Capabilities Enabling Product Orientation and Service Orientation: A Study of Canadian Software Firms

by

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A thesis

presented to the University of Waterloo

in fulfilment of the

thesis requirement for the degree of

Doctor of Philosophy

in

Management Sciences

Waterloo, Ontario, Canada, 2010

Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

This thesis identifies the unique capabilities that characterise product-oriented vs. service-oriented firms in the software industry. Firms in the software industry have very different business models from other industries. Some firms rely entirely on earning revenue from services provided on an hourly basis, while others build and sell software once and earn revenue from it for years to come. There are even successful firms in the industry with a variety of revenue sources and models resulting from planned or unplanned transitions across orientations. The unique characteristics of this industry offer an opportunity to study the development of organisational capabilities that support contrasting strategic orientations.

There is substantial literature on strategic orientations (e.g., Roberts 1990; Lynn et al. 2000; Pelham 2000; Voss and Voss 2000). There is also substantial literature on organisational capabilities (e.g., Nelson and Winter 1982; Leonard-Barton 1992; Day 1994; Teece et al. 1997; Winter 2003; Ethiraj et al. 2005). However, few studies empirically identify organisational capabilities that are developed to support an orientation. This study identifies the capabilities that enable product orientations and service orientations in the software industry. Moreover, the research tests the hypothesis that product orientations and services orientations are distinguished by different organisational capabilities.

The study tests this hypothesis by eliciting capabilities and measuring the maturity of these capabilities in different firms. The findings of this study make unique contributions to the literature pertaining to strategic orientations and capabilities through further definition of both constructs. This research also utilises a previously untested approach for identifying capabilities. The method approaches the research problem using a two-step approach. The first phase focuses on eliciting the capabilities that characterise both service and product orientations. Interviews with key informants support the elicitation of capabilities. The second phase of the research study involved the collection of data using a survey to validate the existence of and identify the maturity of the capabilities from the first phase.

The findings indicate that there are significant differences between product-oriented and service-oriented firms, the capabilities that distinguish them and their perspectives on transition between orientations. The key result of the research is the identification of the capabilities that distinguish between software firms of three different orientations: product orientation, service orientation and a hybrid orientation.

This research study contributes to advancement in the literature pertaining to strategic orientations and capabilities (e.g., Morgan and Strong 2003; Venkatraman 1989; Duhan et al. 2005; Winter 2000; Teece 2007). The results of the study further define what it means for software firms to have product, service and hybrid orientations, resulting in advancement of these constructs. The approach used to elicit and capture capabilities is novel and contributes to advancement in the literature pertaining to capabilities by applying a previously untested methodology. The results of this research are of particular interest to software firms that aspire to build or strengthen a product, service or hybrid orientation.

Acknowledgements

I would like to take this opportunity to thank my family and friends for supporting my research efforts. In addition, a special thank-you to my supervisor Dr. Rod McNaughton for the guidance that made this work possible.

Table of Contents

List of Figures

List of Tables

1.0 Introduction

Software products are unique from other products and the business of software is unique from other types of businesses. Once the first copy of a software product is produced, subsequent copies of the product have minimal marginal cost; this is not true of many other products (Cusumano 2004; Sink 2006). It is also relatively easy to update software products to add functionality or correct defects once they are in the field; this is not true of traditional electronic products or machinery (Gerstner 2002). The unique characteristics of software products allow firms that focus on generating revenue through the sale of software products to benefit from higher earnings per employee, higher profit margins and the ability to export products into the global market (Cusumano 2004; Hoch et al. 2000). From a services point of view, large professional services firms such as CGI continue to experience positive growth in what has become an increasingly competitive market. The business of software professional services is commoditised with the increase in the number of small consulting firms, outsourcers and offshore firms (DiRomualdo and Gurbaxani 1998). Firms in the software industry have a strategic choice with respect to focusing on delivery of software through a product-oriented model, a service-oriented model or some combination of the two (i.e., a hybrid orientation).

