] is working in a big client at the moment and we were talking a week or two back and he said some of the team members have just come back from a meeting with the principal regulator, they've spent a whole day with the regulator. And we started a conversation that said, 'Gosh! The level of intelligence that they are getting'" (Director A).

N2. "Not just one regulator, all the global regulators meet with this client. Periodically, they fly into one city and one of the regulators host it" (Director C).

N3. "So, we've then got a client that is absorbing all that information. That told us other people were meeting with the regulator and setting the bar, we are on the outside of that. Therefore, we are at a disadvantage and it's an example of as time goes by, periodically our consciences will prick and say, 'we've got little things that keep us in touch with the heartbeat but actually more than probably we should be, we're divorced from the heartbeat.' This is a gap for us" (Director A). |
| O. | Sensing of changes in the industry is best achieved intuitively through working with major, significant client organizations | O1. "Where we've had the best education, I would say intuitively, for a while B (Director B) was just on top of everything because with a client, he was at the heart of the decision making about what was going on in security and it had to be bleeding edge because there was regulatory pressure, Board pressure on this client … it was a major client and major institution. And therefore, three years probably we were bang up to speed with everything that was going on" (Director C).

O2. "And the last two years we've suffered as we've come to the end of that work with the client" (Director A). |
| P. | Best learning and education is achieved by working with and observing clients | P1. "I saw something that was quite mind-blowing in terms of speed … we've been talking about speed. I've been working with a client that I would say is quite sluggish, routinely they take time. I've just seen them achieve something in six months that a previous client is still doing three years later, because they took a different attitude. If I was in touch with any Chief Executive … we very seldom talk to Chief Executives, I would say, 'Do it this way you will fix it by then, if you don't personally do it as Chief Executive it will take forever.' And just by observing, the best way we learn is by being on site and observing and we see things done badly that we think, 'actually, we've seen it done better than that, we know how to do that better', through to a couple of cases this year I've seen something done and I don't want to be involved in that. We couldn't possibly move at that speed or help them to be any better" (Director C).

P2. "I do think it's still a bit of a gap in our knowledge framework … how we harvest all that back in and more broadly socialise it, share it" (Director A).

P3. "So, I think one of the conversations I was going to have with the guys [other directors] is, my current assignment will finish somewhere later on this year and I have a chance, probably holding on to a different sort of role in this client on a part-time basis through next year. I think there could be very significant value in doing that, actually as much as anything on the learning side, not so much to earn the money but on the |

		learning side because of the journey this client has been on" (Director C).
7.	Processes to tap exogenous new knowledge and learning opportunities	
Q.	Experiences and activities are the sources of new knowledge	Q1. "I think it's what we are working on at the moment [is the source of new knowledge into the organization] … It is basically the activities and experiences we gain as we do more work" (Project Manager 1).
R.	The more significant and bigger the client, the more useful and relevant the learning and new knowledge	R1. "I would say, one very significant piece of work B [Director B] does with a significant client [bank name], he is very much looking at the changing threat horizon and whether there is a change in prioritization. Because he is working with a lot of people in the client site who are looking at that, just by being in those workshops he brings something in" (Director C).
S.	At external events and workshops people are very revealing about their experiences and situations which give healthy war stories	S1. "I more than anybody will go to events and workshops just to hear conversations going on … It could be through presentations or could be in conversations. People are very revealing about their experiences and vendors are very open about situations and incidents and that gives very healthy war stories" (Director C).
T.	Getting new clients provides more interactions and experiences which ultimately creates more knowledge	T1. "I think the third would be, the more clients we get the more interactions we have, the more knowledge we gain just going into the client organizations … different people have different experiences" (Director A).
8.	Actors bring in new knowledge and experiences	
U.	On the job learning by directors leads to knowledge that is brought back to the firm tacitly	U1. "We'll do something and as we are doing it we learn more and we try to bring that back in … we do that anyway tacitly, we try to bring that in. We learn on the job, we come up with things we realise what works and doesn't work" (Director B).
V.	Staff working on client projects bring in valuable opinions and knowledge to the TMT	V1. "Our guys [staff] also have worked out there they've got their own experiences. Their opinions and knowledge is valuable to us but we are not using that enough" (Director B).
9.	New dimensions from actors improve artefacts	
W.	New people employed bring in new dimensions from their experiences and improve company artefacts	W1. "Well, we are getting an input though [from staff]. We bring in new persons, if you think about what Jim brought in on the exercise he's working on. He added a dimension from his experience and he looked at some of our artefacts and he improved on them" (Director C).
X.	The firm improves its artefacts and capabilities through new employees	X1. "In our recruitment, we always try to bring in people who can add something new to the team or our offerings" (Director B).
10.	Levels of Knowledge Management is partly driven by client demand	
Y.	One of the drivers to evolve knowledge management and codification is client request but some clients are not demanding enough of our knowledge	Y1. "There is no evangelical bit that says we would like everyone [all staff] to know more than they currently do. I think our emphasis is on the knowledge to leverage with the client" (Gary – Lead SME).
		Y2. "One of the things we are suffering from is that some of the clients aren't demanding enough of our knowledge and therefore we can get away with second order [knowledge management]. We have a client now starting to really poke at our codification and that's just been a wake-up call to us and says, actually we should be there and we should be ahead of the game" (Director A).
Z.	We are a small firm so the tacit knowledge on the inside is enough to meet client	Z1. "For some of the things we do at the moment, we are small enough so the tacit knowledge on the inside is

demand but this would be a problem as the firm grows	enough to meet the client demand. But if that changes as the firm grows we have a real issue" (Director B).
Analytical Systems to 'Sense' Opportunities: Exploiting Knowledge and Experiences	
11. Consulting experience and storytelling of success gives credibility and competitive advantage to win business	
AA. Consulting experience of directors is a source of competitive advantage which helps to win business from clients	AA1. "Experience as practitioners [is our source of competitive advantage]. We've got different competitors … The thing that wins us business is, I would say, is our consultancy effort, our ability and that differentiates itself because we are practitioners who have done it ourselves. We've owned the obligation and owned the accountability within large companies and we are now applying not only the knowledge of the subject area but the knowledge and experience of implementing it and that I think gets us the credibility that puts us up able to compete with the Big Four, KPMGs, Ernst and Youngs etc. I think we have less of a differentiator at the bottom of our end use which is staff augmentation where we are just sourcing people now from the market to fit our specific demands" (Director C).
AB. Evidence of business success and storytelling of success provides credibility to clients which helps to win and retain clients	AB1. "The credibility we have with our longest-term client is that we just have a very good track record of doing it so they will continue to do it with us. With our newer clients, it tends to be … it's a natural extension of you told us what to do, can you help us do it? Yes, you can, we trust you until we lose the trust in you" (Director C). AB2. "We are getting a little bit of a snowball effect now with some of our newer clients where because we've done it … our biggest client has got the biggest security change programme in the UK, we help them with that and our other clients know that and we certainly tell them that when we speak to them so that gives us credibility. It's trading on some experience stuff that we've done before" (Director B).
12. Common knowledge is exploited differently, internally and externally by TMT	
AC. There is a need to have a shared common understanding of some core knowledge which is used for different purposes	AC1. "What is that diagram with three circles called … We [directors] are a Venn diagram. So, if you think of us like a Venn diagram, there will be a sweet spot in the middle where we all need to understanding something in a common fashion but we will all be going off using it maybe for slightly different purposes on occasions. So, if it is for selling the knowledge would be used in this way. If it is to help install and change something in the client, we might use it in a different way" (Director A).
AD. The detailed technical knowledge in an actor needs to be brought out and shared so that we can tell the client but before that tell it to ourselves	AD1. "One of the things going on right now … we are doing today, just in terms of the way that we work is, a lot of the detailed core technical stuff that we do is in my head and that's how I operate. I kind of operate in that space and once I know it that's fine, I just work like that … And some of the details that I've got we try to bring it out a level so that we can tell the client, before that we can tell it to ourselves. So at the moment we are going through a bit of a process between me and A [director A], where A is like I need to know that thing that you know and it's not clear so make it clear to me" (Director B). AD2. "So, the process we are going through is a good process. Particularly A [director A] is very organised and focused on, let's get that stuff on the table so not only I can understand it, A will be able to understand it" (Director B).
AE. The same knowledge is used for different purposes	AE1. "But the reason for knowing is different. B [director B] wants to know it because he wants to know because he will use it, I want to know because I understand it. C [director C] wants to know it so he can sell it"

	(Director A).
	AE2. "Yeah so we've all got different levels of knowing it" (Director B).
AF. Shared common understanding is necessary because directors do a bit of everything as they change roles even though they de-facto and assume a place	AF1. "We all do a bit of everything" (Director B).
	AF2. "We can all change places [director roles] but we de-facto, assume a place as well. What we do will change places" (Director A)

Analytical Systems (Individual Capacity) to 'Sense' Opportunities: Operations Risk Management

13. Demystifying processes/operational knowledge is more value creating than technical knowledge	
AG. Power of 3 (3 directors) helps to achieve the right balance of operational effectiveness (processes) and needed level of technical details	AG1. "It's not all technical knowledge, the example I was using about recertification … we've gone through the technical knowledge. It is very much process knowledge, if you do that then that will happen better and if you do that … "(Director A).
	AG2. "B's [director B] knowledge is level of intellectual complexity which is different from operational hardness. The fact that you need to dig down fifty doors to get something is not hard" (Director C).
	AG3. "Some of the big tensions A [director A] and I have is that A is more simple-minded and practical and in the operational environment if you have lots of details in place you don't get any value out of it … it's like 70% and you just struck off the ends. Whereas I'll look at things and want to go to complicated details and with Lloyds I say we need all these thousand things and A will go, that's bullocks! And I'll go but we might need that one day and then we have this debate about do we really need them which is important [the debate]. If everyone was like me, we will have all these complicated propositions but one or two of them will be effective" (Director B).
AH. A problem in IT Sec industry is an obsession with technical knowledge (technology) to the detriment of process knowledge and implementing operational effectiveness	AH1. "We've seen it in the security field. There's a lot of very clever people who will argue about the theory and argue about the theory and three years later they will still be arguing about the theory and nothing will actually happen … nothing would have migrated from theory into process and operational model and the outcome that the shareholders want, that is, the business to be secure will be no more secure" (Director C).
	AH2. "C's [director C] points is very prominent because security has a lot of people that are mentally quite bright, they are jumping on and spending their lives exploring theories" (Director B).
AI. Business owners and decision makers are more concerned with operational knowledge and risk management that will make the business secure	AI1. "Therefore, what we've got, B [director B] can go toe to toe with these people and then will come away with right, we've got enough of that [delivery focus] now let's get articulation in business language let's just get talking business language" (Director C).
	AI2. "That's the simple 33 revolution per second [referring to converting director B's intellectually complex technical knowledge into simple understandable business language]" (Director A).
	AI3. "Yes, that's because that's what the people that own the business do, that's what people that run the business do … it's the people that do the work do. The only people that are bored with the techie stuff is that

