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Operationalising Dynamic Capabilities: A Supply Network Configuration Approach

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Abstract

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Building on the existing dominant strategic management paradigms, Dynamic Capabilities view offers considerable value by explaining how certain firms achieve sustainable competitive advantage in situations of rapid change through continually adapting and reconfiguring resources. Despite their increasing relevance in several settings, the fundamental constructs of the dynamic capabilities are not properly operationalised.

While operationalisation of dynamic capabilities has been acknowledged in the literature, they are characterised as processes or routines. However, recent research indicates that firms' dynamic capabilities also include structures as one of the two business models' cornerstones that enable them to sense and seize new opportunities and renew their existing asset base. This finding suggests a relationship between the configuration and routines captured by a firm.

Moreover, it is believed that in order to further understanding of the dynamic capabilities required in high-velocity contexts, the level of analysis has to be expanded from that of the organisation to strategic nets, and also to the macro networks forming their environment. The emergence of institutional or informal networks, formed by clusters or groups of firms appears to be the major new feature of the contemporary industrial economy. Accordingly, winners in the global marketplace have been firms that not only take timely actions in response to the highly changing environment in terms of new products and services, but also explore and exploit their internal and network latent potential (e.g. through taking different positions in the value chain, aggregating, disaggregating etc) by benefiting of network visioning, coordinating network portfolio position and network orchestration.

While exiting attempts on globally distributed network design and management issues address various aspects of questions concerning supply network footprints, much of the existing research has focused primarily on intra-organisational network and has adopted a rather static perspective. The practice studies reveal that while all these approaches depict where the Promised Land is, by the time firms design such a network, the world is changed. On the other hand, the studies aiming to characterise dynamic supply networks mainly focus on operational flexibility. While strategic flexibility has been acknowledged, the focus has been on firm level. All these models provide useful insights into supply chain flexibility. However, they have limited relevance to network flexibility (or adaptability). Adaptability refers to a willingness to reconfigure supply chains when necessary, without ties to legacy issues or the way the chain has been operated previously to respond to market opportunities and/or explore inter-firm network potential.

This research aims to explore the relationship between supply network configuration and dynamic capabilities through bridging the two communities of OM and Strategic Management. Accordingly, the research seeks to examine the following question: ??How do firms operationalise dynamic capabilities through supply network reconfiguration? ??

The conceptual framework is developed around two axes of dynamic capabilities? role and nature. The literature has tended to consider the central role of dynamic capabilities as related to the change of key internal components of the firm such as resources and capabilities. However, this research expands the unit of analysis from intra-organisation resources and routine to inter-organisation to explore how firms co-evolve inter-firm routines within their business network. Dynamic capabilities with the new role aim to continuously reconfigure firms expanded networks. Additionally, while dynamic capabilities have been defined as abilities (or capabilities) or as processes or routines, this research suggests a relationship between the configuration (both organisational and network) and routines captured by a firm. A case study approach is proposed, employing the developed conceptual framework. Additionally, a case selection index is identified and a list of dynamic capabilities exemplars is suggested.

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1. Introduction

1.1 Background

Recent research reveals that in the new environment described as rapidly changing and highly dynamic (Teece et al., 1997), hypercompetitive (D'Aveni, 1994) and high velocity (Eisenhardt and Martin, 2000), the average period for which firms are able to sustain competitive advantage has decreased over time (Wiggins and Ruefli, 2005). The high mortality rate of commercial corporations also suggests that being successful at one point in time is no guarantee of continued survival (O'Reilly and Tushman, 2008). Based on a sample of 226 US largest manufacturing firms, Louca and Mendonca (2002) also assert that the giants of late 20th century are not the same as those at the beginning of that period.

The emergence of institutional and industrial networks, formed by clusters or groups of firms also appears to be the major new feature of the current industrial economy (Belussi and Arcangeli, 1998; Blundel, 2002). According to Christopher (2000, p. 39), "companies now have entered the new era where the prizes will go to those organisations who can better structure, coordinate, and manage the relationships with their partners in a network committed to better, closer, and more agile relationships with their final customers" (Harland, 1996; Handfield, 2002; Ketchen Jr and Hult, 2007; Srail and Gregory, 2008). Fine (1998, 2000) also affirms that, as industry clockspeeds increase, companies are forced more and more to compete as inter-organisational networks, rather than on a firm-by-firm basis (Meijboom et al., 2007).

The existing strategic paradigms endeavour to explain how firms achieve and sustain competitive advantage. While the strategic paradigms asserting that rents flow from privileged product market positions (e.g. competitive forces, strategic conflicts) enjoy popularity, these models address the profitability of the industries rather than individual firms. Although they present a perspective in which environmental influences matter greatly, firms are left with a considerable range of alternative choices regarding whether or how they will take advantage of the opportunities the environment offers (Nelson, 1991; Teece, 1984; Teece et al., 1997).

Rooting in a much older discussion of corporate strengths and weaknesses (Penrose, 1959), however, Resource Based View (RBV) suggests that firms build enduring advantages only through firm-specific capabilities and assets and the existence of isolating mechanisms as the main barrier for imitation is the fundamental determinants of firm performance (Rumelt, 1984; Teece, 1984; Wemerfelt, 1984).

However, the RBV is not able to provide explanations as to how some successful firms demonstrated timely responsiveness and rapid and flexible innovation in situations of rapid change (Teece *et al.*, 1997). Building on the previous dominant strategic management paradigms, Dynamic Capabilities view (DCV) offers considerable value by explaining how certain firms achieve sustainable competitive advantage through continually adapting and reconfiguring resources.

1.2 Formulating the Research Question

In recent years, dynamic capabilities have been largely subject to theoretical debates (Ambrosini and Bowman, 2009; Barreto, 2010; Di Stefano *et al.*, 2010; Easterby-Smith *et al.*, 2009; Makadok, 2001; Pavlou and El-sawy, 2011; Verona and Ravasi, 2003; Williamson, 1999). It is argued that fundamental constructs of dynamic capabilities are not properly operationalised (Barreto, 2010; Williamson, 1999). They are described as abstract concepts lacking specified and exact components (Galunic and Eisenhardt, 2001; Pavlou and El-sawy, 2011) which are difficult to observe (Simonin, 1999), resistant to measurement (Barreto, 2010; Kraatz and Zajac, 2001; Mulders and Romme, 2009) and hidden until exercised (Easterby-Smith *et al.*, 2009).

Accordingly, exploring the ways that firms can develop and nurture these second-order capabilities (i.e. dynamic capabilities) along with assessing how effectively the capability performs its function and how well it enables firm to make a living in terms of a set of empirically straightforward and valid measures creates an attractive research agenda (Barreto, 2010; Daneels, 2002; Helfat *et al.*, 2007; Mulders and Romme, 2009).

Moreover, dynamic capabilities concept has been largely focused on the firms and its application to the real world context of inter-dependent inter-firm network has not been explored (Defee and Fugate, 2010; Esper *et al.*, 2007; Moller *et al.*, 2002). Moller and colleague (2002) assert that Industrial Network Theory (INT) (Håkansson and Snehota, 1995) provides a foundation for conceptualising dynamic capabilities in a network context. According to INT, an inter-firm network refers to any group of related firms or actors that are interconnected in exchange relationships (Håkansson and Snehota 1995; Johannison, 1987).

Recent studies suggest that the increasing specialisation and uncertainty of economic activities has made firms more and more build strategic networks described as a particular inter-firm network with stable inter-organisational ties, which are strategically important to participating firms (Amit and Zott, 2001). A strategic network (or network organisation) is distinguished from a simple network by the "density, multiplicity, and reciprocity of ties and a shared value system defining membership roles and responsibilities" (Anchor, 1997 cited by Moller *et al.*, 2002).

Accordingly, this research aims to adopt a network perspective exploring how firms co-evolve inter-firm routines and assets within their business network in order to respond to the highly dynamic network-environments. The concept of “network configuration” informed by configuration theory as a modern variation of contingency theory (Donaldson, 1996) appears to have great potentials for contributing to the network perspective of DCV. The concept of “network configuration” is applied in various contexts such as global R&D networks (Hanses and Srαι, 2011), international manufacturing networks (Shi and Gregory, 1998), global engineering networks (Zhang et al., 2008), international supply networks (Srαι and Gregory, 2008) and service supply networks (Srαι, 2010).

At its simplest level, configuration is defined as an arrangement of parts or elements that gives the whole its inherent form (Chandra & Grabis, 2007). The key configuration dimensions of inter-firm networks in general and strategic networks in particular emerging from the literature include network structure, network dynamics, network coordination, network relationships and product/services architecture (Dyer and Singh, 1998; Fisher, 1997; Lamming et al., 2000; Shi and Gregory, 1998; Srαι and Gregory, 2008; Zhang et al., 2008). Recent studies suggest that alternative kinds of network configurations (i.e. a particular arrangement of different configuration positions) have different and intrinsic capabilities (Srαι and Gregory, 2008). The configuration therefore can bridge very effectively and efficiently between the strategic requirements from corporate or business level and the network capabilities during the system design (Shi and Gregory, 1998). Configuration theory holds that fit between contingency and configuration dimensions’ position is limited to just a few configurations or gestalts, that is, fits (Miller, 1986).

While operationalisation of dynamic capabilities has been acknowledged in the literature, they are largely characterised as processes or routines (Eisenhardt and Martin, 2000; Teece et al., 1997). Indeed, the literature is lacking distinct network configuration models across the products/ services value chain (i.e. R&D, design, supply, production, logistics and after-sale services) facilitating dynamic capabilities. However, recent research indicates that firms’ dynamic capabilities include intra firm structures (as a configuration dimension) (e.g. Galunic and Eisenhardt, 2001; Karim, 2006; Rindova and Kotha, 2001) that enable them to sense and seize new opportunities and renew their existing asset base. This finding suggests a relationship between the network configuration (both intra-firm and inter-firm) and dynamic capabilities (Mason and Leek, 2008).

The literature domain pertaining to supply chain (network) is found to give new insights into operationalisation of dynamic capabilities endeavours. A supply chain is the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer (Christopher, 1992; 1998; Harland, 1996). The dominant role of supply chains in achieving and sustaining competitive advantage is increasingly highlighted in recent years (Defee and Fugate, 2010; Esper et al., 2007; Harland, 1996; Handfield, 2002; Ketchen Jr and Hult, 2007; Srαι and Gregory, 2005).

Studies also reveal that as industry clock-speeds continue to accelerate, many capabilities in the existing networks need replacement and/or upgrading (Fine, 2000). However, much of the existing research has focused primarily on intra-organisational network capabilities and/or adopted a rather static perspective (Shi, 2003). The existing endeavours aiming to characterise dynamic inter-firm

networks, mainly focus on operational flexibility. While they have focused on flexibility as a response to changes in demand, there is a much wider range of reasons why inter-firm networks need to be flexible. The change could also be coped through re-designing or re-configuring the network, known as adaptability (Lee, 2004; Stevenson and Spring, 2007).

1.3 Objective

The principal objective in this research is to develop an inter-firm dynamic capabilities concept, taking a configuration perspective, addressing an acknowledged gap in the literature (Defee and Fugate, 2010; Moller et al., 2002; Esper et al., 2007).

Bridging the two communities of OM and Strategic Management, the research aims to explore the relationship between supply network configuration and dynamic capabilities through exploring particular network configurations associated with distinct dynamic capabilities profiles. As discussed, network configurations can be examined at both intra-firm and inter-firm level. The research seeks to examine the following questions:

- **RQ:** How do firms operationalise **dynamic capabilities** through **supply network reconfiguration**?

What (what are inter-firm dynamic capabilities constructs)

- Defining the inter-firm network dynamic capabilities concept

How (how firms co-evolve inter-firm routines and assets within their business network in respond to the highly dynamic environments)

- Exploring intra and inter-firm **processes** that facilitate dynamism
- Exploring particular **network configurations** enabling firms to achieve dynamic fit

The remainder of the paper is organised as follows. First, systematic review protocol is elaborated. Second, the research question is positioned in the theory, using definitions synthesised from the literature. The main literature domains of dynamic capabilities and supply chain (network) design and operations, with a focus on operationalisation of dynamic capabilities and dynamic supply chain are described and summarised. The justification for bringing the two areas together, despite the relatively little extant literature doing so, is made. Synthesising and organising the findings from the literature, the research conceptual framework is put forward.

Then, the research approach including the proposed research methods in terms of philosophical stances and research strategy are detailed. Accordingly, the case-study research method, case-study

selection criteria, developed case selection index, data dimension and data collection instruments are presented respectively. Finally, some concluding remarks in term of potential contributions to academia and industry and future steps are provided.