This research examines two contrasting orientations in the context of the Canadian software industry. The research focuses on identifying the capabilities that characterise product-oriented and service-oriented firms. Of specific interest is also the relationship between each of the two orientations and capabilities. The primary hypothesis tested in this study is that service-oriented and product-oriented software firms are distinguished by different capabilities. The specific questions that this study addresses are:

- What capabilities characterise product orientations?
- What capabilities characterise service orientations?
- What is the relationship between the maturity of capabilities and the orientations they support?

The terms "service-oriented" and "product-oriented" follow from the body of literature that defines a firm's strategic orientation. Prahalad and Hamel (1994) proposed that each firm has a strategic orientation that serves as its organisational compass, guiding the firm's strategy, decision-making and operational activities. Strategic orientations are intentional, and the organisation's processes, systems and culture support them. Manu and Sriram (1996) define strategic orientation in a similar way, characterising it as how an organisation uses strategy to adapt and change aspects of its environment for a more favourable alignment. Voss and Voss (2000) present a view of product orientations that is congruent to the Prahalad and Hamel (1994) view of strategic orientations. Product-oriented firms are able to integrate innovation into the product development and marketing process. They excel at new product development, and as a result, the majority of their revenue comes from product sales (Voss and Voss 2000). The views on product orientation follow consistently from the definition of strategic orientations. However, service orientations have varying interpretations.

Lynn et al. (2000) define a service-oriented firm as one whose organisational policies, practices and procedures support service excellence. This definition is consistent with the way Prahalad and Hamel (1994) and Manu and Sriram (1996) view strategic orientations. However, Hogan et al. (1984) define service orientation as the disposition to be helpful, thoughtful, considerate and cooperative at the individual level. Researchers adopt the latter view when examining the effects of service orientations at the individual level in restaurants and other customer-service-intensive industries. The two perspectives differ mainly in their unit of focus – the individual vs. the firm. Research that typically adopts the definition of service orientation that relates to the individual focuses on how individuals in the firm execute customer service (e.g., Homburg et al. 2002). Research that focuses on the strategic position of the firm adopts the definition of service orientation that focuses on organisational level (e.g., Lynn et al. 2000).

This research builds on the stream of literature that recognises product and service orientations as strategic constructs at the organisational level (e.g., Voss and Voss 2000; Lynn et al. 2000). The study examines the product orientation and service orientation constructs in the context of the software industry. Software firms that produce packaged software and earn the majority of their revenue from products are primarily product-

oriented. Software firms that focus on providing services such as custom software development and software outsourcing solutions and earn the majority of their revenue from services are primarily service-oriented. Based on the distribution of the firm's revenue sources, some firms also have a hybrid orientation, some combination of product orientation, and service orientation. Hybrid orientations can result from a purposeful strategic decision or because a firm is in a state of transition between orientations. The current research literature only begins to address the strategic orientations in the software industry. While both orientations have their respective benefits, earlier literature suggests that a product orientation is superior to a service orientation and that strong product orientations are more challenging to develop (e.g., Roberts 1990; Alajoutsijiirvi et al. 1999). More recent literature and empirical observations of organisations in the industry indicate a shift from product orientation to service orientation.

Roberts (1990) in a study of 114 software firms found that technology-based firms have a tendency to evolve towards a product orientation in the first several years after founding. Specifically, firms in the sample began to move away from consulting and contracting in favour of focusing on products. Roberts (1990) also concluded that a product orientation is more likely to develop in firms with multiple founders and that these firms develop this orientation more rapidly than single founder firms. Of the firms in the sample, the findings also showed that as the age of the firm increased the likelihood of transition from product orientation to service orientation decreased. In the specific case of the 114 firms, no firm between five and seven years of age that began with a product orientation transitioned to a service orientation (Roberts 1990). One of the potential reasons for maintaining the product orientation over the service orientation is the financial benefit associated with a strong product orientation.

Alajoutsijiirvi et al. (1999) argued that productisation is a key growth strategy for small software firms. Productisation in this context is analogous to a product orientation as it refers to the "shift from unique service-intensive customer projects towards tangible standardised products aimed at international mass (either consumer or business-to-business) markets" (Alajoutsijiirvi et al. 1999, 84). A strong product orientation allows a small software firm to export its products in a global (larger) market. Service-oriented firms are not able to benefit from the global market as easily as product-oriented firms

because delivery of the service often requires deployment of resources in the importing country; a much more challenging task with higher marginal costs.