		very small percentage but critical, important" (Director C)
	AJ. Converting the technical security language to a business language for decision makers is a challenge but is of immense value	AJ1. "You can't do anything without that but then it becomes its own worst enemy when you try to explain it to people. In fact, that's why my role with the client is to take all the technical details that their guys have got and turn it into something that is business relevant for them" (Director B). AJ2. "Being able to demystify [processes/operational knowledge and technical/business language] is a strength of our organization and we trade on that" (Director A)
14. Risk Management gained through practical experience is of value		
	AK. The business proposition for security at senior level is risk management and that is where value lies	AK1. "So, in our world, the business proposition for security for an organization at the senior level is risk management. We, unlike a lot of security companies, trade on that. If your perimeter is good, like a lot our clients achieve … the big clients they spend the money on that, we'll say you're good on that, actually spend the money on a risk management tool" (Director B)
	AL. Experience as practitioners is vitally important to turn complex security into risk management	AL1. "We have lived in and worked in a space where we try to turn security into risk management … complex security in terms of what processes you need to put in place as well as technology. We turn it into a risk management thing because security is the cost of doing business. It has crept up on everybody. It didn't used to be the cost of doing business, it used to be something you just sort of did because it was the right thing to do" (Director B).
Analytical Systems (and Individual Capacities) to 'Sense and Filter' Opportunities		
15. Challenge of knowledge transfer between actors in TMT		
	AM. There is difficulty in getting tacit knowledge out of director's brain in a manner such that other directors can understand	AM1. "It always feels to me like I'm having this thing [tacit knowledge] sucked out of me in a way that I'm trying to package it up and it's quite hard to package it up in a way that the guys will get it" (Director B). AM2. "It is the way his brain is wired [referring to the reason for difficulty director B experiences when trying to package his knowledge]" (Director C).
	AN. Different levels of individual cognition and intellectual capability affects actor's ability of transferring knowledge and understanding of knowledge	AN1. "I was going to use an analogy. B's [director B] brain works like a 78 record and it goes round very, very fast and C [director C] and I are more like a 33 … So, what we have to work out is how to slow the speed down to make sure it all comes out in a coherent fashion. So, it's coherent to B but it's going so fast that it isn't always coherent to us" (Director A). AN2. "We have this thing going on … So, if I go to a meeting with all this stuff … what we call 'dance', you dance with the client and come up with the answers [solutions]. That doesn't work if you don't have the

	understanding … the details. So, we try to get it on the table because we all [all directors] need to be able to do that [dance with the client]. I'm going through a process now with one of our clients where we need to dance a bit" (Director B).
16. Creating tension facilitates knowledge transfer	
AO. Tension is created to get the individual director excited	AO1. "We use tensions [to facilitate knowledge transfer conversations]. We have to push B [Director B] until he gets excited, he raises his voice, shouts at us, leaves and comes back and says I agree guys [laughter]. This is just how it works. If we don't create that tension, we don't get the conversations. It's just how it works" (Director A). AO2. "And the reason he [director B] comes back and agrees is that he realises it's not worth falling out about … actually it isn't really" (Director C).
AP. There is no truce as we are open to tensions	AP1. "It's the truce thing … there is no truce. We invite tensions, tension is a good thing" (Director B).
17. Artefacts and common grounds enable shared understanding of knowledge	
AQ. A shared vision and objectives amongst directors helps to balance out tensions which leads to agreements in knowledge transfer efforts	AQ1. "We are all quite aligned in what we want to achieve and the way we want to achieve it. We don't do things at all costs, we're not dishonest, we won't cut corners, we want to do a quality job. And some of the time the energy that we have to try and achieve that, behind it when we realise we are trying to achieve the same thing, we are just passionate about it, it [the tension] just disappears" (Director B).
AR. Objects and artefacts are used to help achieve a shared understanding of knowledge which is used internally for codification and externally to 'dance' with the client	AR1. "So, in terms of materials, I have written down the process that we use … the steps, so that we can codify it for everyone else but mainly, importantly so that A [director A] and I can synch up on it so that he can 'dance' with the client on Monday. So, we use MSWord, Powerpoint, we try to capture everything into these stuff [pointing to the name of a capability on capability framework diagram]" (Director B).
Enterprise Structures…for 'Seizing' Opportunities: Selecting the Technology and Product Architecture	
18. Strategic organizational learning shapes replication efforts and firm growth	
AS. Natural evolution and internal organizational learning mediated capability reconfiguration	AS1. "We were subject to natural evolution … So, as we spent more time thinking about what we were offering as services, it forced us to sharpen our thinking and reconfigure our offering" (Director A).
AT. Capability reconfiguration and clearer articulation of capability framework improved its consistence which also enables better replication of capabilities	AT1. "A [referring to firm's old capability framework diagram] had a bit of complexity and it was difficult to consistently articulate the difference between one stage of the process and the next and one aspect of the offering and the other, and we reckoned that we could rationalise the number of things and it would be a clearer articulation of our offerings to the client" (Director C). AT2. "We evolved it [capability framework]. The top part of it was confusing to us and to our clients. So, I think the big journey is what's underneath that in terms of the control framework in trying to make that more effective but also make it understandable and we've definitely challenged ourselves and we're still wrestling with it to make it even better" (Director B). AT3. "We've got one tool now which is a hundred percent consistent and we can get it out of the box, go and

	run it and we've brought new people in, they can go and run it. We've used it three times, two clients bought it" (Director A).
AU. Capability reconfiguration better articulation of framework and allows for easy inclusion and integration of new capabilities which supports firm growth	AU1. "If we identify a new thing that we think we can develop or do or we can take certain experiences and package it up, it would still fit underneath that and would be relatively easy to fit in" (Director C).
AV. CyberPlus has recently been developed and easily integrated within the capabilities framework	AV1. "Myself and four the guys … Jerry and his team and the guy who just us recently from IBM [SMEs] have put together CyberPlus offering which has fitted well into the other things we do. One client has already bought" (Director B).
19. Codification attributes and frequency of use for replication affects success outcomes	
AW. The greater the codified documentation and the less frequency of use for replication, the greater the challenge of standardization and success of replication	AW1. "So, I'm describing that one [capability on recertification]. I'm saying we now have a repeatable process, it goes through reusable cycles every quarter and the team are involved intricately in it and it works. When we go into this one [a more complex capability], the documentation and the structure are exponentially greater than they were in previous incarnations and the biggest bit we are leading on, B [director B] and I have done three workshops with the guys [staff] in the last 2 weeks is so that they can do it on their own and it has that repetition" (Director A).
AX. Reconfiguration and codification decision and efforts were driven mainly by internal decisions and less by external influences from client feedback	AX1. "Yes, the decision and thinking behind moving from A to B [old capability framework to new one] was internal by directors" (Director C). AX2. "I think as we developed that … the first version, A [director A] was wrestling with it, that doesn't sit quite right with me. Eventually it was brought to a head and we kicked it around and said, actually let's change it to that … with C's [director C] input as well" (Director B).
AY. Strategic decision on codification and governance was done by directors, however knowledge articulation and codification was achieved by practitioners, bottom-up	AY1. "It [articulation and codification] wasn't done by the directors" (SME 1) AY2. "Practitioners. Largely it was done bottom-up, the people who knew most about this was the practitioners that operate and run the service … people like Chris, Jerry, Stuart who are intricately involved. The bit I did most was, I forced us to do it. I have never operated the service and done it … I asked questions in the way you're asking me questions" (Director A).
Enterprise Structures for 'Seizing' Opportunities: Designing Mechanisms to Capture Value	
20. Speed strategy allows the firm to differentiate itself in the market/industry	
AZ. Speed is a key differentiator of the firm's strategy	AZ1. "One of our differentiators is to do it [client's work] at speed. We want to help you understand what you need to do quickly and then help you to do it quickly" (Director C).
BA. Speed is achieved by taking a fast, reasoned approximate estimate and decisions about the client organization's IT security risk position and solution that is required	BA1. "One of the things we might be doing is actually we want to make an assessment of what the weather looks like at the moment [a client's current IT security risk position]. We sit down with the client we'll go, 'OK it's grey, dance'. What the Big Four come along and say, 'We need twenty perspectives on that. We'll walk around, we'll go down there and then in 3 weeks' time we'll tell you it's grey but a bit changeable'. But we encourage them to say, 'actually let's not forensic analyse. This part you need a broad-brush view that says, we going to you about two hundred things, let's get our view of that, plus or minus it would be wrong. But it's a fast view that you can act on'. And as C [director C] says, we find that they tend to be slow in acting on it and

	maybe we don't hang on to them long enough" (Director A)
BB. The client does not always take advantage of the speed and is slow at decision making maintaining a state of hiatus	BB1. "Unfortunately for us, and the guys [other directors] might disagree, I think we are faster than our competition in getting to decision points, I don't think necessarily our clients are ever faster than they would be anyways because the client is slow and bad at decision making" (Director C).
BC. "There is a tension in the firm as to whether to maintain strategic decision of speed or change strategy to adopt prolonged project to increase billing revenue as competitors do	BC1. "Therefore, the reason we might be naïve is, we should maybe be designing more into our offering that keeps us around in volume, billings, while they have a state of hiatus within the client, the way that our competitors do" (Director C). BC2. "But clearly someone is not wrong that says, actually we [Big Four] are going to spend the next year with you working out where you are on those two hundred things, we just happen to do it in two days' time. It's just the level to get a decision point" (Director A).
21. Firms in IT Sec industry pursue different strategies for revenue	
BD. The firm's strategy and USP or differentiator is to get the job done at speed	BD1. "We want a chuck of the investment funds, we want to help you write the business case so if we have to write 23 business cases for 15 families, that is important to convey that very quickly because one of our differentiators is to do it at speed. We want to help you understand what you need to do quickly and then help you to do it quickly" (Director C) BD2. "Now we believe that is something certainly our consultancy competitors won't do because it gives it away too much for the price. We are not driven in the same way as those guys are. Our USP is trying to get the job done. We don't have massive shareholders or sales target, so we are actually quite granular. That actually has created a problem for us in quotes because we've got a lot of details in there our guys need to absorb" (Director B)
BE. The Big Four consultancy competitors are not driven by speed as speed undermines revenue, they want complexity and prolonged client engagement to increase revenue	BE1. "Our competitors are the Big Four level will take you there but speed for them is not great, speed for them undermines revenue. The longer it takes the better for them because they've got an army of people to sell you. They want it to be ever more complex, they want to take you to decision points frequently that says you stall decision making but their team is still deployed with you to help you through the prolonged decision making until the next phase" (Director C).
22. Investment in replication supports growth strategy	
BF. Codification and replication as a method of growth was a deliberate business decision with investment committed to the replication strategy	BF1. "We didn't have a choice [to do codification and replication], we can't scale up. We want to scale our business and if we don't do something to get the guys up to speed with it, then we are limited to me and a few people doing it [risk management] and there are lots of reasons why we don't want that. So, we have to do that and we are committed to doing that but we haven't found a very effective way of doing that" (Director B).
BG. Replication journey has led to growth of the business [	BG1. "We have step changed that part of our organization, the way we perform in terms of skills" (Director B). BG2. "We are 120 people big and when you first came we were probably 80 people big. If we hadn't gone on this journey, we wouldn't have been able to do that" (Director A)