2. Review Protocol

The core literature reviewed in this research has been collected systematically using a title, keyword, and abstract content search of the literature contained within the business and management subject databases. This has been supplemented by a citation review of the key literature. Using this approach, the review begins to cross over from strategic management into operations management and supply chain management literature. The review aims to cover the three key domains (Figure 1- Research Map) of operationalisation of dynamic capabilities, dynamic supply chains and their intersection in terms of stream I, II and III respectively. Table 1 below details the databases referred to during this review. The first three with their comprehensive searching of a wide number of journals in the fields of interest, were explored with Google Scholar used as a cross check at the end. The table also details the keywords used to form the search string applied to the databases discussed.

Table 1 - Review Protocol

Stream	Stream I	Stream II	Stream III
Database	Scopus	Scopus	Scopus
	ABI/INFORM (ProQuest)	ABI/INFORM (ProQuest)	ABI/INFORM (ProQuest)
	EBSCO (Business Source Premier)	EBSCO (Business Source Premier)	EBSCO (Business Source Premier)
	Google Scholar	Google Scholar	Google Scholar
Keywords	<ul style="list-style-type: none"> • Dynamic • capabilit* • Resource • Operationalis* • Measur* • Antecedent 	<ul style="list-style-type: none"> • Supply chain • Supply network • Manufacturing • Network • Change • Uncertainty • Innovation • Learning • Flexibility 	<ul style="list-style-type: none"> • Dynamic capabilit* • Supply chain • Inter-firm • Network • Value chain
Search Strings	[Dynamic AND (resource* OR Capabilit*)] AND [(Operationalis* OR Measur* OR Antecedent)]	[(Supply OR Manufacturing) AND (Chain OR Network) OR (Network) OR (design OR configur* OR structure)] AND [(Change OR uncertainty OR innovation OR learning OR flexibility)]	[Dynamic AND (resource* OR Capabilit*)] AND [Supply OR Manufacturing] AND (Chain OR Network) OR (Network)]

Having conducted the searches elaborated above, the papers extracted have been evaluated. In the first round, they have been limited to those published in the scholarly journals. Citation analysis has also been used to identify the intellectual core of research on domains of focus on the assumption

that citation counts are a valid measure of prominence and influence. This is a standard assumption for bibliometric analyses (Di Stefano et al., 2010). Finally, the quality appraisal in terms of their contribution, underlying theories and methodology is conducted. The processes described resulted in 62, 22 and 28 papers in stream I, II and III respectively. The precise final core source list that was used in compiling this review including their detailed information is attached in Appendix A.

The stream II is found to provide deep insights for operationalisation of dynamic capabilities (stream I) in the network context despite the fact that the concept of dynamic capabilities hasn't been applied explicitly. In addition to the domains discussed, the research also concentrates on those endeavours applying dynamic capabilities explicitly at the network level especially international supply networks (Stream III). However, the third stream also includes papers discussing other parts of manufacturing value chains (e.g. R&D networks, production networks, service network etc).

The review conducted has contributed to a better understanding of phenomena of interest, formulation of research question, development of research conceptual framework and research design aiming to answer to the following questions:

- Operationalisation of dynamic capabilities in terms of processes, antecedents and outcome
- Supply chain design and operations in highly changing environments
- Benefiting of strategic supply chains design in operationalisation of dynamic capabilities
- Investigation of dynamic capabilities within a inter-firm network context in terms of both processes and configurations
- The characteristics of a highly changing environment in terms of macro clusters

3. Literature Review

Figure 1 below illustrates the main literature fields which are of interest in this review. The dynamic capabilities literature describing the historical development of the field, definitions and typologies and then recent endeavours of operationalisation of dynamic capabilities in terms of processes, antecedents, contributors and outcome is reviewed (section 2.1).

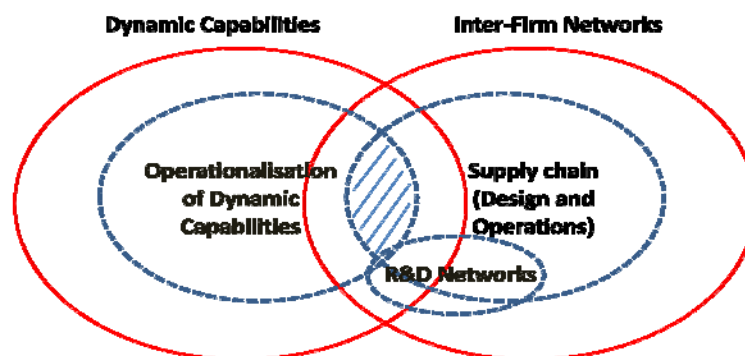


Figure 1 – Research Map

The literature domain pertaining to supply chain (section 2.2) is found to give new insights into operationalisation of dynamic capabilities endeavours, given the difficulty of maintaining a competitive advantage through firm-centric dynamic capabilities due to the changing locus of value creation. Moreover, there is a growing recognition that modern competition is being fought “supply chain versus supply chain” rather than “firm versus firm”. The capability of the supply network has therefore become a vital source of competitive advantage in international markets (Srai and Gregory, 2005). Accordingly, supply networks appear to have great potential for contributing to dynamic capabilities view as a novel unit of analysis (Abrahamsson et al., 2003; Defee and Fugate, 2010; Esper et al., 2007; Wei and Wang, 2007). While the dynamic capabilities literature recognises that the external environment affects learning (Teece et al., 1997; Teece, 2007) and that routines evolve as a result of dialogue and interaction within and across units, departments or functions, these studies have not attempted to adopt a network perspective or explore how firms co-evolve inter-firm routines within their business network. Interestingly, the dynamic capabilities perspective also provides a theoretical foundation that may be used to better understand and predict the success of supply chain firms (Defee and Fugate, 2010).

However, in the new environment described as rapidly changing and highly dynamic (Teece et al., 1997), hypercompetitive (D’Aveni, 1994) and high velocity (Eisenhardt and Martin, 2000), the effectiveness of strategic supply chain management is closely tied to three attributes: agility, adaptability, and alignment (e.g., Christopher, 2000; Lee, 2004; Stevenson and Spring, 2007). While agility provides supply chains with the ability to react quickly to unexpected or rapid shifts in supply and demand, adaptability refers to a willingness to reshape supply chains when necessary, without ties to legacy issues or the way the chain has been operated previously. In fact it characterises the ease (mobility) with which the supply chain can be re-configured. Since supply chains can no longer be expected to preserve their structure over a long horizon, appropriate mechanisms for supporting re-configurability should be embedded in supply chain configuration decisions (Chandra and Grabis, 2007).

Finally, section 2.3 describes the existing attempts applying the concept of dynamic capabilities in the network context with a focus on international supply networks. However, dynamic capabilities have largely been ignored in the logistics and supply chain literature. With few exceptions (e.g. collaboration as a capability; knowledge accessing and co-evolving), the focus has been on operating routines (Zollo and Winter, 2002) where dynamic capabilities have been acknowledged in a supply chain context (Abrahamsson et al, 2003). For example, research describing the need for flexible and agile logistics capabilities has focused on the creation of a logistics system by one firm in the supply chain that can deal with swings in order volume and product variety rather than dynamic capabilities as source of flexibility and agility (Defee and Fugate, 2010).

2.1 Dynamic Capabilities

Teece et al.’s (1990) working paper is the first contribution developing explicitly the notion of dynamic capabilities. They contend that it is not only the bundle of resources that matter, but the mechanisms by which firms learn and accumulate new skills and capabilities. These ideas were first

formally published in 1994 by Teece and Pisano. They explained that the RBV was not able to provide explanations as to how some successful firms demonstrated ‘timely responsiveness and rapid and flexible product innovation, along with the management capability to effectively coordinate and redeploy internal and external competences’ (Teece and Pisano 1994, 537). The 1990 and 1994 work were then elaborated upon in Teece et al. (1997) when they explicitly argued how the dynamic capability view could overcome the limitations of the RBV. They then defined dynamic capabilities as ‘the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments’ (1997, 516).

Although the dynamic capabilities paradigm is barely two decades old, its conceptual underpinnings are much older. Elements of the approach can be found in Schumpeter (1942) work on processes of creative destruction and innovation-based competition, resource-based view (RBV) of the firm, which was developed by Penrose (1959), Richardson (1972) and Nelson and Winter (1982), Cyert and March’s (1963) work on the behavioural aspects of firms, Williamson’s (1975, 1985) work on markets and hierarchies and asset specificity, Prahalad and Hamel (1990), Teece (1976, 1982; 1986; 1988) and Rumelt (1984) and in Hayes, Wheelwright, and Clark (1988). Figure 2 below illustrates the conceptual underpinnings and the historical development of dynamic capabilities literature from the early 40s (Ambrosini and Bowman, 2009; Augier and Teece, 2009; Macher and Mowery, 2009; Teece and Pisano, 1994; Teece et al., 1997).

Figure 2 – The historical development of dynamic capabilities literature and the underpinnings

Compiled by author

Key sources: Ambrosini and Bowman, 2009; Augier and Teece, 2009; Eisenhardt and Martin, 2000; Helfat et al., 2007; Macher and Mowery, 2009; Teece et al., 1990; Teece and Pisano, 1994; Teece et al., 1997; Teece, 2007; Williamson, 1999; Winter, 2003; Zahra et al., 2006; Zoltp and Winter, 2002

Definitions

Several alternative conceptualisations of dynamic capabilities are offered. These proposals vary significantly in terms of the main elements (e.g. nature, role, context, creation and development, outcome and the degree of heterogeneity) highlighting the major theoretical and underpinnings (Barreto, 2010). The seminal works have been summarised in terms of definitions proposed around the main building blocks of dynamic capabilities in Table 2.

As noted by many scholars, almost every author (e.g., Eisenhardt and Martin, 2000; Teece et al., 1997; Zahra et al., 2006; Zollo and Winter, 2002; Winter, 2003) has submitted an individual set of definitions for dynamic capabilities. Notwithstanding the efforts of Helfat et al. (2007), Wang and Ahmed (2007), Mulders and Romme (2009) and Barreto (2010) to develop widely held definitions in the field. Helfat et al. (2007) define dynamic capabilities as the capacity of an organisation to purposefully create, extend, or modify its resource base. This definition is precise enough to be meaningful, yet broad enough to allow scholars to learn more about the nature and origins of dynamic capabilities through investigation. It accommodates both Teece's (1997) view that dynamic capabilities enable a firm to respond to environmental change as well as Eisenhardt and Martin's (2000) broader notion that they can also be the source of disruptive change.

By their definition, Wang and Ahmed (2007) first argue that dynamic capabilities are not simply processes, but embedded in processes. Processes are often explicit and thus can be transferred more easily within the firm or across firms. Capabilities refer to a firm's capacity to deploy resources, usually in combination, and encapsulate both explicit processes and those tacit elements (such as know-how and leadership) embedded in the processes.

Reviewing the diverse research streams on dynamic capabilities, Barreto (2010) also suggests a new conceptualisation of dynamic capability as an aggregate multidimensional. He defined dynamic capability as a firm's specific potential (to solve problems systematically) to stress the fact that, although one should expect that, on average, firms with higher levels of dynamic capability present higher levels of performance, there is no assurance that such a potential is actually realised by each firms and that is actually produces the expected results. By considering four distinct but simultaneously necessary components (propensities to sense opportunities and threats, to make timely decisions, to make market-oriented decision and to change the firm's resource base), this definition depart from previous concerns regarding the obscurity and intractability of the construct and facilitates operationalisation of the construct in future empirical research (Barreto, 2010).

According to Easterby-Smith and colleagues (2009) the slowness to converge on a common definition may be due to variations within the community that contributed to the development of this concept. Scholars coming from different research traditions have viewed dynamic capabilities with different lenses, reflecting their different backgrounds. Some of them followed an approach closer to RBV, whereas others tended to undertake an approach more akin to evolutionary economics (Barreto, 2010). Winter (2003) and his co-authors (e.g. Zollo and Winter, 2002), for example, define dynamic capabilities in terms of routines, a central feature of evolutionary economics. In contrast, Eisenhardt and Martin (2000) define them in terms of processes whose nature varies with the degree of market dynamism (Easterby-Smith et al., 2009).