The growth of Canadian software firm OpenText illustrates the benefits of exporting. In fiscal 2009, OpenText generated slightly over 50% of revenues from outside of North America (OpenText annual report 2009). At the industry level, analysis of the Branham Group's Branham300 survey of technology firms (2009 edition) indicates that the top five product-oriented technology firms (by revenue) realised earnings per employee of US$363,654 compared to the top five service-oriented firms (by revenue) who earned US$184,524 per employee – another benefit of a strong product orientation. In addition to higher earnings per employee, product-oriented firms also have the potential to experience exponential sales growth (a function of the low marginal cost of production for each additional copy of the software product). Overall the key financial benefits of a strong product orientation over a service orientation are:

- Increased earnings per employee,
- Increased sales revenue, and
- Lower production costs.

In an effort to realise the benefits associated with a product orientation, there are a number of challenges that software firms encounter while trying to transition from being service-oriented to becoming product-oriented. Roberts (1990) points out that although many small software firms intend to grow to become successful product-oriented firms, they begin by contracting in R&D or engage in consulting work. They focus on services to generate revenue to stay in business (i.e., generate cash-flow for day-to-day operations) with the longer-term goal to develop software products. These firms fund their growth through service-oriented activities and often deviate from their strategic intentions (becoming product-oriented) by continuing to focus on the delivery of software services. Evolving from providing customised software services to developing products for the mass market is a difficult process – one that many firms never successfully complete. Cusumano (2004), for example, discusses how i2 Technologies failed to successfully develop and evolve their product (supply chain management software) because the firm

focused resources on customising earlier versions of the product for clients. In other cases, service-oriented firms often find that in order to achieve high growth they must codify their expertise into products that can be sold as repeatable solutions to a large market. The challenge in these cases is that the evolution from providing customised software services to independent marketing of software products is difficult; the processes executed in these firms are different and require different capabilities. Many firms, despite their intention to develop and market a software product, never reach this goal. However, those that are able to successfully transition from services to products are able to realise the benefits of a strong product orientation.

More recently, Cusumano (2008) indicates that changes in the software business are driving product-oriented firms to seek service orientations. Citing declining product sales and license fees, Cusmano (2008) contends that revenues of historically product-oriented firms have shifted to services. Lassila (2006) also shows in a case study that product-oriented software firms can expand their businesses through services. Nies (2005, 42) indicates that "Some software companies are typically now selling four to ten times the amount of the software license in the form of services. And their margins could be 30 to 60 percent on the services provided." Examples from the industry such as Siebel's fall in product sales before being acquired by Oracle, and HP's acquisition of EDS indicate a shift towards being more service-oriented. It is unclear if the shift in the industry is due to the achievement of a saturation point with product sales, a natural progression associated with the evolution of these organisations, or a result of strategic choices.

The findings of this research provide insight into how product-oriented and service-oriented firms can strengthen their respective orientations or embark on transformational efforts to transition from one orientation to another. The research questions are phrased in the context of the software industry. The unique characteristics of the software business reduce the likelihood that the findings can be generalised across service and product orientations in other industries. Similarly, it is unlikely that the findings from other studies that are focused on identifying capabilities that characterise product and service orientations in other industries are valid in the software industry. Ethiraj et al. (2005) points out that capabilities are context specific and need to be conceptualised and studied accordingly. Thus, a cognizant decision has been made in the

design of this research study to trade-off generalisability for validity in the context of the software industry.

This research focuses on identifying the capabilities that characterise product orientations and those that characterise service orientations. The study also identifies the relationship between the maturity of capabilities and firm orientation. The findings of this study contribute to the literature related to strategic orientations and capabilities by further defining the orientation construct in terms of capabilities. In addition, the approach used to identify capabilities is novel and contributes to advancing the literature related to capabilities. From a practice perspective, by defining the orientation construct in terms of capabilities the construct is made less abstract and can be applied by the business community. The understanding of the underlying capabilities that support each orientation and the maturities at which these capabilities exist will inform leaders and entrepreneurs in software firms as they seek to strengthen existing orientations or transition across orientations.