Enterprise Structures for 'Seizing' Opportunities: Designing Revenue Architectures- Codification	
23. Codification increases business confidence and success but challenges due to staff structure	
BH. Organization's staff structure of permanent staff and associates pose a challenge for replication efforts	BH1. "One of the challenges we are having is that with our permanent members of staff we can carve out a bit of time for them to come on the journey with us. With our associate members of staff we can't do that and so far we haven't found an effective way to cross that river. It is difficult for us to say we are going to sink 50k on those guys to be up to speed on it and go off and do it because that is a financial consideration and because they are actually in the client most of the time and trying to get them out of the client for a bit and putting them back in the client, to do that is actually very hard" (Director B). BH2. "The thing we've done most of in the first six months of this year is document. The thing we've done less of a good job in the first six months of this year is, taking people on the journey of what we've documented. We are in that parody of not clear on how we want to do it effectively yet. And we can verbalise some words we need the evidence to prove that harder bit of them using it" (Director A).
BI. Standardised, tested methods and structure together with codified artefacts increases business confidence in achieving tasks and leads to success outcomes of tasks	BI1. "The most basic is that sort of financial prize [by doing replication]. Behind that when we go to the client now and say we do access recertification, we have a method, we have a structure, I'm very confident that when we say those words, then the team can turn up the next day with the toolkit and we can wheel that out and say look we are working. We are not making it up on the first week of engagement" (Director A).
BJ. There is evidence that investment in codification has paid off with increased client success and satisfaction	BJ1. "So, one of the clients that bought iDecide [capability name], one of my recent questions to them was, 'Is it still working for you?' He said, 'This is the best news story, I'm still playing out nine months after we started to my bosses.' Because we invested heavily upfront on this" (Director A).
24. Codification and replication reduces business risk and supports the firm's 'speed' differentiation strategy	
BK. Codification allows for sharing of tasks (e.g. risk management) with other actors therefore prevents a reliance on directors, thereby reducing risk to the business	BK1. "It [codification] is easier to sell and to get more people to do it so we can increase our capacity, vastly reduce dependency on us as the directors to do any of the work" (Director C)
BL. Use of codified artefacts allows faster accomplishment of tasks and therefore it is used to drive 'sell as an accelerator' concept of the firm's speed strategy	BL1. "There is a greater propensity for the client to come and say they like it because we have more confidence in what we've put in there. When you are building something and starting together, there's no time so therefore the likelihood of screwing it up is greater and if you're doing a repetition thing screwing up round one kind off might influence the long term gain" (Director A).
Enterprise Structures for 'Seizing' Opportunities: Designing Mechanisms to Capture Value	
25. Demystifying bespoken capabilities and clarity of language aids knowledge articulation and codification and reuse	
BM. Bespoken firm capabilities that are tailored around commonly known industry-wide solutions magnify articulation and challenges for actors – SMEs and Analysts	BM1. "I more or less operated the other one [capability] for years on my own, now we are giving it to other people to do it so the knowledge transfer is different and the thing with it, to contrast the other thing [other capability], it is kind off bespoke, invented thing whereas recertification everybody knows what it is. If you walk into this room and ask a security guy what is recert, they will know what it is but if you ask what is

	iDecide they won't" (Director B).
	BM2. "There is a takeaway for us in that B [director B] which is, we know how we do recert at [firm name] and lots of people know what is a gap analysis … we've got to give them the right tools. So, I think there's something in there for us to think about. There is a lot if insight there in terms of the contrast" (Director A).
BN. Actors have same performative understanding of industry routines but different ostensive understanding of bespoken capabilities and how routines interrelate	BN1. "Me and one of the SMEs together with Ian and Louise, we've been working on it [codification] to try and make it better and it was Ok but we couldn't get a bandwidth in terms of getting it better so recently we had some more SMEs involved and one of the guys Gordon, he said, 'I know what all the sort of real world if you like things are, I just don't know what you mean in [the company's name] and that makes it really hard for me. It is that last 10% that's stopping me from being effective'" (Director B).
BO. Clarity about how routines are connected (demystifying processes) and clarity of language helps to achieve a better shared ostensive understanding	BO1. "So, we are trying to work out a way of telling our language that we know works for us and has worked before in more or less my, Gary's and A's [director A] head into something that we can commoditise with our SMEs" (Director B).
	BO2. "The bit that you'd add to that, we are trying to ask some questions about a given control, and actually the guys will drift … So, I'll use a fruit analogy because it's easy. We were asking questions about the apple and that started to drift into other things that sit in the fruit bowl like the orange, the banana and the pear. And B [director B] said, 'save that until we get to the orange, banana and pear'. And the guys say, 'what is the orange, banana and pear? And actually, it all came back to, do I really understand how things all sit together and how it relates to each other. And there is a 20% prize in being clear to everyone how things interrelate and language" (Director A).
BP. Difficulty in using codified artefacts could relate to clarity of language	BP1. "So, if I say to you [company name] thinks good external vulnerability scanning looks like this and we use some language, because Gordon is trying to use that as a measure of something else … he just wants me to be really crisp about what my good and bad is. We all know what external vulnerability scanning is, but what is it to [company name] because this whole framework is our view of what's important and what's not important" (Director B).
BQ. Greater levels of actor's expertise and experience aids understanding of bespoken capabilities and how routines interrelate	BQ1. "The reason why it is more difficult for [capability name] and not recert is [capability name] … the fruit bowl is quite big with lots of things in it and the fruit in there you've seen it before but you just don't know how it's lined up and set up. So, we've got 500, 600 things you kind off at least have to go through and you need some time to get familiar with it even if you are an SME. If you are a strong SME you might get it faster than a weaker SME" (Director B).
26. Firm capabilities and processes as well as unique language is a differentiator and value creating	
BR. Competitor firms have their own unique language and nuance	BR1. "However, it would be no different to any of our competitors in that they will have their own nuances. If you are a new employee at competitor X, you would have to learn what they mean. So, the headline, everybody understands the headline, it's essentially doing this thing at high level … How do you do it? What is it that you've got in your tool that might be unique or different to something I've seen somewhere else" (Director C).
BS. A spin on language is a valuable differentiating factor that creates a firm's brand and the	BS1. "It could be [in response to the question of if language was the problem}. We knew you could read the

challenge is to make the language 'flavour' clear to actors	book in English therefore we just assumed you could read the book in Latin as well … or you could read the book in English but this book talks about something in a completely different way. Language is the same actually, we've just got a different spin on it, different take on it, and we sell that take, that take is our brand" (Director B).

BS2. "Our flavouring, we are not making clear enough" (Director A). |
| BT. Practical experience gained by actors as they use codified artefacts helps better understanding of language, with added benefit of actor's improving the artefacts | BT1. "We understand the problem and we've said, we've got two SMEs [names mentioned] and we want to drop them into the conium of doing the recert reviews to see if they can cope with the framework. Partly we're doing that which I think it's a good thing in an indirect way because they are helping us to develop it as they are getting familiar with it" (Director A).

BT2. "From a knowledge management perspective, up until the one [Knowledge Management session] we just went through that didn't go that well, we thought that if you are an SME … because [names mentioned] are SMEs you can just pick it up. But hang on a minute, [same names mentioned] are SMEs but they have been working on it for three years now so they are steeped in it, we just completely forgot that [laughter]. It's just now the same with every SME" (Director B). |
| BU. Demystifying hierarchy of routines within a capability, processes and detailed granular language aid replication by actors | BU1. "If you would think of a hierarchy, we've got something up here that is a sentence. Do you do X? Do I do it for this and that or just this? For this and that. OK, do you mean, do I do it for this percent or that percent? … and it drills down and therefore there is always going to be clarification, and what we've defined now to a few levels is, that granular definition that we think makes it material or the stuff we need to understand for the materiality to be there" (Director C). |
| BV. There is equifinality in language and processes across firms | BV1. "Other companies would have done it differently. They will be asking the same first question but they might deviate almost immediately at the second question and through two, they could even get the answer to our second-level questions, they might get the answers to one of those from another primary question and they have decided that works for them" (Director C).

BV2. "That's a good point. When you put the steps and processes together to some extent it's subjective which is the point the guys [SMEs] are making, 'I know about iAccess [capability name], I know about network security but which bit do you mean here?'" (Director B) |
| 27. Codification and replication creates a challenge of harnessing knowledge including about clients | |
| BW. Standardization of documentation to serve what purpose remains a challenge | BW1. "I don't think we've got a very effective approach to documentation at the moment. If I'm hard on it, we haven't really normalised what documentation should be and what level, to serve what purpose, to serve what master type of thing" (Louise – Business Development Manager).

BW2. "On the journey you've lived through with us, we've got more conscious, and in some instances we've got a lot better and in some instances we know where we want to get better, we are not getting better as fast as we desire" (Director C). |
| BX. Delegation of tasks to actors by doing replication presents a new challenge of harvesting softer knowledge and insights from clients back to the firm | BX1. "I do think it's still a bit of a gap in our knowledge framework, how we harvest all that [knowledge] back in and more broadly socialise it, share it" (Director A). |

	BX2. "The other thing that maybe we haven't really discussed is, you talked about information or knowledge harvesting when you first met us. We've got more people doing what we would do and have the conversations with our clients and we're not in the room. One of the things we've maybe haven't talked about is, how do we bring back the insights from those people what we would document. Not the specifics of the tasks they are on but that softer knowledge harvesting … what else should we be aware of in that conversation" (Director C). BX3. "An example would be, so, I talked to a client this week and he said, 'That's going brilliantly, I'm on top of it'. If I wasn't in the room, how would we [directors] have known that" (Director B).
Enterprise Structures for 'Seizing' Opportunities: Avoiding Decision Errors - Conflict & Consensus	
28. Time enables deliberations and consensus	
BY. Consensus rather than vote is used to solve disagreements within the TMT	BY1. "We tend to go to a consensus [on disagreements]. You very seldom get a vote being needed. You seldom get two to one. What you find is one position in the argument, someone taking a position saying, you know what this isn't really important to me, where I actually have had to concede more than the others. More than within an hour, not that anyone goes off" (Director C). BY2. "Normally it gets resolved very quickly. We've had in all the years, probably just one or two toys out of the pram moments" (Director B).
BZ. Time allows for reconsiderations which leads to consensus and agreements	BZ1. "What I've seen you [three directors] do is, disagree but then they'll all leave it for a wee while whether it's a day, an hour, a week, whatever, and then come back round it … and sometimes it takes a couple of times to go back round it but then actually you get to the same point about agreement" (Business Development Manager). BZ2. "My perception is, I am more aware that the other two [directors] are more sensitive to conflict and therefore would move quickly to try and find a compromise position or a way of stopping the conflict even if it is to buy us the time to the next hour, or next week or whatever" (Director C). BZ3. "Sometimes we don't need to make a decision just now, there is a compromise route we can take that will buy us three, four, five months" (Director B). BZ4. "It is time. You actually do a lot of things by time don't you, different flavours of time … be it an hour or six months" (Director C).
CA. Active listening helps to recognise common grounds or accept superior arguments	CA1. "You'll often find that we are not good at listening and you'll find that on the third instance one side would actually listen to the other and realise, oh actually we are saying the same thing or actually he's right or I'll change my position" (Director C).
CB. Shared, common goals amongst directors helps to achieve consensus	CB1. "We are all quite aligned in what we want to achieve and the way we want to achieve it. We don't do things at all costs, we're not dishonest. We won't cut corners, we want to do a quality job. Some of the time the energy that we have to try and achieve that, behind it when we realise we are trying to achieve the same thing we are just passionate about it, it [disagreement/tension] just disappears" (Director B).