Table 2 – The Seminal Literature Definitions

Author(s)/Year	Dynamic Capabilities Concept Main Elements					
	Nature	Role	Context	Creation and Development	Outcome	Heterogeneity
Teece, Pisano and Shuen, 1997	Ability/ Capacity	To integrate (or coordinate), build, and reconfigure internal and external competencies	Rapidly changing environments	Embedded in organisational processes that are shaped by firms' asset positions and the evolutionary path they have adopted in the past	Sustained competitive advantage (A direct relationship between firms' DCs and their performance)	Heterogeneous across the firms
Eisenhardt and Martin, 2000	Firms processes (organisational and strategic routines)	To integrate, reconfigure, gain and release resources	High-velocity markets and moderately dynamic markets	Repeated practice and consequent experience, past mistakes and the pace of experience	Dynamic capabilities are necessary but not sufficient conditions for competitive advantage	Dynamic capabilities exhibit commonalities across firms
Zollo and Winter, 2002	A learned and stable pattern of collective activity	To generate and modifying organisation operating routines	More value in rapidly changing environments, but they consider other environments	The role of learning mechanisms in creation and development of dynamic capabilities	A direct link between dynamic capabilities and superior performance and survival	Heterogeneous across the firms
Winter, 2003	Capability (routine)	To extend, modify or create ordinary capabilities	More value in rapidly changing environments	Learning mechanisms	Other types of costs make dynamic capabilities not necessarily advantageous	Not mentioned
Zahra, Sapienza and Davidson, 2006	Ability/ Capacity	To reconfigure firms' resources and routines / To solve problems	Volatile and changing environment is not a necessary component	Learning from experience, trial and error and improvisation processes	The relationship between DCs and performance is indirect through the quality of substantive capabilities	Not mentioned
Wang and Ahmed, 2007	Firm's behavioural orientation	To integrate, reconfigure, renew and recreate its resources and capabilities and upgrade and reconstruct its core capabilities	Changing environment	developed over time through complex interactions between the firm's resources	Sustainable competitive advantage	Exhibit commonalities but in terms of tacit elements associated with explicit processes, capabilities are often firm-specific
Teece, 2007	Ability/ Capacity	To sense and shape opportunities and threats, seize opportunities and maintain competitiveness	Highly changing and unpredictable markets	Process, position and path	Sustained competitive advantage (DCs lies at the core of enterprise success (and failure)	Essentially firm specific and unique
Mulders and Romme, 2009	Capabilities	To convey deliberate knowledge on how to question purpose and effectiveness of the resource base	Changing environments	invoked on a repeated basis	Firm performance does not automatically increase as a result of developing a dynamic capability.	Heterogeneous across the firms
Barreto, 2010	Potential	To systematically solve problems	More relevant to changing environments due to the timely decisions	Formed by firms 'propensity to sense opportunity and threats and to make timely, market-oriented decisions	Link between dynamic capabilities and performance (Competitive advantage)	commonalities across firms is conceptually assumed in one (or more) of the involved dimensions

Moreover, Schreyogg and Kliesch-Eberl (2007) assert that while at first sight the approaches on dynamic capabilities build a fairly homogenous class, a closer look reveals remarkable differences among them calling for a differentiated discussion. They identified three different theories of dynamic capabilities labelled (1) the radical dynamisation approach, (2) the integrative approach (The most prominent approach towards a theory of dynamic capabilities has been provided by Teece et al. (1997)) and (3) the innovation routine approach. The first treats dynamic capabilities as a functional equivalent to classical capabilities in dynamic environments. The second fosters the idea of amending capabilities by adding a dynamic dimension and the last assigns the task of dynamisation to a special type of routine called innovation routine (Rothaermel and Hess, 2007). The third approach to dynamising capabilities basically suggests supplying the missing dynamic dimension (Lawson and Samson (2001) by installing separate innovation routines that allow a firm to overcome the rigidity trap (paradox) of organisational capabilities (Zollo and Winter, 2002).

2.2 Supply Chains (Networks)

According to Giannakis and Croom (2004), the term “supply chain management” was first used in its popular sense through a consideration of strategic issues within the Logistics literature by Oliver and Weber (1982). The development of the supply chain management concepts was initially along the lines of physical distribution and transport, using the techniques of industrial dynamics through the incorporation of theoretical concepts and research in strategic management, industrial organisation, institutional and production economics (transaction costs), inter-organisational relationships and system theory. Another antecedent can be found in the Total Cost approach to distribution and logistics (Lewis, 1956). Both of these approaches showed that focusing on a single element in the chain cannot assure the effectiveness of the whole system. Figure 3 below illustrates the historical development of ‘supply chain’ literature around 4 different levels of analysis (i.e., functional, dyadic, chain and network) along with the chronology of theoretical developments that influenced this area of knowledge.

Supply chains have come to be understood as relatively stable groups of firms engaged in the sequence of production and distribution activities required to serve the end-customer. For example, Christopher (1998, Chapter 1) explains that:

. . . the supply chain is the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.

Figure 3 – The historical development of ‘supply chain’ literature

Compiled by author

Key sources: Burgess et al., 2006; Caddy and Helou, 2007; Christopher, 1992; 1998; Chandra and Grabis, 2007; Giannakis, Croom and Slack, 2004; Handfield, 2002; Harland, 1996; Harland et al., 2001; Hitt, 2011; Ketchen Jr and Hult, 2007; Lammina, 1996; Lambert and Cooper, 2000; Voss, 1995; Womack et al., 1990

Supply Chain (Network) Capabilities

The last decade has witnessed an increase in research seeking to incorporate different strategic management perspectives in the field of operations management and strategy (Hitt, 2011; Ketchen Jr and Hult, 2007; Smart, Bessant and Gupta, 2007). In particular, the resource-based view examining how certain assets and capabilities set a foundation for competitive advantage and superior performance (Barney, 1991) provides theoretical underpinnings for best value supply chains. Best value supply chains reflect the assumption that unique resources and capabilities exist at the supply chain level, and that supply chains can be inimitable competitive weapons (Ketchen Jr and Hult, 2007).

Accordingly, the capability of the supply network has therefore become a critical determinant in business capability and performance. Wu, Melnyk and Flynn (2010) label operational capabilities as a subset of the organisational capabilities construct, and believe that insights gained from research on

organisational capabilities can be readily applied to the study of operational capabilities. While organisational capabilities has been defined as information-based, tangible, intangible processes that are firm-specific and are developed over time through complex interactions among the firm's resources, for the purpose of achieving a particular end result (Helfat and Peteraf, 2003; Makadok (2001), Wu and colleagues (2010) define operational capabilities as firm-specific sets of skills, processes, and routines, developed within the operations management system, that are regularly used in solving its problems through configuring its operational resources. Operational capabilities are also defined as supply chain enabling processes (or primary capabilities) (Srai and Gregory, 2005). However, those capabilities that are more generic, or are derived capabilities, that result perhaps from a combination of SC capabilities have been separated out; these are termed Meta-SC and include concept such as agility, flexibility, innovation etc (Table 3).

Recent research also has discussed companies developing both internal and external (e.g. cross-organisational) capabilities (Gibson et al., 2009) in order to differentiate world-class supply chain organisations from the rest of the pack. The most frequently described internal capabilities were supply chain orientation (characterised by top management support and a willingness to invest) and agility (characterised by learning and continuous improvement). These internal capabilities formed the foundation for top performance, but the best organisations were also found to possess one or more capability(ies) that cut across and involved multiple organisations working together to create and maintain a competitive advantage (Defee and Fugate, 2010). While some capabilities may deal specifically with adaptation, learning, and change processes, all capabilities have the potential to accommodate change.

4. Positioning the Field of Inquiry

Having reviewed the core sources in each research stream, a matrix framework has been developed (Figure 4). The proposed framework aims to categorise the relevant domains of dynamic capabilities and dynamic supply chains and brings these two together in terms of an integrated unit.

As shown, Dynamic capabilities can take on multiple roles in organisations. The literature has tended to consider the central role of dynamic capabilities as related to the change of key internal components of the firm such as resources and capabilities (e.g. Eisenhart and Martin, 2000; Helfat et al., 2007; Teece et al., 1997; Winter, 2003), operating routines (Zollo and Winter, 2002), and resources and routines (Zahra et al., 2006) (Barreto, 2010; Easterby-Smith et al., 2009). While some authors describe it as an ability to integrate resources, reconfigure resources, creating new resources and shedding resources (Ambrosini and Bowman, 2009), others concern dynamic improvements to the activities of the firm (Collis, 1994).

		View	
		Intra-firm View	Inter-firm View
DCs Role	To upgrade Asset	DC-P DC-C	DC-P DC-C
	To upgrade Routine	DC-P DC-C	DC-P DC-C

DC-P: Dynamic Capability process dimension

DC-C: Dynamic capability configuration dimension

Figure 4 –The matrix framework

While dynamic capabilities literature recognises the role of external environment, these studies have not attempted to adopt a network perspective or explore how firms co-evolve inter-firm routines within their business network (Mason and Leek, 2008; Moller et al., 2002). In fact, the application of dynamic capabilities to the real world context of inter-dependent inter-firm network has not been explored. Relational View describes relationship between firms as an increasingly important unit of analysis for understanding competitive advantage (Dyer and Singh, 1998). Authors also suggest that antecedents to dynamic capabilities, which they describe as “processes to integrate, reconfigure, gain, and release resources—to match and even create market change,” can be found at the individual, firm, or network level (Eisenhardt and Martin, 2000; Rothaermel and Hess, 2007). Accordingly, this research is mainly adopted an inter-firm view.

Dynamic capabilities have been defined as abilities (or capabilities) but also as processes or routines. According to Teece and colleagues (1997) the essence of dynamic capabilities is embedded in organisational processes. Eisenhardt and Martin (2000) present dynamic capabilities as specific and identifiable processes, whereas Zollo and Winter (2002) following an early definition of routines consider dynamic capabilities as learned and stable patterns of activities. This research is grounded in the observations of Hamel and Prahalad (1994), who identify two cornerstones of business models (1) structure: how firms perceive the structure of their firm, their business network and their position within it; and (2) routines: how firms develop effective operational routines to exploit the potential value of the network (Mason and Leek, 2008). Accordingly, this research aims to explore both process dimension (DC – P) and configuration dimension (DC – C) associated to dynamic capabilities. This suggests a constant and iterative need for creation, integration and reconfiguration of both structure and routines (Mason and Leek, 2008; Teece et al., 1997; Zahra et al., 2006; Zollo and Winter, 2002).

Operationalisation of Dynamic Capabilities

Operationalisation is the process of defining a fuzzy concept so as to make the concept clearly distinguishable or measurable and to understand it in terms of empirical observations. Accordingly, operationalisation formalises theories' ideas and concepts into applicable models. In order to interpret how effectively dynamic capabilities affect competitive advantage, scholars have explored the operational mechanisms of dynamic capabilities in terms of organisational processes and routines, antecedents, facilitators (contributors) and outcome. Each of these will be considered in turn.

Identification of Proposed Set of Dynamic Capabilities Processes

Eisenhardt and Martin (2000) argue that dynamic capabilities are a set of specific and identifiable processes by which managers alter their resource base—acquire and shed resources, integrate them together, and recombine them—to generate new value-creating strategies. For instance, product development routines by which managers combine their varied skills and functional backgrounds to create revenue producing products and services (e.g., Eisenhardt and Martin, 2000; Winter, 2003; Deeds et al., 1999; Verona and Ravasi, 2003; Rosenbloom, 2000; Rothaermel and Hess, 2007; Marsh and Stock, 2003; Danneels, 2002; D'Este, 2002) are such a dynamic capability. New products have been indicated as the most natural driving force behind change and renewal at the corporate level (Nonaka, 1994; Daneels, 2002).

Similarly, strategic decision making is a dynamic capability in which managers group their various business, functional, and personal expertise to make the choices that shape the major strategic moves of the firm (e.g., Arragon-Correa and Sharma, 2003; Eisenhardt and Martin, 2000; Helfat et al., 2007; Pablo et al., 2007; Rosenbloom, 2000; Slater et al., 2006). The need to incorporate decision-making propensities in the definition of dynamic capabilities is supported in several studies (e.g. Moliterno and Wiersema, 2007).

Alliance and acquisition routines that bring new resources into the firm from external sources is also mentioned as a key dynamic capability (Eisenhardt and Martin, 2000; Kale and Singh, 2007; Karim and Mitchell, 2000; Rosenbloom, 2000; Zollo and Winter, 2002). Karim and Mitchell (2000) explain that acquisitions allow firms to reconfigure their mix of resources and to overcome failure and exploit opportunities in their environment.

Rindova and Kotha (2001) mentioned continuous transformation of organisational forms as a process pertinent to dynamic capabilities. In their framework, they propose that firms rely on continuous morphing to regenerate competitive advantage under conditions of rapid change through comprehensive and continuous redefinition of the products and services a firm provides, changes in the resources and capabilities deployed, and a mode of organising that facilitates creating and using new resources and capabilities. Dynamic capabilities are also explored by focusing on the corporate-level processes by which multi-business firms reconfiguring their business units (e.g. Galunic and Eisenhardt, 2001; Karim, 2006).