1.1 Research Contributions

1.1.1 Theoretical Justification and Positioning

From a theoretical point of view, this research resolves conceptual issues in the domain of a firm's strategic orientation by applying a capabilities approach. In the current literature, strategic orientations are closely related to the concept of competitive advantage. Morgan and Strong (1998) point out that strategic orientation is closely tied to the concept of competitive advantage. Strategic orientations also lead to competitive advantage (e.g., Miles and Snow 1978; Lau et al. 2008; Luo et al. 2005; Zhou et al. 2005). A parallel stream of literature proposes that an organisation's capabilities are a source of a firm's competitive advantage (e.g., Barney 2001; Dyer and Singh 1998; Hall 1998). While there is agreement that capabilities distinguish a firm's competitive advantage, few studies actually identify and measure specific capabilities. From a theoretical and practical perspective, the construct remains abstract with little applied meaning.

Organisational capabilities are a frequently referenced concept in the literature focused on organisational strategy making. Many widely referenced publications focus on defining the organisational capabilities construct (e.g., Nelson and Winter 1982; Grant 1991). However, few studies focus on identifying and measuring a firm's capabilities. Much of the extant literature focuses on the conceptual aspects of capabilities such as definitions and frameworks for classification (e.g., Nelson and Winter 1982; Day 1994).

This research contributes to the advancement of the state of the capabilities literature by definition and execution of a novel method for eliciting organisational capabilities that enable strategic orientations. Contributions are also made to advancement in the state of research in the software industry. The extant literature acknowledges that there are differences in the business models of product-oriented and service-oriented software firms (e.g., Alajoutsijiirvi et al. 1999; Roberts 1990). However, few studies address the specifics of what these differences are in a structured manner. This research advances the understanding of specifically how product-oriented and service-oriented software firms are different.

Much of the basis for this research centres on empirical observations and examples from within the software industry. Michael Cusumano discusses the phenomenon of firms transitioning from being service-oriented to product-oriented in his book *The Business of Software*. Cusumano (2004) examines cases of software firms struggling to develop and maintain product orientations. In attempts to grow and fund research and development activities, software firms often engage in service related activities. Unfortunately, as Cusumano highlights, these firms often begin to focus on services and fail to succeed at product development. There are also cases of large software firms successfully launching products but failing to maintain their product orientation. In the case of i2 technologies, the firm experienced tremendous success initially and then fell into the trap of focusing too heavily on revenue from consulting services. Senior executives in the organisation attempted to restore the product orientation that fuelled the firm's initial success but were unsuccessful in doing so.

Other organisations have recently struggled with finding the appropriate balance between software products and services. One of the most prominent technology firms with a global presence and operations in Canada to face these challenges is IBM. In his

book, *Who Says Elephants Can't Dance?: Inside IBM's Historic Turnaround*, Lou Gerstner (2002) discusses the challenges associated with moving away from IBM's traditional product orientation. He points out that the economics of service-oriented business are different because a services contract might last six to ten years (an outsourcing contract). These contracts may lose money for the first year but still be profitable as a whole; this concept is foreign in the world of product sales (Gerstner 2002). In the case of IBM, Gerstner (2002) also notes that the skills required to manage service processes are very different from those that drive successful product companies. IBM struggled through the transition because the firm had no experience in building a labour-based business. The services model requires different types of compensation models, financial management practices, etc. Gerstner (2002) captures the difficulties faced in making this transition in his observation: "We were expert at managing factories and developing technologies. We understood cost of goods and inventory turns and manufacturing. But, human-intensive services business is entirely different. In services, you don't make a product and then sell it. You sell a capability. You sell knowledge. You create it the same time to delivery it" (Gerstner 2002, 223). Thus, from a strategic orientation point of view, there are differences in process, policies, and metrics between product orientations and service orientations.

This research takes a theoretical approach to addressing the issues identified by Cusumano (2004) and Gerstner (2002). Identifying the capabilities that enable product orientations and those that enable service orientations is a first step to understanding how firms can effectively build and transition between orientations. This research identifies the capabilities that characterise both product orientations and service orientations, providing firms in the industry with the necessary knowledge to build the requisite capabilities to support their chosen orientation.