29. Balance of conflict and consensus is needed for progress and right decision-making	
CC. Directors recognise and accept each other's relative strengths and expertise	CC1. "Yes, we know where our relative strengths are" (Director C).
	CC2. "To continue on that, we know depending on what the issue is" (Director B).
	CC3. "If we were having a conversation about firewalls will C [director C] and I and Louise defer to B [director B] in terms of his expert knowledge, yes. If C says something on firewall, it won't be I don't trust what C said because C won't pretend to be the expert on firewalls" (Director A).
CD. Questioning of opinions and expertise sometimes lead to frustration and conflict	CD1. "Where you would get frustration, sometimes the strongest individual is intolerant of the questioning of the others. For instance, if it's something that I am not completely clear on, sometimes I want to drill down. There's something I'm not comfortable with in a situation and I want you to explain more, you will find the other players, and this is common to all three of us, would get frustrated after a while, 'What the hell, you know that I am the specialist in and around that. You know I've got the most experience in this, take my word for it and move on', and actually 'No' because there is something pricking at us" (Director C).
	CD2. "It absolutely varies by subject and anything else. So probably it's B [director B] and I versus C [director C] in a conversation we were having this morning. C was defending one position, B and I were coming from the other position. The next conversation might be B and I and C acting as an intermediate, and it can be any conversation that drives it. You don't quite know whether … what subject is going to drive that but it happens intermittently" (Director A).
CE. Questioning and challenging of opinions which causes conflict is necessary to achieve clarity and to avoid decision errors	CE1. "I sometimes like conflict because I think it puts it [the issue] on the table and it resolves itself sooner" (Director A).
	CE2. "That's true. For example, A [director A] would say, that's crap I think that thing is crap and that thing, it might be something that you feel that is actually quite good and you're passionate about it. In the old days before we got together [formed this company] I would be like, 'What do you mean!?' But I've learned that it is actually a way of making sure that we are doing the right thing. Because that's the way A works … A's work is absolute, it works well" (Director B).
	CE3. "So, it's often C [director C] and I might play those different roles with B [director B]. It absolutely varies week by week, there's not a predictability about it" (Director A).
Enterprise Structures for 'Seizing' Opportunities: Mechanisms to Capture Value – Recruitment	
30. People are a key differentiator for the firm and source of competitive advantage	
CF. Recruiting best talent in the industry is a key differentiator and a source of competitive advantage	CF1. "A key part of our differentiator is, we get feedback that we give better people than the average provider of people in the market" (Director A).
	CF2. "We have a recruitment process that pulls people from our rivals therefore we discern out the weath from the shaft" (Director C)
CG. With the fast rate churning of staff in consultancy firms, having long serving staff with an identity with the firm is a key differentiator	CG1. "One of the reasons we do that [recruiting process] is unlike a lot of resourcing scenarios and resourcing companies like Hyncth and Hedge in IT, they just pick people in and put them in. But our guys have a bit of an

		identity with us, they are long serving, they are good anyway" (Director B)
	CH. Leveraging and fully maximising the collective power and knowledge of our people remains a challenge for a small sized organization especially with staffing structure	CH1. "What we've realised is that we are not really leveraging much of that. We get that … kind of because we know them and they know us, that is a real asset that we are not doing anything with. In fact, the knowledge we just spoke about in terms of processes and technical stuff, we're doing loads on that out the way but in the way … and one of the challenges we have is that 85% of our company aren't our core employees, they are our partners and associates which makes that interesting" (Director B).
31. A model of trusted networked colleagues is used to recruit talent		
	CI. Strong networks and relationships built with associates and consultants is vital for recruiting and retaining scare IT security talent	CI1. "So, when we started our day one model was we will take people we know and trust. Our day two model was we go one step beyond that, if we know you and we trust you we will trust your friends as well and actually for the first four, five years of business we were able to have a network of trusted colleagues" (Director A)
	CJ. A thorough recruitment process is used to identify the right talent from the open market	CJ1. "We go on that trusted model and it's only in the last two, three years we've gone on to the open market to source people and what we've done to compensate for we don't know them, all we've tried to do is put references, put in a step processes of interviewing, eye-balling and getting ourselves comfortable with them" (Director A). CJ2. "For all of the market, we can find somebody who knows somebody who knows somebody as well. We get a little like that and take our chances" (Director C).
32. Processes of resource and recruitment management is vital		
	CK. The process of specifying internal and external talent and resource requirements of the firm is key to address opportunities and needs	CK1. "We have a review meeting on Wednesday mornings and the meeting is to look at what are the requirements before us. That is, we need ten people to make apples, ten people to make bananas … so, we have that input on a Wednesday morning and Nicola [recruitment manager] orchestrates it and on the other side of it, is what people and skills have we got to support it. And for the more technical skills people, B [director B] takes an active role still in he can do apples, he can't do bananas type of thing" (Director A).
	CL. Improved recruitment capability has enabled an increase in talent employed which has supported business growth by method of replication	CL1. "We've step changed the recruitment capability part of our organization, the way we perform in terms of skills. We are 120 people big and when you first came we were probably 80 people big. If we hadn't gone on this journey we wouldn't have been able to do that. And that 120 people there's some churn and changing personnel but there are a hell lot of different reasons people change" (Director A).
33. Recruitment Manager's role is important and learned over time		
	CM. Recruitment Manager's learning of the business is important to understand and to simply the process and to take more ownership of recruitment	CM1. "B [director B] used to do 100% of it. Since you've first met us, I do a bit more analysis on pre-requirement and zero input post. I'll say we still have own defining requirement even that's much simpler than it was because Nicola [recruitment manager] understands so much more about the business and it says it's one of those like individual X that you already know. So, Ok look for one of those then" (Director C). CM2. "So, what A [director A] did to hundred percent twelve months ago, I do seventy percent of it now" (Nicola – Recruitment Manager).
	CN. A broad range of commoditised non-technical skills like project managers are sourced by	CN1. "For the more technical skills people, B [director B] takes an active role still in he can do apples, he can't

the recruitment manager	do bananas type of thing. For a broader range of skills, Nicola now does more of it" (Director A). CN2. "We need different types of resources, for example a project manager, SME. Project managers are not the hardest … the skills are more commoditised and they are not necessarily interchangeable with the teams, and Nicola [recruitment manager] can get these" (Director B).
Enterprise Structures for 'Seizing' Opportunities: Mechanisms to Capture Value – Leadership in Resourcing and Recruitment	
34. TMT leadership plays an active role in resourcing the right talent	
CO. Directors share roles with respect to people, processes and task requirements needed for talent resourcing	CO1. "We have a process for capturing the requirement from the client which we [directors] are involved in and basically we look at that on a weekly basis and scrutinise it. C [director C] has a way of getting that on the table and we consider opportunities and needs. I interview the SMEs" (Director B). CO2. "B [director B] used to do 100% of it. Since you've first met us, I do a bit more analysis on pre-requirement and zero input post" (Director C). CO3. "I don't do the people. I do the process with the clients, less people less time" (Director A).
CP. Explicit coaching by director increases recruitment manager's capability	CP1. "Her [recruitment manager] improvement is consequence of her being here longer and explicit coaching and getting her more involved in some of those bits" (Director A).
35. Essential technical resource is the responsibility of Top Management Team	
CQ. Technical director oversees technical requirements involving assessing firm's available talent and recruitment of technical people	CQ1. "For the more technical skills people, B [director B] takes an active role still in he can do apples, he can't do bananas type of thing" (Director A). CQ2. "I interview the SMEs" (Director B).
CR. Technical resource such as SMEs are more challenging to source and have greater impact on the firm's ability to operate	CR1. "We need different types of resources, for example a project manager, SME. Project managers are not the hardest … the skills are more commoditised and they are not necessarily interchangeable with the teams, and Nicola [recruitment manager] can get these. SMEs we put a slightly higher bar, some of the things we want to do will completely depend on if they can do it or not. So, I interview those guys" (Director B).
Continuous Alignment and Realignment of Specific Tangible and Intangible Assets: Capabilities, Framework and Strategy	
36. Firm's capabilities and framework are shaped by the changing industry	
CS. The changing industry and industry standards shape the solutions and frameworks that clients adopt and in turn, demand from IT security consultancy firms	CS1. "What we are seeing is, periodically, over the security industry, maybe over twenty plus years, people [organizations] have tried to align with something that is an industry standard … and the information security forum was there. NIST is the current one and it comes from The States, it's a standard for security like ISO. Information Security forum was probably first and has some global coverage, the British Standards Organization signed off to some of that and that became the international standard probably about fifteen years ago, I would guess and that's ISO, and now there is a feeling in quite advanced organizations that we need to move beyond that and what we are seeing, our more advanced customers are aligning with that"

	(Director C).
CT. IT Sec consultancy firms have to adapt their bespoken solutions and frameworks to these industry standards	CT1. "What we have to therefore do with our tool is to understand how it maps into these various industry standards" (Director C).
37. Mapping of firm's framework is necessary to align with firm's strategy	
CU. Mapping of firm's framework and codification is important (internally) to the firm because it allows actors to speedily complete holistic security solutions	CU1. "The reason why we need to do that [mapping] perhaps with all the standards, we are trying to be more specific about, when somebody says do access recertification which is on this line item, should we check your access? We actually go quite specific about the minimum thing you need to do is this and you should be doing that and that's a bonus … and the reason we do that is because what we are trying to do all in one go, is access the organization at that level so that we can tell them what they need to spend to fix it" (Director B)
CV. Mapping of the firm's framework that of the client is important (externally) because it makes it easier to sell the solutions to the client get revenue	CV1. "Ok, can I now give the client dimension. If you can't map your proprietary framework which ours is, to something that the client is using, it's very difficult to sell. So, we've seen clients decide to just fire their expenditure to align to international standards which have 15 or 16 families of things which we have as well but NIST has 50. Therefore, you have to be able to sub-divide and map to go to those because for us, as B [director B] says, we want to accelerate through the first stage of assessing where you are currently at cuff the mark, where you need to be" (Director C).
Continuous Alignment and Realignment of Specific Tangible and Intangible Assets: Knowledge Management	
38. Active role of leaders in Knowledge Management journey	
CW. Directors provide leadership but are not directly involved in codification by SMEs and Analysts and Business Development Manager is champion for documentation	CW1. "Practitioners did the codification and documentation. Largely, it was done bottom up, the people who knew most about this was the practitioners that operate and run the service. It wasn't the directors. The bit I did most was, forced us to do it. I have never operated the service and done it. I asked questions in the way you're asking me questions" (Director A). CW2. "Louise [Business Development Manager] is the champion for documentation" (Director B).
CX. Directors take actors on Knowledge Management journey on the use of higher-level tools and artefacts of risk management – iDecide and iAccess	CX1. "We are more instrumental in this piece [pointing to higher-level capability on the capability framework diagram] and that piece [pointing to technical capability on the capability framework diagram] is more successful than this at the moment" (Director A).
39. Technical knowledge management journey is less complex and more successful than risk management journey	
CY. Lead SMEs take actors on the technical Knowledge Management journey on use of artefacts	CY1. "So, that one [pointing to technical capability on the capability framework diagram], the team is largely self-govern. So, Jerry [Lead SME] would have done more of that on that journey [Knowledge Management journey in the company]. Jerry was instrumental in that piece and taking the team with it" (Director A).
CZ. Technical artefacts and journey are less complex than risk management ones and are also more successful	CZ1. "We are more instrumental in this piece [pointing to higher-level capability on the capability framework diagram] and that piece [pointing to technical capability on the capability framework diagram] is more successful than this at the moment" (Director A).

	CZ2. "The reason why that is the case for iDecide and maybe not for re-cert is that iDecide, the fruit bowl is quite big [referring to the bundle of solutions in that capability] with lots of things in it and the fruit in there you've seen it before but you just don't know how it's lined up and setup so we've got 500, 600 things you kind off at least have to go through that you need to have some time to get familiar with it even if you are an SME. If you are a strong SME you might get it than a weak one and we've got various guys so we are now trying to work out ways of doing this" (Director B).
Continuous Alignment and Realignment of Specific Tangible and Intangible Assets: Know-how and IP Protection	
40. Complexity of capability and knowledge restrictions provide intellectual property protection	
DA. Layering of documentation and artefacts on process and technology and restricting the levels accessible to clients provides some intellectual property protection	DA1. "Two, three things that partially answers it [question on how to protect intellectual property of intangible assets]. So, in terms of … we give the client a level of documentation that says we do 1,2,3, we don't share with them 1.1,1.2, that gives them the details of, if you don't do that little bit in the middle you'll screw it up. So, we keep some from them in the backroom and the same with the technology which is, we'll see that bit, if you're very clever you can go and re-write it but we don't make it easy for you to go and plagiarise it" (Director A).
DB. Less complex tools, frameworks and artefacts are harder to guard from intellectual property theft	DB1. "I think again that's true about protecting that one [pointing to a complex tool] but not with the control framework" (Director B).
	DB2. "We can't protect it [pointing to a less complex control framework]. We did have a conversation somewhere sometime, somebody said you can't patent it" (Director C).
41. Storytelling and tacit knowledge provide intellectual property protection but internal knowledge transfer challenge	
DC. Know-how and storytelling is value creating which enhances the artefacts	DC1. "Half of the value [of the artefacts and documentation] is the story we tell with it" (Director A).
	DC2. "The raw IP in the middle is only a fragment of the whole" (Director B).
	DC3. "The nick-able IP is only a fraction" (Director C).
DD. Ability to map frameworks, know-how of using artefacts and storytelling when using artefacts is tacit knowledge and that provides some intellectual property protection	DD1. "So, you can steal my car but you can't drive it like me type of thing" (Director A).
	DD2. "We actually saw an individual at our client site who was the interim CISO and he had his own framework that he developed somewhere else and brought it along and had used it before and it just couldn't match with ours and in some ways the way they described it as if it was more advanced than ours. They just couldn't make it work again. They couldn't sell it, they couldn't package it, they couldn't describe it in a way that made it effective or valuable" (Director C).
DE. On the flip side, knowledge transfer of tacit knowledge within the firm gives away intellectual property internally	DE1. "I think effectively we're describing a limitation of our own model which is, our tacit knowledge which we need to impart onto others in the firm, how do we do it effectively and therefore make our IP not plagiarise-able" (Director A).