More recently, some studies have added additional components to what are elsewhere considered to be the constituents of dynamic capabilities. Schreyogg and Kliesch-Ebrel (2007) proposed the consideration of “capability monitoring,” a separate organisational function removed from the operational level and intended to observe both a firm’s capabilities usage and evolvement and the firm’s external environment. Teece (2007) suggested that, in addition to the resource reconfiguring capabilities, there are two even more fundamental types of capabilities involved: the capability to sense and shape opportunities and threats and the capability to seize opportunities (Barreto, 2010; Easterby-Smith et al., 2009). He also contends that enterprises with strong dynamic capabilities not only adapt to business ecosystems, but also shape them through innovation and through collaboration with other enterprises, entities, and institutions (Menguc and Auh, 2006; Teece, 2007).

Specifically, Bowman and Ambrosini (2003) building on Teece et al. (1997) explain that dynamic capabilities processes comprise four main clusters: reconfiguration, leveraging, learning and creative integration. Reconfiguration refers to the transformation and recombination of assets and resources. Leveraging involves replicating a process or system that is operating in one business unit into another, or extending a resource by deploying it into a new domain. Learning allows tasks to be performed more effectively and efficiently as an outcome of experimentation, reflecting on failure and success. Finally, creative integration relates to the ability of the firm to integrate its assets and resources, resulting in a new resource configuration.

Wang and Ahmed (2007) also identify three main component factors of dynamic capabilities, namely adaptive capability, absorptive capability and innovative capability. Adaptive capability is a firm’s ability to adapt their product–market scope to respond to external opportunities. Absorptive capacity is the firm’s ability to assimilate and replicate new knowledge gained from external sources. Innovative capability refers to a firm’s ability to develop new products and/or markets, through aligning strategic innovative orientation with innovative behaviours and processes (Rothaermel and Hess, 2007).

Following Winter (2003) and Teece (2007), Pavlou and El-sawy (2011) define dynamic capabilities as those capabilities that help units extend, modify, and reconfigure their existing operational capabilities into new ones that better match the changing environment. The proposed dynamic capabilities that are proposed as tools for reconfiguring existing operational capabilities are: (i) sensing; (ii) learning, (iii) integration, and (iv) coordination capabilities. Sensing capability is the ability to spot, interpret, and pursue opportunities in the environment through generating, disseminating and responding to market intelligence (Galunic & Rodan, 1998; Kogut & Zander, 1996; Teece, 2007). Learning capability is the ability to revamp existing operational capabilities with new knowledge through acquiring, assimilating, transforming, and exploiting knowledge (Zahra and George, 2002). Integrating capability is the ability to embed new knowledge into the new operational capabilities by creating a shared understanding and collective sense-making. Coordinating capability is the ability to orchestrate and deploy tasks, resources, and activities in the new operational capabilities (Helfat and Peteraf, 2003).

Identification of Proposed Set of Antecedents and Contributors

This section characterises the mechanisms that guide the genesis and evolution of dynamic capabilities. As discussed earlier, the mechanisms proposed are both in terms of routines and structures. While most of the research describes the structures supporting the dynamisms at the firm level in terms of organisational structure, internal hierarchies, their departments and their functions, some recent endeavours depict the way firms identify, interact and exploit network value to support dynamic capabilities creation and development.

Teece and colleagues (1997) identify several classes of factors that will help determine a firm's distinctive competence and dynamic capabilities. They organise these in three categories: processes, positions, and paths. They suggest that while the essence of competences and capabilities is embedded in organisational processes of one kind or another (managerial and organisational, learning and reconfiguration processes), the content of these processes and the opportunities they afford for developing competitive advantage are shaped significantly by the assets the firm possesses and by the evolutionary path it has adopted/inherited. The internal 'paths and positions' that have a moderating effect include managerial behaviours and perceptions, and the presence of complementary assets and resources (Ambrosini and Bowman, 2009).

Eisenhardt and Martin (2000) suggest that effective product development routines typically involve the participation of cross-functional teams that bring together different sources of expertise which is often facilitated by strong or 'heavyweight' team leaders. Marsh and Stock (2003) discuss how knowledge acquisition, distribution, interpretation, retention, and application and action activities feed the process of inter-temporal integration. Based on an in-depth analysis of a leading company in the hearing-aid industry, Verona and Ravasi (2003) also indicate how continuous innovation requires the simultaneous presence of three fundamental processes of knowledge creations and absorption, knowledge integration and knowledge reconfiguration at the organisational level. The authors map the resources and structures that underpin such capabilities in terms of actors, physical resources, structures and systems and culture. Deeds, DeCarolis and Coombs (1999) suggest that new product development is a function of a firm's geographic location (close proximity of organisations with similar interests), scientific (research team) capabilities, external contacts (strategic alliances), and the functional and educational background of top managers. Similarly, based on an examination of the history of Mergenthaler Linotype, a firm that has survived three revolutions in 1990, Tripsas (1997) highlights two key contributors to dynamic technical capability: external integrative capability and geographically distributed research sites. Using two wave panel data on a sample of U.S. public manufacturing firms, Danneels's (2008) also proposes key organisational features that nurture firms marketing and R&D second-order competences. They include willingness to cannibalise, constructive conflict, tolerance for failure, environmental scanning and slack resource.

Similarly, successful acquisition processes are characterised by pre-acquisition routines that assess cultural similarity and consistency of vision and post-acquisition routines that pay particular attention to the speed of integration and the strategic redeployment of assets across the two firms (Eisenhardt and Martin, 2000). Kale and Singh (2007) see the alliance learning process as a process that is directed toward helping a firm (and its managers) learn, accumulate, and leverage alliance

management know-how and best practices. Drawing on prior research on dynamic capabilities (Zollo and Winter, 2002) and the knowledge-based view of the firm (Grant, 1996; Nonaka, 1994), the authors suggest that such a process involves deliberate efforts to articulate, codify, share, and internalise alliance management knowhow in firms.

Zollo and Winter (2002) address the role of experience accumulation, knowledge articulation and knowledge codification processes in the evolution of dynamic as well as operational routines. The argument is made that dynamic capabilities are shaped by co-evolution of these learning mechanisms. At any point in time, firms adopt a mix of learning behaviours constituted by a semi-automatic accumulation of experience and by deliberate investments in knowledge articulation and codification activities (Eisenhardt and Martin, 2000). This acknowledges that dynamic capabilities do not appear as a fully formed capability; they are typically the outcome of experience and learning within the organisation (Ambrosini and Bowman, 2009). Cepeda and Vera (2007) also, based on a sample of 107 firms in the information technology and communication industry in Spain clarify the link between dynamic capabilities and operational capabilities by building on a knowledge management (KM) perspective to unpack the concept of dynamic capabilities. In doing so, they describe the KM processes associated with dynamic capability development and utilisation in terms of creation, transfer, retention, and utilisation of an enterprise's explicit and tacit knowledge assets and their effect on operational capabilities.

Jantunen and colleagues (2005) study in a sample of 217 firms in the manufacturing and service sectors indicate that a firm's entrepreneurial orientation and its reconfiguring capabilities have an effect on its international performance. The concept of entrepreneurial orientation is a multidimensional construct, which in its commonly used form consists of dimensions of innovativeness, proactiveness and risk-taking (Covin and Slevin, 1989; Wiklund, 1999). This study complements existing studies, and the results suggest that it is not only the firm's entrepreneurial behaviour, but also its ability to create new asset configurations that have an effect on performance in international markets. Similarly, Jiao and colleagues (2010) find that entrepreneurial orientation and continuous organisational learning have positive effects on dynamic capabilities.

In a broad model of the various activities associated with the creation of dynamic capabilities and their effect on a company's performance, Zahra et al. (2006) also place a particular emphasis on firms' entrepreneurial activities as those activities influencing the selection of resources and skills and promoting organisational learning processes to capture external knowledge as new situations arise. These choices combine to create new substantive capabilities and the organisation's knowledge base.

There is also significant debate over what type of organisational structure is best suited to utilise effective dynamic capabilities in high velocity markets. The literature proposes numerous organisational designs including dynamic community (Galunic and Eisenhardt, 2001); modular design (Karim, 2006; Pil and Cohen, 2006); ambidextrous (Benner & Tushman, 2003), hybrid, decentralised (Teece et al., 1997), autonomous, integrated and switching but there is no consensus as to an ideal type (Westerman, McFarlan & Iansiti, 2006 cited by Wilson, 2008).

Pil and Cohen (2006) contend that modular design practices provide a lens on the link among product architecture, imitation, and the dynamic capabilities that sustain long-term performance. To enable flexibility, organisational and strategy scholars advocate the use of modular design principles at multiple levels. Modular corporate strategies, comprised of loosely coupled simple rules, can be reconfigured as environments shift (Galunic & Eisenhardt, 2001). Modular business unit competencies can be quickly leveraged into other markets as opportunities change (Galunic & Eisenhardt, 2001). Modularity in product design allows a firm to exploit technological opportunities and to react to evolving market opportunities through recombination, modular innovation, and outsourcing (Thomke & Reinertsen, 1998).

The loose, flexible organisational structures required for variation and uncertainty during exploration differ markedly from the tightly controlled processes and strong task interdependencies required for highly efficient and exploitative firm improvement. As a result of this distinction, suggested organisational structures commonly consider either exploration or exploitation but not both, casting doubts over the practical application of dynamic capabilities (Wilson, 2008).

However, recently O'Reilly and Tushman (2008) contend that dynamic capabilities require a balance in centralisation and decentralisation of control to encourage feedback from market-facing units, a culture of openness that encourages debate, the commitment of resources by senior leaders (financial and time) to encourage long-term thinking, and a senior management team that fosters a long-term mindset and promotes exploration. In organisational terms, this requires leaders who can craft a vision and strategy, ensure the proper organisational alignments (whether it is for exploitation or exploration), assemble complementary assets, and decide on resource allocation and timing. In more concrete terms, this involves developing a consensus among the senior team about the strategic intent, avoiding the decision traps that path dependencies and mindsets bring, and aligning the business model and strategy.

Conducting an in-depth case study on NCR Corporation, Rosenbloom (2000) also suggests a bigger role for managers in actualisation of latent dynamic capabilities. More recently, Pitelis and Teece (2010) place a particular emphasis on the role of entrepreneurial management in orchestrating system-wide value creation through market and eco-system creation and co-creation. Augier and Teece (2009) elaborate that the manager/ entrepreneur can bargain, negotiate, and buy or sell or swap investments/assets, orchestrate internal assets (entrepreneurship), transact with the owners of external assets (entrepreneurship), and design and implement new "business models," which define the architecture of new businesses (Chesbrough and Rosenbloom 2002). The astute performance of these functions will help achieve what Porter (1996) calls "strategic fit," not just with internally controlled assets, but with the assets of alliance partners. Accordingly, the crucial task here is not the simple organisational structural decision in which the exploratory and exploitative subunits are separated, but the processes by which these units are integrated in a value-enhancing way.

Outcome

The most important relationship in this field is perhaps the one between dynamic capabilities and performance (Barreto, 2010). Some authors assume a direct relationship between firms' dynamic

capabilities and their performance or competitive advantage (e.g. Makadok, 2001; Teece et al., 1997; Zollo and Winter, 2002). There is increasing evidence that the firm performance is affected by firms' abilities to integrate, build, and reconfigures their resources and competencies. As discussed, Teece and colleagues (1997) have argued that the competences and capabilities and hence competitive advantage of a firm rest fundamentally on processes, shaped by positions and paths. However, competences can provide competitive advantage and generate rents only if they are based on a collection of routines, skills, and complementary assets that are difficult to imitate (Teece et al., 1997). Empirical evidence also supports that dynamic capabilities plays an important role in firms' long-term survival and success (Rindova and Kotha, 2001; Lampel and Shamsie 2003; Zahra and George, 2002; D'Este, 2002).

Eisenhardt and Martin (2000) propose a different argument, albeit with similar implications. They argue that capabilities to gain, integrate, release and reconfigure resources are typically valuable and rare (i.e., they are not possessed by all competitors equally), but are equifinal, and hence neither inimitable nor immobile. This quality implies that dynamic capabilities cannot be a source of sustainable competitive advantage. In their view, long-term competitive advantage does not rely on dynamic capabilities themselves but on the resource configurations created by the dynamic capabilities and on using them sooner, more astutely, more fortuitously than competition (Helfat et al., 2007). The propensity to make timely decisions is also consistent with the early spirit of dynamic capabilities, reflected in the importance assigned by Teece et al. (1997) to the ability "to quickly accomplish reconfiguration and transformation ahead of competitors."