1.1.2 Practical Justification

The size of the global and Canadian software industry as well as the projected growth makes research in this industry, significant and relevant. Moreover, the success of

product-oriented firms in Canada and abroad raises the importance of this research study and highlights a need for a greater understanding of how firms can successfully develop strong product orientations.

Software products account for substantial economic activity worldwide. According to DataMonitor (2009), the size of the global software industry in 2008 was US$303.8 billion, an increase of 6.5% from 2007. DataMonitor (2009) projects that by 2013 the size of the industry globally will be valued at US$457 billion. Within Canada, the Branham Group reports that companies appearing in the 2009 edition of the Branham300 set a new record for combined revenue in 2008, of US$75.97 billion. This total represents an 18% increase over 2007 revenues. This statistic is impressive when considering that financial services and other industries globally during the same period suffered one of the worst years in history. In addition, the minimum threshold for making the list of Top 250 IT firms increased to US$5.88 million, an increase of US$1.3 million from the previous year. Thus, despite struggles in other industries because of the global recession, the Canadian software industry has maintained growth and continued to show signs of strength.

The Branham300 survey also provides insight into the composition of Canada's portfolio of IT firms. IT Professional Services firms comprise 29.2% of Top 250 Canadian IT Companies. The Branham category definition for IT Professional Services firms specifies that firms in this category earn greater than 50% of their revenue from IT services, and as a result, are service-oriented. The Branham300 also reports that 34.4% of the Top 250 Canadian IT Companies are classified as part of the Software Products category. Similarly, the Branham definition for this category are firms that earn greater than 50% of their revenue from the sale of packaged software products and as a result are product-oriented.

There are firms that are part of the Canadian ICT industry that do not fall into the IT Services or Software Products categories. The Branham300 survey classifies these firms into two categories, xSP or IT Hardware and Infrastructure. Table 1 shows the distribution of the firms in the Branham300 2008 edition and 2009 edition across these four categories. xSP firms are mainly comprised of telecommunications providers, cable companies, ISPs or firms that host proprietary solutions and make them available to

subscribers. IT Hardware and Infrastructure firms earn greater than 50% of their total revenue from hardware and infrastructure solutions (e.g., servers, PCs, networking, etc.). This study focuses on the firms in the IT Services and Software Products categories. Based on the data in Table 1, it is clear that firms in these two categories comprise a significant portion of the Branham300.

Table 1 – Top 250 IT Companies Composition by Focus Area 2008 vs. 2009

Category	Number of firms 2008	Number of firms 2009	+ / -
IT Professional Services	67	73	+ 6
Software	96	86	- 10
xSP	33	34	+ 1
IT Hardware and Infrastructure	54	57	+ 3

From an operational perspective, a transition from a service-orientation to a product-orientation can be measured by the shift in revenue generated from software services to revenue generated from the sale of software products. Similarly, a transition from product-orientation to service-orientation can be measured by the shift in revenue generated from software products to software services. The findings of this research contribute to a better understanding of what capabilities firms should develop to achieve a desired transition. In addition, firms seeking to strengthen their current orientations will gain an understanding of what capabilities to focus on to ensure success.

At the industry level, the findings from this study have the potential to benefit the Canadian software industry as a whole. As individual leaders of software firms chose to apply the findings of this research study, there is potential to increase overall earnings per employee and profitability across the Canadian software industry as well as increasing opportunities to export Canadian software products into the global market. Leaders of software firms will be able to use the results of this research to understand the types of capabilities are that will contribute to building and sustaining strong product and service orientations.

1.2 Methods

This study employed a two-step research approach. Phase one was qualitative and focused on eliciting the capabilities that characterise product orientations and service orientations. Interviews with key informants were used to elicit a list of capabilities that characterise product and service orientations in the software industry. A total of 15 interviews were conducted resulting in the identification of characteristics of product-oriented and service-oriented firms, capabilities that characterise software firms and perspectives on strategies and impediments for transition between product orientation and service orientation (and vice versa).