42. Firm size and nature of competition might shape concerns about intellectual property protection	
DF. The massive market opportunities in the IT security industry makes intellectual property theft less of a concern to a small sized firm like the organization	DF1. "I think there is something else in play here, we're not really concerned about the loss of the IP. We had a view and we still have a view that the market is so massive and we're such a small player in it that there's plenty of places to go and sell our stuff and try to make end roads and it's likely that our major competition that we engage have their own version anyway, and therefore it is ours versus theirs or us versus them. The people who steal it they'll go and find their own clients that we are unaware of" (Director C).
DG. Big direct rival firms or a franchise firm might be more concerned about intellectual property theft	DG1. "If we were Accenture constantly competing with Deloitte, we might be concerned that Deloitte don't get hands on to our thing" (Director C).

DG2. "Also, if we were building the company up, turning the company around and saying we'll franchise that, if there is a product where we are trying to sell ten thousand units, it would be a problem but we are not doing that yet" (Director B). |
| 43. Challenge of knowledge transfer between actors in TMT | |
| AM. There is difficulty in getting tacit knowledge out of director's brain in a manner such that other directors can understand | AM1. "It always feels to me like I'm having this thing [tacit knowledge] sucked out of me in a way that I'm trying to package it up and it's quite hard to package it up in a way that the guys will get it" (Director B).

AM2. "It is the way his brain is wired [referring to the reason for difficulty director B experiences when trying to package his knowledge]" (Director C). |
| AN. Different levels of individual cognition and intellectual capability affects actor's ability of transferring knowledge and understanding of knowledge | AN1. "I was going to use an analogy. B's [director B] brain works like a 78 record and it goes round very, very fast and C [director C] and I are more like a 33 … So, what we have to work out is how to slow the speed down to make sure it all comes out in a coherent fashion. So, it's coherent to B but it's going so fast that it isn't always coherent to us" (Director A).

AN2. "We have this thing going on … So, if I go to a meeting with all this stuff … what we call 'dance', you dance with the client and come up with the answers [solutions]. That doesn't work if you don't have the understanding … the details. So, we try to get it on the table because we all [all directors] need to be able to do that [dance with the client]. I'm going through a process now with one of our clients where we need to dance a bit" (Director B). |
| 44. Creating tension facilitates knowledge transfer | |
| AO. Tension is created to get the individual director excited | AO1. "We use tensions [to facilitate knowledge transfer conversations]. We have to push B [Director B] until he gets excited, he raises his voice, shouts at us, leaves and comes back and says I agree guys [laughter]. This is just how it works. If we don't create that tension, we don't get the conversations. It's just how it works" (Director A).

AO2. "And the reason he [director B] comes back and agrees is that he realises it's not worth falling out about … actually it isn't really" (Director C). |
| AP. There is no truce as we are open to tensions | AP1. "It's the truce thing … there is no truce. We invite tensions, tension is a good thing" (Director B). |

45. Artefacts and common grounds enable shared understanding of knowledge	
AQ. A shared vision and objectives amongst directors helps to balance out tensions which leads to agreements in knowledge transfer efforts	AQ1. "We are all quite aligned in what we want to achieve and the way we want to achieve it. We don't do things at all costs, we're not dishonest, we won't cut corners, we want to do a quality job. And some of the time the energy that we have to try and achieve that, behind it when we realise we are trying to achieve the same thing, we are just passionate about it, it [the tension] just disappears" (Director B).
AR. Objects and artefacts are used to help achieve a shared understanding of knowledge which is used internally for codification and externally to 'dance' with the client	AR1. "So, in terms of materials, I have written down the process that we use … the steps, so that we can codify it for everyone else but mainly, importantly so that A [director A] and I can synch up on it so that he can 'dance' with the client on Monday. So, we use MSWord, Powerpoint, we try to capture everything into these stuff [pointing to the name of a capability on capability framework diagram]" (Director B).

APPENDIX THREE

OBSERVATION DATA

Participant observation was a primary source of data along with interviews of actors.

The study was conducted openly and the researcher was careful to obtain the backing of the owners (directors) of the company and participants prior to data collection. The researcher kept a diary of events in which he recorded his thoughts about the operation of the firm, details of informal conversations with organizational members, the content of key meetings, and other general observations. The field notes in the diary were regularly reviewed and reflected on and thereafter developed into more detailed notes. These reflections were also used to identify key questions for further data collection.

No.	Event	Discussions/Field notes	Overarching Themes/Researcher's Reflections
1.	Observation at TMT meeting	a. An agenda at the meeting is, To Improve Sales Strategy and Relationship Building with Clients Strong deliberations between Director A and Director B on prospects of winning new clients, Director C listens mostly and then makes strong points intermittently. Director A. "We are not speaking to enough people, we need to change 'the heartbeat' and change our behaviour to drive sales." Director C. "We should be knocking on more doors and getting through." Director C provides a lot details and insights about what is going on with clients, including stories, leads and possible opportunities to exploit and how to deal with different challenging people. It is decided that Directors C & B will go to London to pitch a sale to a client, Director C will lead the pitch. Final decisions after deliberations are made by Director A.	Theme: Sensing opportunities to win clients and business – To improve knocking on doors to improve sales strategy Reflection: The company is of the opinion that they need to improve their sales strategy by reaching out to more prospective clients. Director C seems to have lots of information about their engagement with clients. He is also sales-focused and will be leading a sales pitch to a client.
		b. Resourcing and Recruitment of a Staff Director B briefs directors about an individual he had interviewed. Director B. "He is technically good but relationship management is important, the soft skills." Directors recognise the person's talent and a decision is made. Director A. "We will find the best way to get him in, on the right project and right cost to us and this should reflect in the wordings of his fixed-term contract." Director A makes the final decision regarding recruiting the staff. Recruiting the individual long-term all depends on the company getting the right project and that the client likes him.	Theme: Recruitment of scarce, valuable talent Reflection: The directors are actively involved in resourcing and recruiting talent. While technical skills are important, relationship building and client management skills are equally vital. The company is desperate to keep hold of the valuable talent because of his technical skills but put him on an appropriate project to assess his client management skills. His long-term prospects with the company will depend on his performance as well as the availability of right project.
		c. Enhancing of the Firm's Capability Strategic decision on whether to adopt CyberPlus into the firm's capability offerings. Director B seems to know more about the technical details and explains 'Plus' and the difference with CyberEssential to the other directors. Deliberations on; Should the firm adopt CyberPlus next year because the government talks about it? But will their clients want it? They will have to evaluate what the cost of adopting CyberPlus will be?	Theme: Renewing/Reconfiguring of firm capabilities Reflection: The ecosystem including government, industry and client demands shapes the capabilities and solutions firms adopt and provide. There are also considerations about the cost implications to the firm. Also, director B appears to have more technical knowledge than the other directors, at least regarding this capability. However, all directors contribute probing questions about implications to the firm. Final decisions

		Director B will give an action on this the following Friday meeting. d. Social Event for Building Client Relationships Plans are made for Christmas drinks event to invite clients, business partners and staff. Directors are all mentioning names of key people to invite. It is specifically noted, to invite anyone working with Lloyds bank if they can land them.	are made by Director A. Theme: Relationship building and sensing opportunities Reflection: The social event is an opportunity to build and maintain good relationship with clients and staff, especially since most staff work on client sites and so do not meet in person very often. Importantly, there is a specific determination to have people from Lloyds bank at the event. Lloyds is a key client to the firm and nurturing that business relationship appears to be of paramount importance to them.

2.	Observation at end of Royal London project meeting. Project team members and TMT in attendance (Meeting 1)	a. Objective of the meeting was to leverage what they have done for Royal London
		Director A. "This is the most successful piece of work the company has done. How can the business leverage this success/learnings/experience and identify areas for improvement?"
		Communication, Tracking and Monitoring on projects are identified as areas for improvement.
		Jane. "As a niche consultancy firm, we need to do Tracking and Monitoring before the client kicks us."
		Director B. "T&M is Gerry's strength, how do you apply this rigour across all people. It shouldn't be difficult."
		Alan disagrees. "It is personal skill, it is the disposition of the individual to do it. It is how people are wired."
		Louise suggest. "T&M should be assigned to person within a project team to do that."
		Director B. "That will bring about tension due to trying to check and monitor other people's work i.e. micro-managing."
		Director A. "Tension is a positive thing because it means that you are challenging. No tension is a bad thing."
		It is agreed that tension is acceptable and an individual on projects will be responsible for T&M. An SME will flag it up when work done by people in their SME area of expertise is not of the required quality. Will resolve any tensions/conflicts.
		
		    b. Leveraging the collective power of people
		Directors have good oversight that other team members relied on did. They did lots of peer reviews on the project, however that could have been more rigorous.
		
		    c. The reuse (replication) of the company's toolset for the Royal London project
		 Gerry. "The gap analysis tool used for the project was that used for Sainsbury's Bank which was bespoken and had to be tweaked a lot. It was not generic and not ready to use."
		It was agreed that a half-baked toolset will be created. That way users will
			Theme: Tension within Project Teams – Tension is a positive thing
			
			Reflection: In order to improve quality of work, an individual within a project will be responsible for tracking and monitoring the work of other team members. This could result in tensions and conflict within the team. But tension is a good thing because it makes people challenge each other which has a positive impact on project work.
			
			Theme: Leadership of TMT
			
			Reflection: Leaders (the directors) play a key role on projects and this aligns with the firm's mantra to clients – we use Power of 3 which is valuable experience the 3 directors possess. Team members biography especially those of the directors is made clear to clients to demonstrate the extra experience that the firm is offering which hopefully makes the firm more competitive. Also, project team members value the oversight that the directors provide to them on projects.
			