Zott (2003) suggests that dynamic capabilities create and shape a firm's resource positions, capabilities, operational routines, and activities. In turn, these mediating variables determine the firm's product market position and therefore its performance. This chain of causality implies an indirect link between dynamic capability and firm performance. He also finds that timing, cost, and learning effects foster the emergence of robust performance differences among firms with strikingly similar dynamic capabilities. Moreover, the results show that even small initial differences among firms can generate significant intra industry differential firm performance, especially when the effects of timing, cost and learning are combined. Wang and Ahmed (2007) also note that the relationship between dynamic capabilities and firm performance is more complex than a simple, direct effect. For example, Spanos and Lioukas (2001) find that firm assets have a significant direct impact on market performance (i.e. market share, absolute sales volume and increase in market share and sales), but their impact on profitability (i.e. return on equity, profit margin and net profits relative to competition) is not statistically significant; instead, the relationship is indirect, mediated by market performance.

Another approach suggests that dynamic capabilities may lead to performance effects only if the new resource configuration, resulting from the exercise of such capabilities, holds certain characteristics. Accordingly to this view, performance effects should be expected only if the new resource configuration passes the VRIN criteria (Barreto, 2010).

Dynamic Supply Chains

In late 1990s and early 2000s, researchers started to focus on the role of supply chain in responding to the changing environment such as demand fluctuations and need for product innovation. For instance, in one of the studies, Adler et al. (1999) introduce a particular supplier partnering arrangement in order to capture supplier's innovative capabilities. In the proposed arrangement, only one or two suppliers per part are kept, long-term contracts are negotiated with them and they are challenged to make product and process improvements. Tsay (1999) also proposes a quantity flexible contract, helping both supplier and buyer to make their forecasts more stable. In fact, these studies aim to propose supply chain configuration archetypes supporting innovative capabilities or abilities to respond to changes. It is also revealed that supplier relationship is found as the main element in supporting configurations proposed (e.g., Hall, 2000; Choi et al., 2001; Handfielda and Bechtel, 2002). Accordingly, Frayret et al. (2001) specify six collaboration mechanisms between supplier and buyer including information system infrastructure, business models exchange, efficient resources sharing, explicit win-win rules-of-the-game, contingencies management and collaboration performance measurement.

At the same time, two concepts of supply chain agility and flexibility are emerged. Christopher (2000), in his seminal article, defines agility as "the ability of an organisation to respond rapidly to changes in demand, both in terms of volume and variety" (Christopher, 2000, p. 38). He also defines four characteristics for an agile supply chain as market sensitive, virtual, process integrated and network based. He identifies the quality of supplier relationship, the high level of shared information and the high level of connectivity between the firm and its strategic suppliers as those configuration positions supporting agile supply chain.

Prater et al. (2001) argue that complexity is a barrier for supply chains to become agile. They introduce the concept of supply chain exposure to show this complexity. Exposure is defined by five factors including the number of geographic areas covered by the supply chain, the number of transportation modes used and their speed, the number of political areas and borders, the technical infrastructure, and environmental issues. Indeed, Prater et al. (2001) argue that building an agile supply chain depends on the complexity in its structure and material and information flow configuration. Similarly, Choi and Krause (2006) identify three dimensions of complexity: the number of suppliers in the supply base, the degree of differentiation among these suppliers, and the level of inter-relationships among the suppliers. However, Choi and Klaus (2006) show that, in certain circumstances, reducing supply base complexity reduces supply chain innovative capabilities.

Lee (2004) specifies two sets of supply chain configurations which support agility and adaptability. Accordingly, an agile supply chain promoting flow of information with suppliers and customers, developing collaborative relationships with suppliers, designing for postponement, building inventory buffers by maintaining a stock-pile of inexpensive but key components, has a dependable logistics system or partner, draws up contingency plans, and develops crisis management teams. Furthermore, he defines adaptability as the ability to adjust supply chain's design to meet structural changes in markets. According to this definition, an adaptable supply chain monitors economies all over the world to spot new supply bases and markets, uses intermediaries to develop fresh suppliers

and logistics infrastructure, evaluates needs of ultimate consumers, and determines where companies' products stand in terms of technology cycles and product life cycles.

The term “flexibility” is also used to reflect the supply chain ability to respond to changes, or in our words supply chain dynamic capability. Flexibility has a more expanded meaning than agility. Flexibility refers to the ability of the supply chain to adapt to different types of changes, while agility deals only with product volume and variety fluctuations. Duclos et al. (2003) describe six types of flexibility: logistic, supply, operations system, market, organisational, and information system flexibility. Logistics flexibility is the ability to receive and deliver product cost effectively, as sources of supply and customers, in particular their location, change. Supply flexibility is the ability to reconfigure the supply chain in order to respond to changes in customer demand. Operations system flexibility is the ability to react to emerging customer trends through the configuration of assets and operations. Market flexibility is the ability to build close relationships with customers through improving existing products or developing new products. Organisational flexibility is the ability to develop human resources' skills and abilities required in the supply chain for responding to the customer needs. Information systems flexibility is the ability to provide an information system architectures and systems to meet the changing information needs of the organisation. Based on this definition, flexibility is classified based on supply chain main elements and not the nature of changes or change processes.

Winkler (2009, p. 16) defines flexibility “as the ability of a system to perform proactive and reactive adaptations of its configuration in order to cope with internal and external uncertainties”. It includes structural flexibility, technological flexibility and human flexibility. Winkler (2009) presents a strategic supply chain network that improves flexibility. This strategic supply network is a virtual organisation which is characterised by a selected circle of supply chain members, a collective identity, an internal role differentiation and power division, the delegation of responsibility, its' limited permanence, the possibility to transpose members, and a rational procedure for the realization of common targets executed by all of the participating companies.

Stevenson and Spring (2007) examine the role of supply chain design on its flexibility. They argue that moving decoupling point upstream in the supply chain increases its flexibility. Additionally, supplier relationship is explained as an important element in supply chain design, which affects the chain flexibility. It is suggested that although long-term procurement contract reduces uncertainty, arms-length relationships provide higher flexibility in supply chain. Furthermore, Stevenson and Spring (2007) specify information sharing and modular supply chain design as sources of a flexible supply chain. However, Gosain et al. (2004) argue that sharing broad range of information is detrimental and companies need to work on the quality of shared information.

Network-level Dynamic Capabilities

This section is dedicated to those studies which explicitly apply the concept of dynamic capabilities in the networked context. Extant research generally focuses on only one level of analysis, incumbent firms, while neglecting other levels of analysis. Accordingly, authors believe that, in order to further

understanding of the dynamic capabilities required in high-velocity contexts, the level of analysis need to be expanded from the organisation to strategic nets, and also macro networks forming their environment (Belussi and Arcangeli, 1998; Moller et al., 2002; Rothaermel and Hess, 2007).

Building on industrial Network Theory and the Dynamic Capability View, Moller and colleagues (2002) contend that the current set of dynamic capabilities should be expanded to include a number of networking capabilities. Following the value-system approach to business nets, they propose that new dynamic capabilities comprise of network visioning, net mobilisation and management, and network orchestration. In navigating the network environment, management should identify and understand the value systems and key actors through which the macro network produces value for the end-customers. Moreover they describe business fields or clusters (Porter 1990) as several overlapping strategic nets, the management of which requires the mobilisation and coordination of the value activities of other relevant actors. Management faces a complicated optimisation challenge concerning in which nets to operate and through what kind of roles and strategies. This includes issues such as evaluating the future importance of the value net in terms of its business potential, evaluating one's own influence potential, and determining how the nets are interrelated and how a firm should take that into account in coordinating its portfolio of positions. Finally, network-orchestration capability at the right end of the value-creation continuum refers to an actor's capacity for influencing the evolution of a whole new business network.

Defee and Fugate (2010) also suggest that the dynamic capabilities perspective provides a theoretical foundation that may be used to better understand and predict the success of supply chain firms. They note that dynamic supply chain capabilities are embedded within the collaborative routines formed between multiple supply chain partners. Thus, multiple partners may jointly develop and use them to update existing (static) capabilities or form entirely new capabilities. Accordingly, they introduce and theoretically develop two specific dynamic capabilities, knowledge accessing and co-evolving. Knowledge accessing is defined as "a dynamic capability held by two or more parties that foster an understanding of the current knowledge resources possessed by each party". In a supply chain context, co-evolving is also defined as: "a dynamic supply chain capability held by two or more supply chain members that facilitates the joint development of new capabilities between supply chain-oriented firms that aspire to compete on the basis of superior supply chain capabilities" (Defee and Fugate, 2010).

Wei and Wang (2007) suggest that reconfigurability is an important dynamic capability in a supply chain for generating competitive advantage in changing environments. Reconfigurability is the ability to deploy new configurations that match the environment and to reconfigure resources with timeliness and efficiency. Different supply chain configurations may exhibit different levels of operational efficiency and market knowledge creation (Malhotra et al., 2005). It is important for a supply chain to quickly reconfigure its resources into the right combination to address shifting market opportunities. Many firms have adopted new supply chain practices to deliver better products/services to customers, such as postponement strategies, virtual integration, JIT purchasing, vendor managed inventory (VMI), collaborative planning, forecasting and replenishment programs, These practices reconfigure supply chain processes as a whole by integrating physical and information flows of collaborative firms.

While Zahra and George (2002) conceptualise absorptive capacity as a dynamic capability pertaining to knowledge creation and utilisation that enhances a firm's ability to gain and sustain competitive advantage, Malhotra and colleagues (2005) complement the absorptive capacity perspective with the relational view of the firm to derive a set of attributes that influence the absorptive capacity of an enterprise in supply chain partnership contexts. These attributes, taken together, form the basis of a capability platform that enhances the potential of an enterprise to share information with its supply chain partners and create new knowledge.

Considerable interest has been shown in dynamic capabilities concept, with studies particularly focusing on their role in international expansion (Luo, 2000; Madhok & Osegowitsch, 2000; Griffith & Harvey, 2001; Weerawardena, Mort, Liesch and Knight, 2007). International expansion furnishes new opportunities for a firm to extract returns from current resources and to build new capabilities. To seize such opportunities, however, MNEs must be prepared to avoid environmental uncertainties in a foreign market that may challenge capability exploitation, deployment, and upgrading. Luo (2000) proposes organisational learning during international expansion as a primary vehicle for upgrading capabilities. Weerawardena and colleagues (2007) also content that the existing approaches at explaining accelerated internationalisation would be incomplete unless they capture the learning undertaken by these firms and their founders prior to the firm's legal establishment. They further argue that the capability building process in a born global firm is driven by entrepreneurial owner-managers with a global mindset, prior international experience and a learning orientation.

Based on survey results from overseas distributors in Canada, Chile, Great Britain and the Philippines regarding their relationship with their primary US manufacturer, Griffith and Harvey (2001) also suggest two primary components of global dynamic capabilities: 1) developing systematic global coherence while recognising the unique features of each country's environment to facilitate customisation of individual country strategies and; 2) adaptation, integration and reconfiguring of internal and external assets to match opportunities in the global marketplace.

Some studies, however, benefit from the network concept through proposing various network archetypes (e.g., R&D networks, supply networks, logistic network etc). The archetypes proposed appear to support such highly changing environment.

R&D Networks Archetypes Supporting Dynamic Capabilities

Blomqvist, Hara, Koivuniemi and Aijo (2004) delineate the challenges of a dynamic environment to R&D management. Based on case studies conducted in ICT industry, the authors emphasise internal and external collaboration networks as critical for companies operating in a dynamic business environment. Furthermore, Rothaermel and Hess (2007) develop a multi-level theoretical model using a comprehensive data set of the innovation attempts of global pharmaceutical companies within biotechnology over a 22-year time period (1980-2001). The model proposed accounts for potential heterogeneity in and across three distinct levels of individual, firm and network when explaining and predicting innovation. They examine intellectual human capital and star scientists at individual, R&D capability in terms of R&D expenditures at firm and alliance and acquisition activities at network level. Smart, Bessant and Gupta (2007) also suggest a networked-innovation model in

terms of new capabilities to co-ordinate network development relevant to strategy and operations based on a systematic survey of 142 scholarly and practitioner articles and 45 expert interviews with senior professionals. In trying to do so, they stress the important role of strategic alignment and some “synergistic process of integrating business and operations strategic issues” for significant impact on organisation performance.

Agarwal and Selen (2009) bring up the concept of “elevated service offerings,” as a new definition of service innovation, implying new or enhanced service offerings that can only be eventuated as a result of partnering and one that could not be delivered on individual organisational merits. The authors examine the impact of collaboration on innovation in services through dynamic capability-building processes. Using empirical data from a large telecommunications company, they demonstrate through structural equation modelling (SEM) that higher-order dynamic capabilities in services are generated as a result of collaboration between stakeholders. The higher-order capabilities proposed include customer engagement, collaborative agility, entrepreneurial alertness, collaborative innovative capacity and collaborative organisational learning.