Phase two of the study was quantitative in nature. This phase of the research focused on validating that the capabilities elicited in the first phase of the research are indeed present in firms with strong product and service orientations. The survey collected data to test for the existence of capabilities and to provide insight into the various levels of maturity at which capabilities exist in product-oriented and service-oriented firms. The survey was administered over the Internet and firms were sampled from the software firms listed in Industry Canada's Canadian Company Capabilities database.

The data from the survey was analysed using quantitative techniques. Specifically, tests for equality of means indicate that there are significant differences between product-oriented, service-oriented and hybrid-oriented firms. A Principal Components Analysis (PCA) was performed to reduce the elicited capabilities into linearly independent components. The results of the PCA served as input into a regression model that was to determine which capabilities distinguish between product, service and hybrid orientations. Further details on analysis approach and findings are available in Chapter 5.

From a theoretical perspective, this research builds on existing constructs to address a gap in the extant literature by further defining the product orientation and service orientation constructs. In addition, the approach this research employs is a novel and is a unique contribution to research in the area of organisational capabilities. The context for the application of the theory is the study of software firms and the capabilities that enable their product orientations and service orientations.

1.3 Thesis Organisation

The next chapter contains an extensive review literature pertaining to strategic orientations, organisational capabilities and the development of organisations. Chapter 3 provides an overview of the Canadian software industry and discusses the salient characteristics of product-oriented vs. service-oriented software firms. Chapter 4 provides a detailed description of the methods used to execute the research. Chapter 5 contains the details associated with the analysis of the data obtained from the study. Finally, Chapter 6 concludes with a summary of findings and discussion of future research opportunities. Figure 1 depicts the overall structure of this document.