			Theme: Replication of routines (gap analysis) using artefacts – A need to adapt routines and artefacts
			
			Reflection: Consultancy firms that provide the same solutions to different clients need to adapt bespoke routines and accompany artefacts (toolsets) to suit client's environment. This means that it is necessary to have generic

		need to plan ahead perhaps a month before it needs to be used so that they can do the tweaking before the gap analysis is done on projects. Mike. "The project was not a project off the shelf hence we lost our way. You can customise toolset for a client but you have to continuously customise it."	toolsets which can be adapted to suit clients before user. Failure to have a generic toolset will pose a challenge of using bespoken toolset to match to client environment. On the other hand, use of generic toolset means that you have to continuously customise it for every client which creates more work and difficulties as you learn on the job.
3.	Observation at end of Royal London project meeting. Project team members and TMT in attendance (Meeting 2)	a. Speed vs Quality Director B. "We [director C] like to sell speed but quality can suffer." Director A. "For the project, the end bits were not good enough, there was sub-optimal quality sometimes." Jane. "We need to decide what we need speed for – not everything." To improve quality, how do we stop ourselves going faster than we need to? To manage speed, it was decided that; - Let everything (deliverables) back at 1/2month and check against project list. - Document and routinize this process/guideline to ensure it done by all project members as not everyone may have the natural appetite to do it. To deal with clients that want something sub-standard for speed reasons, it was decided to refresh the SIP. That is; - What the project team has done. - What they still need to do (i.e. incomplete/sub-standard work) and apply a risk. - Communicate the risk to the client and let the client make a decision about accepting the work. Replicate and implement this process to other clients and projects b. To Create more similar successful project teams Director A. "How can we change the chefs but use the same ingredients and recipes and reproduce the same meals? Stuart. "It is hard to replicate the success of this team because we have been working together for so long. Jane and Gerry provide a positive environment." Chris. "There was good diversity on the Royal London team but we don't create enough positive tension to exploit each other." Director B. "In creating a team environment, we should think about people's traits, that is strengths and weaknesses when creating teams. We need to create the right team dynamics and right positive environment for new clients." A number of suggestions were put forward to help create more successful teams and right team dynamics; - Informing how [company name] works - Knowing people's strengths and weaknesses - Briefing people on teams - Project kick off – have a social event at start of projects - Regular contact with new persons on the team	Theme: Speed strategy may impact negatively on quality Reflection: Speed and quality can be a double-edged sword as the company found out in this project and have come up with processes to deal with this challenge. A routinized process is to be implemented to ensure that projects do not move faster than necessary and that all project members implement this. Where clients want quick project deliverables at the detriment of quality, the risk of this action is to be communicated to the client and let the decision be made by the client. These processes and procedures to achieve a balance of speed and quality should be replicated across other projects. Theme: Transactive Memory System within project teams Director A uses lots of metaphors in this narratives and communication style e.g. ingredients [for artefacts]..recipes[for processes/routines] Reflection: There is a recognition that transactive memory system (expertise, credibility and coordination) is idiosyncratic to teams and built over time. The good team dynamics that TMS offers provides an opportunity to create positive tensions to exploit and maximise team member's potential. The company recognises the challenge of replicating successful project teams due to TMS and offers a number of suggestions to implement in this regard.
4.	Observation at TMT meeting – In	Agenda for the meeting is Business Management at [company name]	Theme: Selecting the technology and product architecture ('Seizing')

attendance is three directors and Business Development Manager	a. Product Development Director B informs that he and 4 SMEs have created CyberPlus and the product is being tested in the firm. The 3 directors question each other about the product development and the discussions centre on ideas, specifying and refining the product. - Director B provides the technical and practical information - Director A questions the practical ideas, often plays devil's advocate and seems to have a bigger picture of things - Director C listens actively then makes strong points sporadically b. Client-centric discussions about the product Discussions then progress to questions regarding if the client will accept the proposed solutions. Client implications are highlighted by all directors. Director B argues, "This is a branding issue. As a niche consultancy, what we do is whatever the client wants. We should be doing it my default." Director C quizzes. "Does the client want to just comply with regulation and regulation is always behind or do they want to be secure and be at the forefront of new technology and threats? We should drive this for the client." c. Activities to maintain external environment scanning and knowledge management Louise (BDM). "We have a risk log for keeping on top of new issues in information technology and the IT security industry." Director B. "Changes in the external environment is a risk to the business but also an opportunity, for example cloud security and PAAS. This was the case recently in Standard Life [a client] where we assumed we knew but did not know some new changes in cloud security!" Director C provided a list of 16 new developments which were discussed and the main source of information was social media platform Twitter. Discussions took place about new developments in the industry. These included; - Regulatory matters and its effect on the firm's control framework e.g. EU GDPR – new data protection legislation for Europe - Topical issues e.g. Blockchain – the technology that underpins bitcoin currency and its impact on banking operations and the financial industry [banks are the firm's major customer group] - What competitor firms are offering - New IT security threats Director C. "Information is Twitter-driven and more useful than reading magazines and websites. I'll ask Louise to share a list of gurus to follow to make sure that our employees are on top of new developments and develop themselves. Declan will be assigned to manage this monthly" Cyber Digest was agreed and one day set aside every month to spend to scan the environment for opportunities and threats and communicate that knowledge across the firm. In terms of knowledge management and sharing information, Louise and Director B said the company has a process for limiting and controlling who	Reflection: Selecting the technology and product development in the firm is very much within the remit of the top management team. There is lots of questioning amongst the directors in a bid to develop the right product and avoid decision errors – this can be viewed as evidence of the power of 3 mantra of the firm. There is also evidence of difference in individual cognition and knowledge with directors displaying different areas of strength and expertise. Theme: Client demands and needs drive the technology and product the firm develops but the firm can also influence client's demands and needs. Reflection: Product development is highly client-centric and strong considerations are given to client's needs and demands. It is argued that being a niche firm, the company should be extremely client focused. There is also a recognition that regulation is slow, therefore it is vital that client do not just seek to comply with regulation rather they should keep pace with new technology and threats. The directors believe that firm should make this argument to clients and drive this agenda for clients to adopt. Theme: Environmental and knowledge dynamism create new risks and opportunities ('Sensing' – Processes to Identify Changing Customer Needs) Reflection: Environmental and knowledge dynamism create new risk and opportunities for the IT sec industry and organisations and it is important that firms keep on top of new developments. Such sensing of the external environment is largely within the remit of the TMT, including how the firm responds or adapts. Failure to be aware of new developments can present a business risk to the company as demonstrated by the cloud security issue when working at a client organization, Standard Life. Another example is the growing impact of bitcoin technology and Fintech and its impact on financial operations and how banks and other financial institutions respond by adopting the technology to create new services/platforms and changes to banking operations – a prime example is Pay Pal. This in turn presents new IT security risk and opportunities for the industry and shapes the capabilities IT security firms build/enhance to provide services and solutions in this area. A failure to sense, shape and respond to the external environment would leave a firm competitively disadvantaged. Social media is a valuable source of new knowledge, perhaps more effective than traditional sources such as technology magazines and websites. In terms of knowledge management, it is important to have processes in place to share new knowledge across the organization and TMT provides leadership on this. IP protection to protect knowledge assets is also important and the challenge is to strike the correct balance between knowledge sharing between employees (and with clients) and IP protection. The company has processes in place to control who has access to documents and artefacts to achieve IP protection of assets.

		has access to documents and codified artefacts.	
5.	Observation at TMT meeting and Researcher's questioning at the meeting	a. Renewing and Enhancing firm capabilities Director A. "We have updated our capabilities and offerings organically over time through learning and experience … we have done this, we see it works and we improve on it." Director B. "It [capability renewal] is done in an ad-hoc way, there is no laid down procedure or process or periodic schedule which we implement to renew our offerings." Researcher. "How do you acquire new capabilities that you do not already have in the business?" Director A. "So, a client, Standard Life last week has asked us if we could do what we have done for them so far in IT Security across their overall IT. This is something we haven't done before. So, we are in discussions with them if we will deliver this. If we decide to do this, we'll need to develop this process and new capabilities as this is something we haven't done before." Researcher. "So, talking about renewing/upgrading your current offering, if a client requires a solution for which you do not already have the capability in-house e.g. the technology behind bitcoin payment system that you mentioned the other day … should a client require that within an offering you provide to them, how would you get this capability in order to deliver to them?" Director A. "We would do a search online to find the resource [person with the skills set] and deliver to the client. This is what Nicola (recruitment manager) is really good at. We have become really good at this recruitment over the years – better than the competitors, because we try to understand exactly what the client wants, the skill sets of the person. For example, for a penetration tester … 3 to 5 years of experience, client-facing can speak the business language to the client, project management skills etc and we find the right person and fit for the client. Director C actually thinks we are really good at this and so we should sell it, that is, be a recruitment company, but I'm cautious about doing that otherwise you could become a jack of all trade and master of none."	Theme: Enhancing/renewing firm capabilities is done organically ('Sensing' - Processes to enhance capabilities and Select New Technologies) Reflection: The firm does not have methodical and systematic processes for renewing its capabilities and offerings, rather renewal occurs organically through learning and experience and as opportunities present themselves. Similarly, opportunities may arise in an ad-hoc manner from interactions with clients and the firm builds processes and capabilities to exploit the opportunities. Good performance and client satisfaction inevitably leads to client retention and possible exposure to new opportunities. Theme: Recruitment plays a key role in firm's ability to seize opportunities and enhance firm's capabilities/offerings (Seizing Opportunities) Reflection: Recruitment process and skills is important to recruit the right talent and meet client's need. Recruitment/Resourcing capability is learned over time and is also a source of competitive advantage and value to the firm.
6.	Observation at TMT meeting	a. Sensing Opportunities and Threats Louise (BDM). "The guys [employees] on the client sites, they know the client's problems and needs by working directly with the client and we get this information from them. This is something we can get better at or seek to more actively get this information from our guys." Louise (BDM). "We don't know what our competitors are doing, how could we possibly know this? Although sometimes we get inside information." b. Sensing Opportunities and Renewing Capabilities/Offerings. Director A. "The client might have asked for peers, we say, we can give you apples to for an extra £10,000. The client might say, can we get kiwis too, we need kiwis. We [the company] then understand that kiwis are the flavours that those type of clients want so we add kiwis to our offerings.	Theme: Sensing of opportunities is done by staff working on client's site who get to know the client's needs and problems. Reflection: The firm can get better at information about opportunities from staff on client sites. However, it is difficult to know competitor information which may pose a threat to the business. Theme: Sensing of opportunities occurs through interactions with clients and this influences what capabilities the firm possess/adopt and the solutions they provide. When Reflection: Evolution of capabilities happens organically in respond to

		We develop or acquire the resource and capabilities to deliver this product or service." c. Renewing Capabilities and Knowledge Management Director B. "Over the last two years, our offerings have changed very little organically but over the past six months we have thought in a more critical and structured way to upgrade our capabilities and offerings." Louise (BDM). "Now we have developed this new offerings and framework, we want to bring in our fixed-term contract staff to share this knowledge and how they can use the artefacts to deliver work to the clients." Director A. "As a small, niche consultancy we don't have vast resources to spend to bring in our staff and take them on the knowledge management journey. So, the challenge is how we can share, exploit and get knowledge to them and from them as best as possible and at the same time protecting our intellectual property."	client's needs and demands. In the past six months, the firm has taken a deliberate decision to upgrade its capabilities and offerings. Theme: Costs associated with knowledge management and transfer about new capabilities, frameworks and use of artefacts creates a challenge. Reflection: There are benefits for knowledge management and transfer but there are also cost implications, especially for a small firm which has limited resources. There are also concerns about protection intellectual property of intangible assets when that is shared with employees.
7.	Observation at TMT meeting	a. Knowledge Management journey, codification and Intellectual Property protection Director C. "Four people who did access recertification came in [from the client site to the company's office] to deliver their experience to make contributions to the iAccess offering [upgrading and codification] so that it is not only B's [director B] input. Louise (BDM). "The offerings we have redeveloped, we have a new control framework behind it and behind that we have a macro 1, macro 2 and macro 3 levels of artefacts. There are Excel Spreadsheets with details behind macro 3. Most staff only get macro 3, they may never see macro 1. I created what they need from macro 1 which is higher level stuff and added to macro 3 which a staff may need to completely deliver a job or task on a project. This macro 3 is knowledge that is kept and replicated so that any staff can use it with minimal training and go and achieve a task. Macro 1,2 and 3 is the make-up of the offerings which is sold to the client." b. Strategy to be cheaper than the Big 4 Director B. "We have a strategy to be cheaper than our competitors." Director A. "We have a deliberate strategy to be cheaper than the Big 4 [big four consultancy firms]. So, I was speaking to a client last week about his feedback from a project we just successfully delivered. He said 3 things about the success, 'One, you are pragmatic. Two, you are robust. Three, we see the full solution in practice and holistically without asking for more.' Whereas the Big 4 would say; We give you this [deliver this part of the project as agreed] but we can give you this secondly and then this thirdly [we can go further and solve more of your problems] for an extra amount of money. They will look to do the second part for more money and then another sum for the third. We gave all at one go so we are cheaper."	Theme: Wealth of actor's experience is used in articulation and codification. Theme: Knowledge and artefacts are managed to achieved speed and also IP protection. Reflection: Levels of access to documentation and artefacts by staff and clients is restricted to a need-to-know basis in order to help achieve speed and also intellectual property protection. Theme: Firm's strategy is to be cheaper than the Big 4 by providing holistic solutions Reflection: The firm's strategy is to provide comprehensive solutions making them cheaper, in order words more value for money. In contrast, the Big 4 consultancy firms will structure solutions into segments which would require a payment for each from clients.
8.	Observation at Knowledge Sharing session 1	A Knowledge Sharing session was held to unveil the firm's new capabilities framework, replication strategy and how to use the artefacts. The session was attended by the directors, managers and staff (SMEs and Analyst) a. Replication Strategy	Theme: Codification and replication has many benefits to the firm and clients Theme: Leaders play an active role in Knowledge Management journey