Supply Networks Archetypes Supporting Dynamic Capabilities

As a boundary spanning function in the supply chain, logistics excellence has become a powerful competence and source of competitive advantage for many firms (Abrahamson et al., 2003; Esper, Fugate and Davis-Sramek, 2007; Defee and Fugate, 2010). Accordingly, focusing on logistics as a platform and a resource base supporting and being an enabler for new strategic moves on the market, Abrahamsson and colleagues (2003) describe, define and exemplify the concept of the logistics platform with such a built-in strategic flexibility. They define a logistics platform as a homogenous part of the logistics system, which a logistics organisation centrally manages and controls, and has the power to design in a way that it is a resource base for new market positions. This includes concepts for logistics operations, a physical structure, processes and its activities as well as the information systems needed for design, operations and reporting. In order to adhere to the changing market environment, marketing and sales need to respond to new customer requirements and changing marketing channels with a higher frequency than before. The logistics type proposed is not only separated from marketing and production, but also considered as a platform with built-in dynamics, where resources are continuously developed, enabling logistics innovations that stimulate market development.

Esper, Fugate and Davis-Sramek (2007) further explore how through a logistics learning capability organisations can sustain a logistics leverage competitive advantage. They contend that the on-going evolution created through organisational learning enables firms to remain competitive over the long run by contributing “sustainability” to that which is achieved through competitive logistics strategy. They define Logistics learning capability (LLC) as the ability of a logistics organisation to effectively maintain and manage learning organisation characteristics and convert learning outcomes to new logistics management strategies, tactics and operations in support of further developing other logistics capabilities. They suggest that such an organisation benefits from open-mindedness, shared vision, commitment to learning culture. The structural component of a logistics learning capability involves adopting an organisational structure that is organic, flexible and decentralised and utilising

self-managed work teams. Logistics organisations can also facilitate the learning process through information sharing, group idea generation, and employee empowerment. Moreover, inter-organisational relationships can serve as a key source of learning as supply chain exchange partners often rely on the expertise of other organisations as a source of knowledge.

To understand the role of supply chain visibility in creating strategic value in a high-velocity environment, Wei and Wang (2007) propose supply chain visibility as a key factor leading to reconfigurability and competitive advantage. Supply chain visibility is viewed as the degree to which supply chain partners have on-hand information related to demand and supply for planning and control management. Their research identifies four important measurable constructs (sensing for visibility, learning for visibility, coordinating for visibility and integrating for visibility) of supply chain visibility that are proposed to drive supply chain reconfigurability. The author suggest Supply chain reconfigurability as an important dynamic capability in a supply chain and define it as the ability to deploy new configurations that match the environment and to reconfigure resources with timeliness and efficiency.

Zhang and Tao (2008) also propose dynamic reconfiguration capability as capability vital for supply chain management to respond to changing customer requirements and operating environments. While there are multiple challenges in modern supply chain management like customer demand uncertainty and changing market, it cannot be expected that supply chains preserve their structure over a long horizon because each company or factory may risk losing its competitiveness or face internal collapse for the changing customer demands and operating environments. Therefore, appropriate mechanisms for supporting reconfigurability should be embedded in supply chain configuration decisions (Chandra and Grabis, 2007).

Yang, Zhang and Chen (2008) clarify the relationship among learning ability, knowledge innovation and dynamic capability of supply chain. Knowledge innovation is the basic driving force of dynamic capability of supply chain. Moreover, the authors propose that knowledge sharing of inter-enterprises supply chain can improve the organisational learning ability. They suggest that the knowledge concerning sharing knowledge of supply chain mainly comes from two sides: one is selected explicit knowledge from node enterprise of supply chain; the other is public and innovation knowledge from other supply chain or external of supply chain which benefit the whole absorption and innovation of supply chain, such as the status of competitor, market situation and so on. Undertaking a case study of three automotive supply chains that face such new demands resulting from the introduction of an order-driven supply-chain strategy, Holweg and Pil (2008) also highlight the fact that supply-chain coordination relies on the availability of prompt and accurate information that is visible to all actors in the supply chain. However, new demands on the supply-chain system require changes to information flow and exchange.

Some recent studies aim to reveal how decision makers use collaboration to enable their firms to combine and configure resources across organisational boundaries (e.g. Allred et al., 2011; Macpherson, Jones and Zhang, 2004; Rodriguez-Diaz and Espino-Rodriguez, 2006; Vivek et al., 2009). The literature indicates that varying types and natures of supply chain relationships, such as coordinating, cooperating, partnering and collaborating within supply chains affects supply chain relationships, particularly, the range of intra and inter-organisational competence and dynamic

capabilities (Eisenhardt, K. M. and Martin, Rothaermel, F. T. and Deeds, D. L., 2006, Teece, D. J. et al., 1997, Zott, C., 2003) available from its participants. For instance, based on two cross-sectional, multi-method studies over a 6-year period, Allred and colleagues (2011) find that collaboration, as a dynamic capability, mediates the conflict resulting from functional orientations, and improves performance. The authors proposed that entrenched organisational structures and cultures perpetuate inter-firm and inter-organisational conflict and stifle collaboration. Boundary spanning initiatives like aligning goals and metrics, improving information sharing, and investing in collaborative people skills are seldom embraced holistically.


Malhotra, Gosain and El Sawy (2005) also place a particular emphasis on inter-organisational partnerships for sharing information and, ultimately, market knowledge creation. They define supply chain partners as firms engaging in interlinked processes that enable rich (broad-ranging, high quality, and privileged) information sharing, and building information technology infrastructures that allow them to process information obtained from their partners to create new knowledge. Through an exploratory field study conducted in the context of the RosettaNet consortium effort in the IT industry supply chain, the authors characterise five supply chain partnership configurations based on differences in capability platforms, reflecting varying processes and information systems.

Based on a sample of 83 British software firms, Hawass (2009) also contends that inter-firm collaboration positively relates to the implementation of effective reconfiguration. In addition, the findings have revealed that group-level learning is a successful technique for improving a firm's ability to recombine knowledge streams. Furthermore, the paper emphasises the role of organisation-level learning in creating the strategic and structural context from which reconfiguration capability operates.

5. Conceptual Framework

Table 3 below details the key inter-firm dynamic capabilities dimensions developed based on the systematic review conducted. As shown, the inter-firm dynamic capabilities are defined as the integration of 4 focal constructs of sensing, shaping, seizing and transforming. It is also attempted to relate the developed concepts to the existing boundaries of knowledge. Accordingly, the right-column is dedicated to the labels used by the authors in the relevant dimensions. As discussed earlier, this research aims to explore and examine both process dimension (DC – P) and configuration dimension (DC – C) associated to inter-firm dynamic capabilities. However, in order to conceptualise inter-firm dynamic capabilities, both process dimension and configuration dimension utilised in the existing literature are considered. Later, the so-called dimensions are differentiated in terms of a process maturity model and a configuration mapping tool.

The sensing construct of inter-firm dynamic capabilities is defined as the ability to utilise own (intra-firm network) and network capabilities (inter-firm network) to constantly identify, create, and anticipate Social, Technological, Economic, Environmental and Political trends as well as network configuration trends across the focal firm's network and to disseminate identified, created and anticipated trends across the firm and the ecosystem. Shaping is the ability to utilise own (intra-firm network) and network (inter-firm network) capabilities to constantly devise plausible responses to



the sensed trends through modifying existing, developing new and/or exploring new contexts for existing businesses, inter-firm and intra-firm configuration and routines. Seizing refers to the ability to utilise own (intra-firm network) and network (inter-firm network) capabilities to constantly prioritise and select shaped opportunities, and allocate resources (investment decisions) to capture opportunities developed. Finally, transforming refers to the ability to utilise own (intra-firm network) and network (inter-firm network) capabilities to constantly implement the seized opportunities.

Table 3– Conceptual Framework

Conceptualising Inter-firm dynamic capabilities			Authors/ Year	
Sensing	<p>The ability to <u>utilise own</u> (intra-firm network)</p> <p>And <u>network</u> capabilities (inter-firm network)</p>	Macro Factor Sensing	Technological Trends	Scanning, searching, and exploration; Competitive intelligence processes (O'Reilly and Tushman, 2008; Teece, 2007) (<i>Identifying opportunities</i>)
			Market Trends	Generating, disseminating and responding to market intelligence (Pavlou and El-sawy, 2011) Integration and transfer of knowledge (O'Reilly and Tushman, 2008) (<i>Utilising network capabilities</i>)
			Regulatory Trends	Access to information (Teece, 2007) Processes to tap developments in exogenous science and technology (Teece, 2007)
			Environmental Trends	Processes to tap supplier and complement innovation (Teece, 2007) Scenario planning can collapse likely situations into a small number of scenarios that can facilitate cognition, and then action, once uncertainty is resolved (Teece, 2007) (<i>ability to anticipate</i>)
			Economic Trends	Scanning business 'ecosystem' (Teece, 2007)
			Social Trends	Adaptive capability (ability to identify and capitalise on emerging market opportunities (Wang and Ahmed, 2007) Establishing linkages between corporations and universities assists broad-based search, as university programs are usually unshackled from the near at hand ()
	To constantly <u>identify, create, and anticipate</u> the trends across the focal firm's network and to <u>disseminate</u> identified, created and anticipated trends across the firm and the ecosystem	Network Sensing	Network actors emergence and exist	Learning from various partners (Pavlou and El-Sawy, 2011; Wang and Ahmed, 2007) (<i>Utilising network capabilities</i>) Organisational and individual learning capabilities; learning from early errors (O'Reilly and Tushman, 2008; Teece, 2007)
			Network Structure changes	Knowledge management routines (e.g. knowledge creation absorption, knowledge integration (Eisenhardt and Martin, 2000; Verona and Ravasi, 2003; Zollo and Winter, 2002; Zott, 2003; Lee and Slater, 2007; Cepeda and Vera, 2007)
			Flow (material, info, financial changes)	Tracking technological change (O'Reilly and Tushman, 2008) Processes to direct internal R&D and select new technologies (Teece, 2007)
			Governance Model Trends	Market orientation (customer, competitors and inter-functional coordination): Generating information about customers through monitoring and assessing their changing needs and wants and disseminating it throughout the firm and revising business strategies to enhance customer value (Menguc and Auh, 2006) Processes to identify target market segments, changing customer needs, and customer innovation (Teece, 2007)
			Product/Service architectural changes	Scanning the market, allocate resources to marketing activities, monitoring customers and competitors (Wang and Ahmed, 2007) Thoroughly analyse the new drilling technology and share information within multidisciplinary teams (Wang and Ahmed, 2007) Co-evolving (Eisenhardt and Martin, 2000) Network Analysis (Ability to analyse the supply network in terms of structure, value addition, complexity, cycle-time, inventory, fit with product) Srari and Gregory, 2005 Network Visioning (Moller et al., 2002) Network visibility (Wei and Wang, 2007)

Shaping	The ability to <u>utilise own</u> (intra-firm network)	Business	Business Opportunities	Dynamic capabilities comprise four main processes: reconfiguration, leveraging, learning and creative integration (Bowman and Ambrosini, 2003)
				Innovation processes (Menguc and Auh, 2006; Wang and Ahmed, 2007)
	And <u>network (inter-firm network) capabilities</u>	Network configuration	Flows (material, information, financial)	Three reconfiguration mechanisms: capability substitution, capability evolution and capability transformation (Lavie, 2006)
				Patching routines: a strategic process that centres on routines to realign the match-up of businesses (i.e., add, combine, and split) and their related resources to changing market opportunities (Eisenhardt and Martin, 2000)
				New Product Development (e.g., Eisenhardt and Martin, 2000; Winter, 2003; Deeds et al., 1999; Verona and Ravasi, 2003; Rosenbloom, 2000; Rothaermel and Hess, 2007; Marsh and Stock, 2003; Danneels, 2002; D'Este, 2002; Rindova and Kotha, 2001)
				Alliance and acquisition routines-partner selection (Eisenhardt and Martin, 2000; Kale and Singh, 2007; Karim and Mitchell, 2000; Rosenbloom, 2000; Zollo and Winter, 2002; Kylaheiko, K. and Sandstrom, 2007)
			Identifying partnering arrangement (Joint ventures vs. licensing vs. go-it-alone approaches as part of important business model choices (Srai and Gregory, 2005; Teece, 2007)	
			Identifying of market segments to be targeted (Tecce, 2007; Wang and Ahmed, 2007)	
			How the revenue and cost structure of a business is to be 'designed' to meet customer needs (Teece, 2007)	
			Continuous morphing (toward a view of organisational form as a strategic tool employed in the pursuit of competitive advantage (typically refers to changes in structural attributes, such as adding or removing a unit or a level of the organizational hierarchy) (Rindova and Kotha, 2001); Architectural innovation (reconfiguring divisional resources within multi-business firms/ remapping business charters among divisions) (Galunic and Eisenhardt, 2001)	
Intra-firm configuration	People (Skills, Leaders, Culture)	Changes in organisational structure (i.e. Unit reconfiguration (realigning their businesses and transferring resources) between divisions is the addition of units to, deletion of units from, and recombination of units within the firm (for both reconfiguration of internally developed vs. acquired units) (Karim, 2006)		
		Re-engineering (Zollo and Winter, 2002)		
	Organisational architecture	Significant changes in organisational routines (Rindova and Kotha, 2001)		
		Delineating the customer solution and the business model (Teece, 2007)		
Organisational Relationships	New products have been indicated as the most natural driving force behind change and renewal at the corporate level (Nonaka, 1994; Daneels, 2002).			
	Transfer processes (routines for replication and brokering, are used by managers to copy, transfer, and recombine resources, especially knowledge-based ones, within the firm e.g. using it in new product development (Eisenhardt and Martin)			
to constantly devise plausible responses to the sensed trends through <u>modifying existing, developing new and/or exploring new contexts</u> for existing	Business	Business Opportunities	Co-evolving (routines by which managers reconnect webs of collaborations among various parts of the firm to generate new and synergistic resource combinations among businesses (Eisenhardt and Martin).	
			Kale and Singh (2007) show than an alliance learning process that involves articulation, codification, sharing, and internalization of alliance management know-how is positively related to a firm's overall alliance success	
to constantly devise plausible responses to the sensed trends through <u>modifying existing, developing new and/or exploring new contexts</u> for existing	Network configuration	Flows (material, information, financial)	Kale and Singh (2007): Prior research has found that firms with a dedicated alliance function (good for intra-firm configuration position), which oversees and coordinates a firm's overall alliance activity, have greater alliance success.	

		Processes	Intra –firm routines	<p>Knowledge creation routines (whereby managers and others build new thinking within the firm, a particularly crucial dynamic capability in industries like pharmaceuticals, optical disks, and oil where cutting-edge knowledge is essential for effective strategy and performance) (Eisenhardt and Martin, 2000)</p> <p>Learning mechanism (O’Reilly and Tushman, 2008)</p> <p>Asset orchestration (O’Reilly and Tushman, 2008)</p> <p>Selecting enterprise boundaries to manage complements (Teece, 2007)</p> <p>Discovering new sources of supply (Wang and Ahmed, 2007)</p> <p>Managing human resource proactively (Kylaheiko, K. and Sandstrom, 2007)</p> <p>Buying services from experts/ professional (Kylaheiko, K. and Sandstrom, 2007)</p> <p>Co-specialisation (Teece, 2007)</p> <p>Information sharing can also provide flexibility and improve the responsiveness of the supply chain (Stevenson and Spring, 2007)</p> <p>Coordinating portfolio position (Moller et al., 2002)</p> <p>Selection Options (Capability of optimising; location of own and partner assets, in-house and outsourced activities)(Sari and Gregory, 2005)</p> <p>Risk Management (Capability to assess and manage the trade-offs between supply security, quality, cost and long term network benefits)(Srai and Gregory, 2005; O’Reilly and Tushman, 2008)</p> <p>Network mobilisation and management (Identifying how a hub company can build value-producing nets, and what positions and roles it should take in different and overlapping nets, across various strategic situations) (Moller et al., 2002)</p> <p>Internationalisation (Luo, 2000; Madhok and Osegowitsch, 2001; Weerawardena et al., 2007)</p>
			Inter-firm routines	
Seizing	<p>The ability to <u>utilise own</u> (intra-firm network)</p> <p>And <u>network (inter-firm network) capabilities</u></p> <p>to <u>constantly prioritise</u> and <u>select</u> shaped opportunities, and <u>allocate resources</u> (investment decisions) to <u>capture</u> opportunities developed</p>	Decision Making (prioritisation, Selection and Resource allocation)		<p>Strategic decision making (in which managers pool their various business, functional, and personal expertise to make the choices that shape the major strategic moves of the firm) (e.g., Eisenhardt and Martin, 2000; Helfat et al., 2007; Pablo et al., 2007; Rosenbloom, 2000)</p> <p>Prioritisation (Eisenhardt and Martin, 2000)</p> <p>Strategic execution (Harreld et al., 2007)</p> <p>Selecting decision making protocols (Teece, 2007)</p> <p>leaders who can craft a vision and strategy, ensure the proper organizational alignments (whether it is for exploitation or exploration), assemble complementary assets, and decide on resource allocation and timing. In more concrete terms, this involves developing a consensus among the senior team about the strategic intent, avoiding the decision traps that path dependencies and mindsets bring, and aligning the business model and strategy) (O’Reilly and Tushman, 2008)</p> <p>this involves senior leaders’ willingness to commit resources to long-term projects (Danneels, 2002)</p> <p>analyze multiple alternatives (Teece, 2007)</p> <p>Co-evolving (Eisenhardt and Martin, 2000)</p> <p>Financial commitment (The ability to mobilise the types of financial resources that will remain committed to sustaining the innovation process) (Lazonick and Prencipe, 2005)</p>
	The ability to <u>utilise own</u>	Business opportunities	Business opportunities	<p>Transition task (reconfiguration, process re-engineering)(Zollo and Winter, 2002)</p> <p>Change management processes</p> <p>Commitment and loyalty (Teece, 2007)</p>

transforming	(intra-firm network) And <u>network (inter-firm network) capabilities</u> to <u>constantly implement</u> the seized opportunities	Network Configuration	Products and services	Organisational learning (Zahra et al., 2006)
			Network partners	
			Governance	
			Structure	
		Intra firm configuration	Flows (material, information, financial)	
			People (Skills, Leaders, Culture)	
			Organisational architecture	
		Processes	Organisational Relationships	
			Intra-firm routines	

Configuration positions			
Configurations Dimensions	Intra-firm	Organisation Architecture	<p>Dedicated alliance function (Kale and Singh, 2007); Organisational form (dynamic community (modular structure: independent but related))(Rindova and Kotha, 2001) structures that permit targeted integration across organizational units to capture the advantages of co-specialized assets (Helfat & Peteraf, 2003) cited by O'Reilly and Tushman, 2008</p> <p>More decentralized organizations with greater local autonomy are less likely to be blindsided by market and technological developments (good configuration position for sensing dimension) (Teece, 2007)</p> <p>Decentralized structure and local autonomy help develop dynamic capabilities (Rindova and Kotha, 2001)</p> <p>Cross-functional teams (Tripsas, 1997; Eisenhardt and Martin, 2000)</p> <p>Agile organisation (Modular corporate strategies, Modular business unit) (Pil and Cohen, 2006)</p> <p>Decentralized decision-making in hierarchical structures (Halsmann et al., 2008)</p>

		Culture	<p>corporate culture: competition and cooperation (Rindova and Kotha, 2001)</p> <p>Intra-firm configuration positions: The whole configuration is describes as Dynamic community (Modular structures: independent but related, corporate culture: competition and cooperation, Dynamic capabilities that are guided by simple rules that embody both economic and social logics, leaders as architects, entrepreneurs, and cultural guardians). However the configuration dimensions could be inferred in a way including: structure, culture, leaders) (Galunic and Eisenhardt, 2001)</p> <p>Cultural similarity and consistency of vision (Eisenhradt and Martin, 2000)</p> <p>Openness to creativity, absence of departmental identification, interaction and dialogue encouraged, involvement in strategic processes (Verona and Ravasi, 2003)</p> <p>Organisational cultures that encourages employees to be innovative, hierarchy, participative decision making and power sharing (Menguc and Auh, 2006)</p> <p>Willingness to cannibalise, constructive conflict, tolerance for failure (Danneels, 2008)</p> <p>Open-mindedness, shared vision commitment to learning culture, Self-managed work teams (Esper et al., 2007)</p>
		Leadership	<p>leaders as architects, entrepreneurs, and cultural guardians (Rindova and Kotha, 2001)</p> <p>Senior management team involvement (O'Reilly and Tushman, 2008)</p> <p>The ability to design incentive systems ((O'Reilly and Tushman, 2008)</p> <p>Whether the firm's management systems encourage people to challenge outmoded traditions (Wang and Ahmed) mentioned for adaptive capability</p> <p>Trustworthy leadership, Trusting followers capable champions (Judge and Douglas, 2009)</p>
		People	<p>Appropriate staffing (O'Reilly and Tushman, 2008)</p> <p>Individual capabilities (extant knowledge , the ability to learn and creativity abilities) (Teece, 2007)</p>
		Structure	<p>Geographically distributed research sites (Tripsas, 1997)</p> <p>Firm's geographic location close proximity of organisations with similar interests, external contacts (Deeds et al., 1999)</p> <p>Distributed network of partners (Gunasekaran et al., 2008)</p> <p>Centralised logistics structures such as direct distribution or multi-echelon structures with central, regional and local distribution centres (Abrahamsson et al., 2003)</p>
	Inter-firm	Flow	<p>Successful implementation of control oriented schemes (e.g. ERP, JIT II) (Choi et al., 2001)</p> <p>Promote flow of information with suppliers and customers (Lee, 2004)</p> <p>Design for postponement (Lee, 2004)</p>
		Governance (relationships)	<p>Keeping only one or two suppliers per part, Negotiated long-term contracts with them, Challenging them to make product and process improvements (Adler et al., 1999)</p> <p>Quantity Flexibility (QF) contract (Tsay, 1999)</p> <p>Flexible procurement contracts can provide stability for the supplier and help the buyer respond to demand fluctuations (Stevenson and Spring, 2007)</p> <p>Have a dependable logistics system or partner (Lee, 2004)</p> <p>Develop collaborative relationships with suppliers (Lee, 2004; Handfielda and becktel, 2000; Christopher, 2000; Agarwal and Selen, 2009)</p> <p>Power in its global relationships (Griffith and Harvey, 2001)</p> <p>Central platform (Abrahamsson et al., 2003)</p> <p>Sharing knowledge mechanisms and having shared norms, values, obligations and expectations, Trusting relationships (Blomqvist, K., Hara, V., Koivuniemi, J. and Aijo, T., 2004; Rothaermal and Hess, 2007; Smart, Bessant and Gupta, 2007)</p>
		Product Architecture	<p>Modular product architecture (Pil and Cohen, 2006)</p> <p>Modularity: The degree to which all product, process and resource entities at all levels of enterprises of supply network are modular (Kelepouris et al., 2006)</p> <p>Customisation configuration (Product modularity, Product platforms, Product commonality, Loosely coupled interfaces, Component independence) (Fixson, 2005)</p> <p>Network configuration (Postponement, Long term sourcing arrangement, Location and number of suppliers) (Fixson, 2005)</p>

6. Proposed Research Approach

Despite its importance for firm prosperity and the scholarly attention devoted to it, empirical work on dynamic capabilities is still in its infancy (Danneels, 2008). Pablo and colleagues (2007, 690) emphasise that ‘while the dynamic capabilities framework is drawing support and increased validity by researchers, empirical studies of dynamic capabilities remain relatively rare’. This comment is easily understood, as arguably the most influential dynamic capability articles, those by Teece et al. (1997) and Eisenhardt and Martin (2000), use illustrative examples deriving from data that, while pertinent, were not collected purposively to understand dynamic capabilities (Ambrosini and Bowman, 2009). On the other hand, field research, understood as the systematic study of original data – qualitative or quantitative – gathered from real settings is also encouraged to develop scientific knowledge within operations and supply chain management (JOM editorial, 2011).

Moreover, Ambrosini and Bowman (2009) contend that the existing research of dynamic capabilities does not delve into the detailed, micro mechanisms of how these capabilities are deployed or how they ‘work’. According to Danneels (2008) while quantitative studies usually involve statistically valid large sample sizes which result in quantitatively aggregated responses in order to advance theory via the inference of common trends (Armstrong and Shimizu 2007), it may be difficult to collect any longitudinal data via archival sources or structured surveys. Hence, as suggested by Lockett and Thompson (2001), ‘it may be necessary to sacrifice some of the generality of quantitative investigation for a more qualitative attention to detail’. Qualitative, smaller sample studies are likely to be more appropriate for understanding the subtlety of resource creation and regeneration processes. To understand fully firm-specific resources, their context and how they were created or renewed in practice requires fine grained investigations to obtain rich and contextualised data qualitative fieldwork (Godfrey and Hill 1995; Rouse and Daellenbach 1999 cited by Ambrosini and Bowman, 2009). This need is also more highlighted where this research aims to expand the level of analysis from intra-firm to inter-firm in terms of exchanging the resources and upgrading the routines.