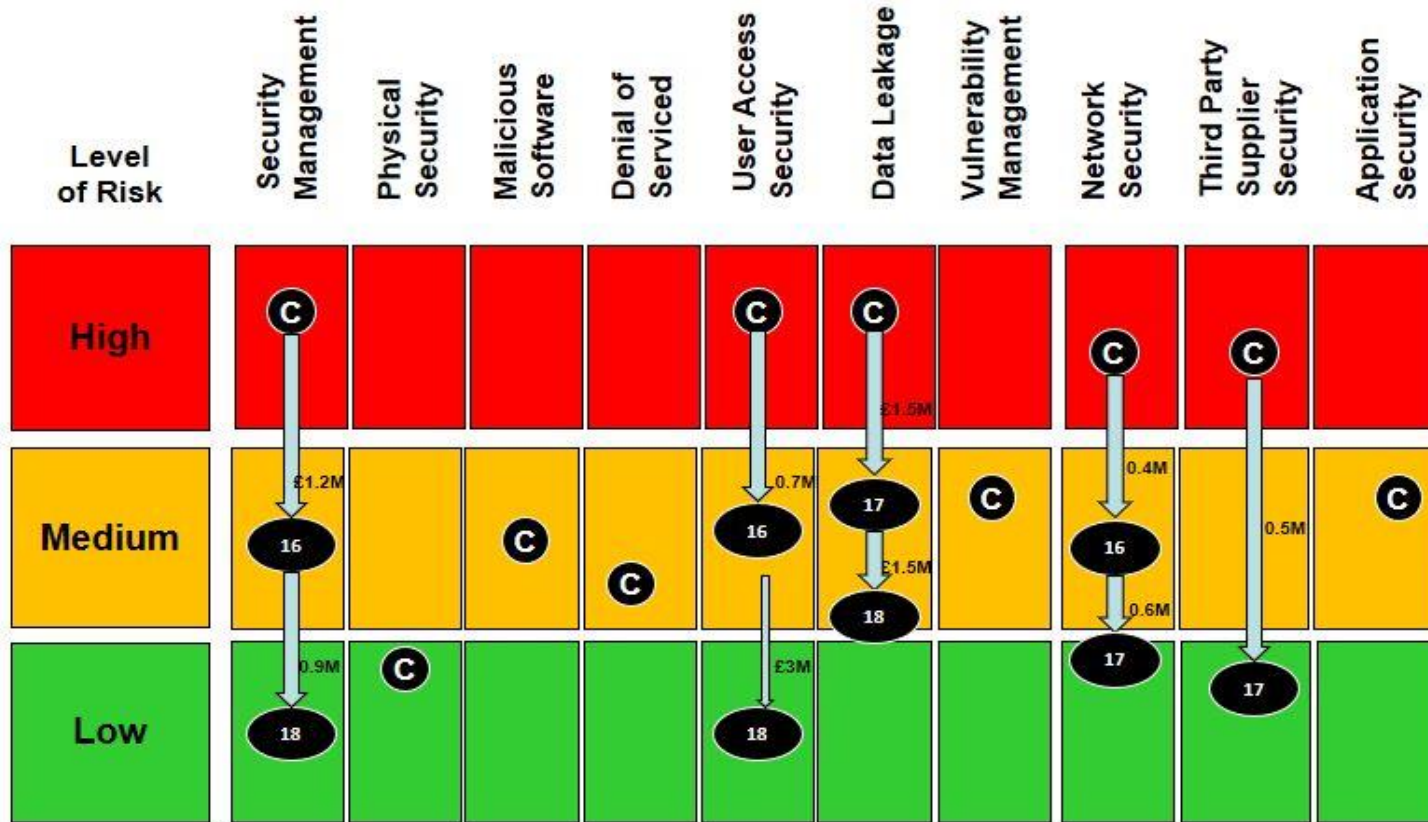|		Director A made a presentation on the framework and use of artefacts and his presentation slides included these statements and discussions;
		Our strategy was to build reusable methods and services. The benefits to clients:
		- Faster outcomes – sell into clients to accelerate the outcome of the engagement
		- Consistent message to client in terms of language
		- Credibility of using industry standards
		- Tailored to meet client needs
		- Library based on experience
		The benefits to [company name]
		- Creates structure and method
		- Easier to teach and coach
		- Company talks to ourselves and client with one language
		   b. Knowledge articulation, codification and language
		Director B stressed the challenges the team faced during the process of knowledge articulation and codification, especially the use of the correct language when creating documents and artefacts.
		Director B. "The amount of time you [the team] spend when you start thinking about what you actually do in tasks [articulation] and putting it down [codification]. We could spend a whole day arguing about language or the right definition … what do things actually mean, what is an offering? The right wordings or language is so important, it is vital to use that to create our identity or brand."
		Director C. "We have processes and documents which we will give to you guys, Subject Matter Experts to see if you can use it."
		Louise (BDM). "We will create a space where everyone can have access to the controls [artefacts] and provide feedback."
		   c. Sensing opportunities by directors.
		Katy speaking to directors. "If you tell us what you want to sell to HSBC, we can all work towards it."
		Director A. "Sometimes we go in and want to sell peers, apples but we realise that they want grapes and plums … sometimes we just don't know.
		Director C. "B [director B] is now working in HSBC to help a senior director there, Mark to drive a security change programme. By getting his feet through the door, he will be able to see what other problems HSBC have and we can then seize the opportunity and see what offerings we can sell to them that suits them."
		Director A. "We used to have a very good relationship with [bank name] but all the people we knew have left! C [director C] .. in fact, all three of us sometimes have to move too with people we know to maintain these relationships to get business."
		   d. Sensing opportunities by staff on client site.
		Director C. "Lloyds are industry leaders in the DPL space and Information Asset Protection … I got this information at a Symantec conference. We got into Lloyds three years ago and now they are market leaders and we have some of you working with Lloyds. How can we tap into this and leverage this knowledge? Can you come up with potential offerings that
			Theme: Clarity of language in knowledge articulation and codification is challenging but helps differentiates firm's brand.
			
			Theme: Practical use of artefacts for replication and feedback on use is important
			
			Theme: Getting into client organizations makes it possible to discover client's needs and sense opportunities
			
			Reflection: Building personal relationships at higher level at client organizations helps to win business
			
			Theme: Exploiting knowledge from staff at client site can be used to enhance the firm's offerings.

		would be worth articulating and codifying into our offerings? Think about this and get in touch with any ideas you come up with." Richard also suggested, "IBM charges so much for penetration testing, if we can offer that service we can undercut them." Director B responded. "We could also do that in partnership with them."	
		e. Cyber Digest on Environmental and Knowledge dynamism Cyber Digest initiative to keep on top of the external environment and industry knowledge which was discussed in past TMT meeting has been rolled in the company and headed by the Business Development Manager. Louise." We have lots of information which is important for your training and awareness." Louise made a presentation on Cyber Digest and covered topics including; Regulation (EU GDPR – new EU data protection regulation), Security News and Breaches, Competitor Information, Security Products, and Customer News. She then asked the audience – Have you read it? Is it useful? Can you feed in information? Discussions followed and staff agreed that they found Cyber Digest informative and useful to their work, especially giving credibility to knowledge when engaging with clients.	

9.	Observation at Knowledge Sharing session 2	A Knowledge Sharing session was held and the agenda covered; Business Update, Firm's Control Framework (How to Use and Q&A) and Knowledge Management.
		    a. Business Update and Strategy
		Director A provided some update about the business;
		   - Our biggest exposure [client] is Lloyds bank, they give us more work but we need to diversity more our revenue base.
		   - 10 clients have bought from us this year, however 3 have stopped buying from us in the last quarter.
		   - Standard Life has given us the most quantity and quality of feedback which is valuable.
		   - Business with HSBC is growing but slower than we would like. We have got on their supplier list as 1 of 4 suppliers so it is now easy for the people in the firm to buy services from us.
		Director B. "One of my clients has seen one of my other clients in a 'Leaders-In-Action' conference and [because] I have now suggested, he told the client that I helped the other client do the things that they've done … now when I say x y z and a b c, he says 'Oh yeah, that's right you guys did that.' You get that kind of cycle going on"
		Director A. "A feedback I got from a director at Standard Life was, 'You gave us four chunks for the price of 1, you are underselling yourself … also you are robust, pragmatic, talked simple language and your people are competent and excellent."
		Director B. "A director formerly at Deloitte and now at HSBC said to me, 'This documentation you have given me that shows how the control frameworks all fit together, I haven't seen that before. Don't give that away for free.' He is thinking as consultant in the Big 4 who probably has a sales target and can sell that artefact for 10k. We are not driven in the same way, we do not have massive shareholders. Our USP is to get the job
			Theme: Increase and diversify firm's revenue base.
			
			Reflection: There is evidence that the firm is cheaper than the Big Four competitor firms.
			
			Reflection: There is evidence that documentation and artefacts are of value and have intellectual property.

		done."	

		Katy [an SME] is response quizzed. "I keep hearing we are selling ourselves cheap. Do we want to change this strategy?"
		Director B. "We have a deliberate strategy to be cheaper, we want repeat business."
		Director A. "It allows us to show all to the client, that is, the problem and the solution need in one go and then we say, we can also do this for you [provide the solution]. Also, we let the client know we are giving them a discount but also tell them the full price otherwise they won't appreciate its value."
		Director A. "It is easier to go back and be friends with someone you are already friends with than try to make new friends all the time."
		    b. Use of Control Framework and Artefacts
		Director B led the presentation and session on this.
		Director B. "The core backbone … documents, methods, processes, have been done within the last year but it's not perfect. We want you guys to keep using it and give us feedback so we can improve it."
		Director B. "The control framework drills down to the control attributes with 5-tier levels and the level you get to depend on who you are talking to, along with the stories you tell [when using the artefacts]. You can talk to respective audiences, for CEO you might stop at the first level."
		Paul [Analyst]. "I take the control framework and develop about 3 or more questions and ask them [the client] if I am not satisfied with their initial answers. I have found it very useful."
		    c. Collective power of our people and Knowledge Management
		Director A led the session and sought suggestions on how to improve knowledge management and team relationships.
		Director A. "How can we best harness our people's capability especially when they are physically located at client's office? [Speaking to Alan] The working relationship you have with Fiona and others at DLP, how can you replicate that relationship with other teams without physically being in many places at the same time? This is a challenge, there is a sweet spot we are still trying to crack."
		Declan [Project Manager]. "The banter … the physical contact helps to create this relationship. Perhaps we should have more frequent Knowledge Sharing session and have more staff to come from client's office, these meetings help to build that relationship.
		Director B. "We are too small a firm not to have as many staff as possible attend these sessions."
			Reflection: The firm's strategy is to be cheaper so that they can get repeat business.
			