Therefore, in the empirical research path, this research employs the logic of inductive inquiry suitable for investigating phenomena that are relatively poorly understood (Glaser & Strauss, 1967). The goal of inductive inquiry is to allow new theoretical insights to emerge from rigorous examination of relevant data collected from multiple sources, analysed through constant comparison, and validated both by extant theories and ongoing re-examination of the data (Eisenhardt, 1989; Yin, 1994).

Accordingly, the approach adopted to address the complexities above and capture intra and inter-firm dynamic capabilities and their specific configurations applies:

- Existing theory and research in terms of a number of targeted literature reviews
- Empirical fieldwork data (exploratory and in-depth case studies)
- Multiple sources of data

Figure 5 below illustrates the sequence of activities in the research approach. The literature review discussed brings together existing endeavours of operationalisation of dynamic capabilities in terms of routines and supportive organisational and inter-organisational configurations. Additionally, the literature domain pertaining to dynamic supply chain (network) is found to give new insights into dynamic capabilities operationalisation endeavours, given the difficulty of maintaining a competitive advantage through firm-centric dynamic capabilities. The review conducted is also enriched through reviewing the case histories of dynamically capable exemplars. The development of a framework model for supply network dynamic capabilities assessment is a recognised method for advancing theory. The targeted literature reviews elaborated greatly contribute to development of a preliminary model inter-firm capabilities assessment in terms both routine and configuration menus.

A process-based approach to operationalising inter-firm dynamic capabilities is adopted. The approach involves identifying underlying set of processes (organisational routines) leading to dynamic capabilities from an inter-firm view with a focal firm focus. Benefiting of the concept of process maturity involving assessing levels of process formality, the dynamic capabilities assessment tool is developed. Additionally, in order to examine the inter-firm network configuration supporting dynamic capabilities, the supply network configuration dimensions proposed by Srari and Gregory (2008) is adopted. The supply network configuration approach developed by Srari and Gregory (2008) entails an operational definition of supply network configuration, one that captures key elements of network configuration including tier structure, shape and location, principal unit operations and their internal manufacturing processes; roles and relationships between key network partners; and product structure, complexity and composition. The developed definition lends itself to the creation of practical mapping tools to capture the complex, dynamic and international structures.

Furthermore, multiple case study approach has been chosen for model refinement and testing. The strength of the case study method lies in its ability to examine, in-depth, a “case” within its “real-life” context. Moreover, the case study method is pertinent when the research addresses an explanatory question (How or why did something happen?). It is also a useful method in illuminating a particular situation, to get a close (i.e., in-depth and first-hand) understanding of it (Eisenhardt, 1989; Yin, 1994; 2003). Additionally, multiple case study approach seeks to capture the varied empirical evidence supporting the research. Although this study aims at replication, it does not seek literal replication suggesting the cases selected would offer contrasting results at some points.

Furthermore, the use of multiple data collection instruments (i.e. semi-structured interviews, documents and on-site observations) within the research methods assists with triangulation of data thereby strengthening the largely qualitative outcomes of the research. The triangulated multiple data-points within each source of evidence (e.g. multiple respondents at various levels) also are suggested.

Case Studies

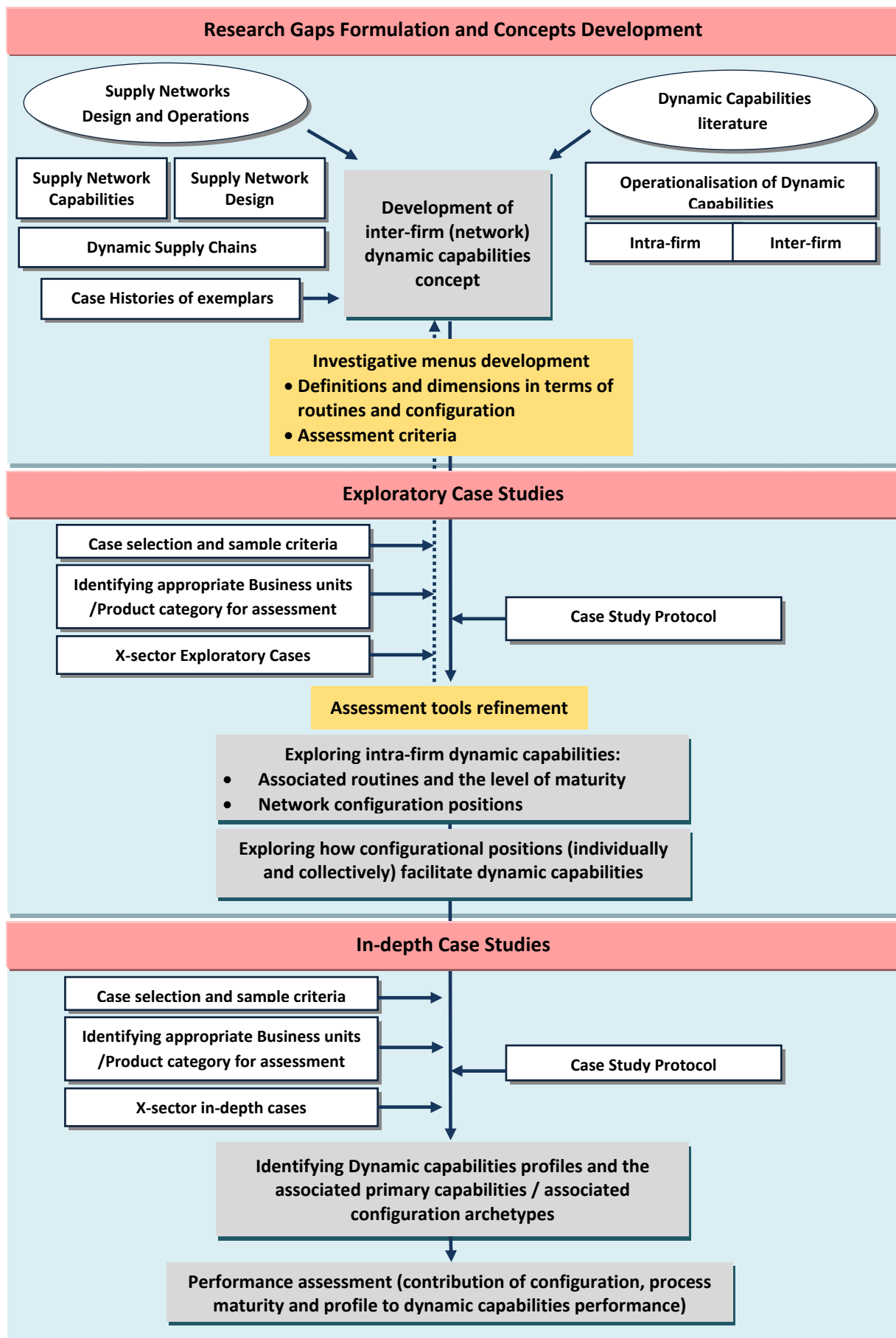


Figure 5 – Research Approach

7. Discussion and Concluding Remarks

Bridging the two communities of Operations Management and Strategic Management, this research aims to explore the relationship between supply network configuration and dynamic capabilities. The process-based approach along with the identified maturity stages were found to give new insights into operationalisation of dynamic capabilities. The inter-firm dynamic capabilities have been developed in terms of a set of processes around sensing, shaping, seizing and transforming activities aiming to explore and exploit inter-firm potentials. Capability maturity is assessed based on level of process formality and the extent to which network capabilities are employed to constantly identify and anticipate macro factors and network trends.

The literature domain pertaining to supply chain (network) is found to give new insights into operationalisation of dynamic capabilities endeavours. Fine (2000) discusses that the interest in globally distributed networks design will only increase in the decade to come as industry clockspeeds continue to accelerate. However, in recent years the design of global supply networks has developed and evolved from traditional lowest landed-cost analysis to include more strategic concepts such as how supply networks support business strategy. Strategic alignment maybe supported by particular archetype network configurations, each with a complementary set of operational capabilities. Globally distributed manufacturing network design and management issues also have been discussed in a number of studies (e.g. Sturgeon 2001; Ferdows 2008 cited by Slepnirov, Waehrens and Jørgensen, 2010). They address various aspects of questions concerning 'why, where and how' a company distributes its operations globally. These aspects include plant roles, levels of competence, and location decisions. However, much of the existing research has focused primarily on intra-organisational network and has adopted a rather static perspective (Shi 2003). The practice studies reveal that while all these approaches depict where the Promised Land is, by the time firms design such a network, the world is changed.

Moreover, the studies aiming to characterise dynamic supply networks mainly focus on operational flexibility (plant level). Ability to add or substitute new parts into the system (product modification), range of output levels (volume) at which the system can produce cost effectively products, ability of the system to respond to changes in delivery requests and range of products the system can produce without adding new equipment are the main capabilities that have been discussed. While strategic flexibility has been acknowledged, the focus has been on firm level (e.g. new design, expansion, market). While all these models provide useful insights into supply chain flexibility, they have limited relevance to network flexibility (or adaptability). Adaptability refers to a willingness to reshape supply chains when necessary, without ties to legacy issues or the way the chain has been operated previously. In fact it characterises the ease (mobility) with which the supply chain can be re-configured in response to (or in anticipation to) market change, technological change and environmental change. Accordingly, winners in the global marketplace are the firms that not only take timely actions in response to the highly changing environment through products and services innovation, but also explore and exploit their internal and network latent potential (e.g. through taking different positions/roles in the value chain, aggregating, disaggregating, new partnering arrangements etc) by benefiting of network visioning, coordinating network portfolio position and network orchestration.

While dynamic capabilities have been acknowledged in the network context (e.g. Blomqvist et al., 2004; Smart et al., 2007; Agarwal and Selen, 2009; Rothaermal and Hess, 2007 on innovation networks; Abrahamsson et al., 2003; Esper et al., 2007 on logistics networks; Zhang and Tao, 2007; Yang et al., 2008; Wei and Wang, 2007 on supply networks), the focus has been on operating routines (Zollo and Winter, 2002). For example, research describing the need for flexible and agile logistics capabilities has focused on the creation of a logistics configuration that can cope with demand uncertainty in terms of both volume and variety. Additionally, the studies mainly characterise network configurations (e.g. R&D, logistics etc) in support of firms' dynamic capabilities with the desired end of changing resource base and operating routines (Eisenhardt and Martin, 2000; Galunic and Eisenhardt, 2001; Zollo and Winter, 2002), but stopped short of identifying network dynamic capabilities as the source of flexibility and agility. Accordingly, the nature of supply chain (network) capabilities in this evolving, dynamic environment is a gap needing to be addressed.

The configuration mapping tools provide the foundations for linking configuration to capability and performance, and contribute to supply network design and development by highlighting the intrinsic capabilities associated with different configurations (Srai and Gregory). Accordingly, the configuration dimensions adopted facilitating dynamic capabilities (i.e. network structure, operations flow, network governance and products/services architecture) are examined. Additionally, network configuration dimensions have greatly contributed in conceptualising inter-firm dynamic capabilities. For instance, network monitoring in terms of actors, structure, flows and relationships is included in the sensing stage.

The conducted study also revealed that inter-firm dynamic capabilities are multi-dimensional meaning the ability to respond to change in one dimension does not necessarily mean that the unit of analysis is dynamically capable in another. Additionally, the effectiveness of inter-firm dynamic capabilities to well make a living for firms is affected by firms' competitive priorities, industrial context and environmental dynamism.

To recapitulate the main points, this research hopes to provide new insights into operationalisation of dynamic capabilities through expanding the level of analysis from intra-organisation resource exchanges and routines to inter-organisation level. Additionally, building on two key cornerstones of business models, routines and configuration, the research seeks to expand the nature of dynamic capabilities from routines to configuration at both intra and inter-firm level. At the same time, in the decade that the clockspeeds of many industries continue to accelerate, and the half-lives of many capabilities in the existing supply chains need replacement and/or upgrading, the dynamic capabilities perspective also provides a theoretical foundation that may be used to better understand and predict the success of supply chain firms (Defee and Fugate, 2010; Esper et al., 2007).

The research developed an industry relevant approach to understand and capture inter-firm dynamic capabilities providing a basis for subsequent analysis, using strategic management and operations management perspective. The study will be of relevance to the international manufacturing operations management community, strategists as well as MNCs who face the challenges of constantly (re) designing inter-firm networks.

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