			Reflection: Codified artefacts are used at different levels with different audiences.
			
			Theme: Transactive memory systems in teams.
			
			Reflection: Building transactive memory systems with teams and people physically located at different client sites is a challenge.

10.	Observation at Knowledge Sharing session 3	A Knowledge Sharing session was held at the company and was attended by Directors, Managers, SMEs and Analysts. a. Business Strategy This part of the session was delivered by Directors A and B. Director A. "Normally our clients buy 2 things from us … staff augmentation [our people] and professional services which is our offerings. Developing this part [offerings] makes us more sustainable. We can tailor it and also use it off the shelf which is faster. We can repeat it and teach you how to do it. From this year, we improved our strategy and	Theme: Change of the firm's strategy. Reflection: The firm's new strategy is to sell people and offerings and artefacts.

		started to sell our control framework … our artefacts. We have done this for a while and as we build more confidence in the artefacts … it has IP, then we would increase the price."	
		Director B. "You've [the client] got that reducibility. We tell you the problem, we know how to fix it, this is the solution.' It is the way we sell, we don't have salesmen … it is brought to life by the artefacts."	Reflection: The firm's strategy to give holistic solutions (part of its cheaper strategy) is also a form of sales strategy.
		b. Use of Control Framework – Risk Management	Theme: The firm's Risk Management offering.
		Risk management is based on higher-level tools that has been operated by directors at the company.	
		Director A. "Every company … PWC does risk assessment and show red, amber and green. But what is vital is to cost the risk and show that and it is difficult."	Reflection: The directors use lots of stories and narratives to communicate and transfer knowledge on risk management.
		Director A. "I was playing golf the other day in Ireland with the Chief Information Officer of HSBC and said to him, 'Surely you guys have an effective way of measuring information security risk.' He said, 'Even though society has had credit for hundreds of years, we still had the financial crisis … It is extremely difficult to measure risk'."	Risk management is a high-level offering delivered by the directors and is now shared with/passed on project managers to do using artefacts and by being taught in the knowledge sharing sessions.
		Director A. "It is difficult to measure information security risk to a metric. iDecide and iKnow control frameworks allows measurement of risk metrics easy and sensible for the client to see. slides. It's a 3-steps process … gap assessment, risk measurement and cost. We can give the frameworks to our Project Managers to use and get the costings right. Director B used to do this [risk process] but by end of this year we want to be 30% dependent on B and 70% on the Project Managers."	Measuring IT security risk accurately to a metric is very challenging but is of value. This can be described as the quantitative or science part of risk management.
		Director B. "The risk assessment and management requires a lot of tact and nuanced conversations. If you tell the client exactly how bad they are [high amount of risk] with the metrics, they feel exposed, they don't want to hear it … CEOs say different things. It's a bit like houses where the back garden is rubbish but the front garden is good [laughter]. Lloyds has developed an excellent metric system but they don't like the numbers [the truth] so they hide it at the back of fancy reports [laughter]. So, the trick is having the risk metrics but also having the skill … the right language, rhetoric, stories and conversations to deliver it to the client."	Risk management requires a delicate understanding of the client's risk approach and appetite, nuanced conversations and good use of narratives and storytelling for success. This can be described as the artful aspect of risk management.
		Marcel [Project Manager]. "How do we have the same conversations with the clients regarding the risk metrics, we are not there to see when you [the directors] do it … I mean use the same language, rhetoric and the rest of it?"	Practical experience of 'doing' risk management along with language in the artefacts helps to achieve the art of risk management.
		Director B. "We will get you guys involved in the conversations we have with the client as we do it going forward, partly the language in the artefacts … that's why we've tried to make it as granular as we can. Also, learning by experience, by throwing you in the deep end. That is the acid test … it is challenging but exciting."	
		c. Cyber Digest (EU Cyber Security Directive and EU GDPR Heather [SME] delivered this session on the new EU regulation and discussions followed on what it would mean for the company's clients.	Theme: Process to Identify Target Market segment - Environmental dynamism caused by new regulation creates opportunities to sense/identify new target markets and clients e.g. third-party companies and SMEs.
		- The UK will continue to need clear and effective data protection laws whether or not the country remains part of the EU after	Reflection: Sensing of opportunities can be done by individuals or groups

		the EU referendum. - Katy [Analyst] argued that opportunities would arise at third party organizations. Big companies comply with data protection legislation, new opportunities will be with third parties in which the new legislation would compel them to comply. Also, small and medium size organisations (SMEs). - Alan [SME] agreed about opportunities at third-party firms, due to compliance with the new regulation. He told the story of a big company that sent data to a woman who worked in a shed to process [third party] who in turn used the data for marketing purposes. Now such a third party would need to comply with the new EU data protection legislation. Greater need for compliance creates more potential business opportunities for the firm. Thirty party companies and SMEs are an opportunity to target new market segments/clients Information on new security breaches and news in the industry was also shared.	though the process of knowledge sharing sessions held at the firm.
11.	Observation at Company's Christmas Drinks Social Event, December 2015	a. Informal Social event at the company venue The company organised an annual Christmas drinks event where employees, associates and partners and clients were invited. Having been working/researching at the company for about 5 months, the researcher was invited to attend – about 60 people attended. It was an opportunity for the researcher to interact with many employees and clients and gain useful insights into the firm's informal culture and values. The researcher chatted informally to find out what people felt about working at the firm. Some notable responses include; Mark (Analyst). "I enjoy working at the company you feel comfortable giving your opinions … it's a very friendly at relaxed environment." Stuart. (Senior Partner) "Compared to other places I've worked this company strives to deliver high quality which is really good because it pushes you to do your best and you actually learn a lot during that."	Theme: Investigating organizational culture and values Reflection: Informal settings like social events where people interact without the pressures in the workplace and formal hierarchical structures can provide useful insights into the taken-for-granted in organizations such as culture, behaviours and value systems. The firm's documents and the top management team states that the organization's culture and value include- Our strength comes from diversity, all opinions are valued; We strive for excellence and are proud of the standards we achieve; We care about work/life balance; Learning to live our values and to attract good people and win new business. It was evident from the opinions of people at the event that they feel the firm promotes a friendly, relaxed work environment and delivers high quality work.
12.	Observation at Company's Summer drinks event, July 2016 at Le Monde Hotel/Restaurant, George Street, Edinburgh	a. Informal Social event at a restaurant in Edinburgh The company held a summer drinks event to eat, drink and mingle as the Business Development Manager said, 'We don't often get to see everyone face to face." There we about 85 people in attendance including employees, partners, clients and the researcher. Director C welcomed/introduced 2 new employees to the group and then gave a short Business Update before informal interactions began. The researcher observed how people interacted in an informal setting and got opinions from a number of people. Paula (Project Manager). "I've been at the company since it started. For me it's the work-life balance. They recognise that work is important but there are many other important areas in our lives as well."	Theme: Investigating organizational culture and values Reflection: The event was another opportunity to observe the nature of the informal interactions of people that work with the company. It was noted that there was absolutely no segregation between senior employees and junior employees in seating arrangements or the way people interacted. Also, the way people dressed to the event was mostly very informal (even though the event was in the evening of a mid-week working day) and conversations were very light-hearted and enjoyable. This would suggest that people feel relaxed and friendly at the company. Also, in conversations with employees they believe that the company cares about the welfare of its people which has helped to retain staff.

APPENDIX FIVE: ILLUSTRATING FIRM ARTEFACT SHOWING PYRAMID TIER LEVELS IN i-Deliver Control Framework

13 control areas

48 control families

162 control statements

597 control attributes
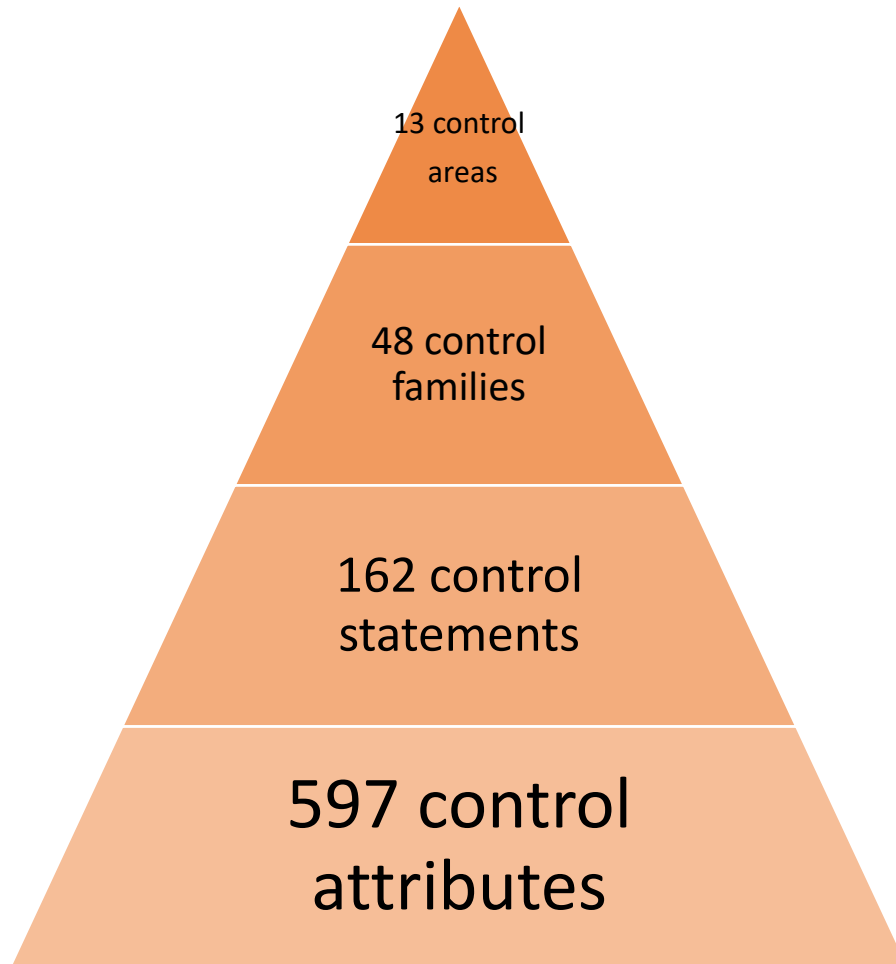
Control Area	Statements	Critical 14%	Must 41%	Should 40%	Could 6%
Application Security	16	2	6	8	
Business Continuity	4	1	2	1	
Identity and Access Management	13	3	7	2	1
Information Asset Protection	22	1	11	9	1
Information Security Management	18	1	6	8	3
Information Security Policy and Standards	19	2	9	8	
Infrastructure Security	16	3	4	8	1
IT Operations	10	2	3	5	
Network Security	13	4	4	4	1
Personnel Security	6		3	2	1
Physical Security	10	1	4	4	1
Security Incident Management	9	1	3	5	
Third Party Supplier Management	6	1	4	1	
Total	**162**	**22**	**66**	**65**	**9**
		14%	41%	40%	6%