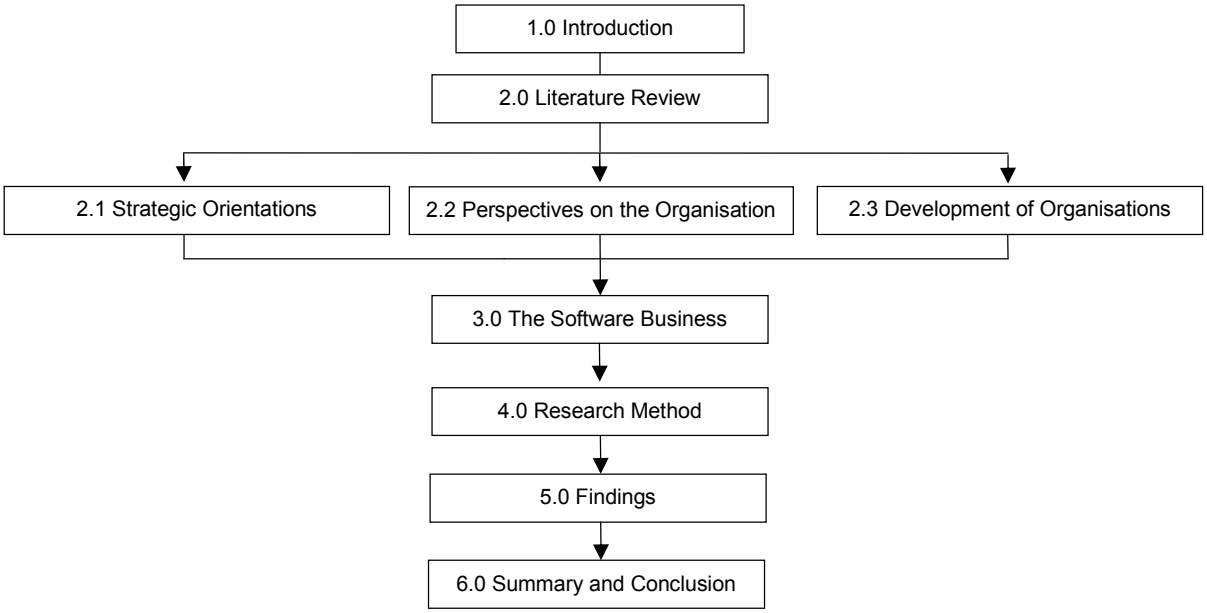

Figure 1 – Document Structure

2.0 Literature Review

To address the objectives of this research, it is critical to understand the current state of multiple literature streams. Literature that pertains to strategic orientations, perspectives on the organisation and capabilities, organisational development and the software business all play key roles in understanding the capabilities that characterise product and service orientations in Canadian software firms. The strategic orientation literature is foundational to understanding *what* it means for a firm to have a specific strategic orientation. Literature on perspectives on the organisation and capabilities provides the necessary background into *how* a firm's strategic orientation can be characterised in terms of capabilities. Literature pertaining to organisational development builds an understanding of *why and how* a firm's capabilities evolve and change over time. Finally, understanding the software business is a critical to this research because it sets the context for understanding the specific capabilities that characterise product orientations and service orientations in this industry. Each of these areas of literature contribute to building an understanding of the *what*, *why* and *how* associated with this research.

2.1 Strategic Orientations

Very little academic research focuses on product orientations or on service orientations and the research that does exist in these two areas has been applied sparingly to the software business. There is however, a large body of literature that focuses on the strategic orientations of firms in general (e.g., Miles and Snow 1978; Porter 1980; Porter 1985; Venkatraman 1989). The Miles and Snow (1978) typology has been used to examine the link between strategy and firm performance (e.g., Conant et al. 1990). Other studies have used different typologies to explain firm performance, including the propensity of firms to be opportunity seeking or problem avoiding, to maintain an external or internal orientation, or to adopt differentiation-based or cost-based strategies (e.g., Wright 2000). From a different perspective, strategic orientations have been

examined as reflections of the beliefs and mental models of senior executives (Hitt et al. 1997). This view relates a firm's strategic orientation to elements of organisational culture and attitude. The strategic orientation construct is also called strategic fit, strategic predisposition, strategic thrust and strategic choice (Chaffee 1985). Within the literature, competitive strategy is also argued to result from strategic orientation, which is "how an organisation uses strategy to adapt and/or change aspects of its environment for more favourable alignment" (Manu and Sriram 1996, 81). Within this body of literature, researchers have defined a firm's strategic orientation in many different ways. Morgan and Strong (1998) point out that the extant literature pertaining to strategic orientation can be categorised into three main viewpoints: the narrative approach, the classificatory approach and the comparative approach.

2.1.1 Narrative Approach

The narrative approach uses qualitative methodologies such as case studies. The focus is on describing the holistic nature of strategy (Andrews 1971). The narrative perspective has applications in organisational research but it has been criticised for being limiting because it is not suitable for theory testing; narrative descriptions cannot be tested. It is also difficult to measure a strategic orientation in this context using measurement scales (Ginsberg and Venkatraman 1985). The qualitative and subjective nature of the approach and associated descriptions also make it difficult to recreate results between research studies.

2.1.2 Classificatory Approach

The classificatory approach focuses on defining categories for similar types of strategies and then assigning strategies into categories (Morgan and Strong 1998). The categories, which are referred to as typologies (e.g., Miles and Snow 1978; Porter 1985), are used to group firms based on the type of strategy they favour. Miles and Snow (1978) define strategy as an on-going process of evaluating organisational purpose as well as

questioning, verifying and redefining the manner of interaction with the competitive environment. From an operational perspective, their typology focuses on the direction and influence given by managing directors and the top management team to the firm's overall vision and direction. It suggests that three fundamental issues need to be addressed by decision-makers in any firm: managing the firm's share of the market, deploying solutions, and structuring the firm to manage the processes outlined. Miles and Snow (1978) argue that different firms exhibit patterns of responses that can be used to detect the type of strategic orientation the firm possesses. They present the view that every organisation has a dominant trait resulting from the influence of its key decision makers and their perceived view of the operating environment. Each of the different types of strategic orientations represents different approaches and perceptions of the operating environment. Based on their research, they identify four types of organisations, *prospectors*, *analysers*, *defenders* and *reactors*.

Prospector firms typically maintain an aggressive competitive position and tend to be pioneers within their industries with respect to the creation and development of new technologies. They are also opportunistic and display an interest in new and broader markets. In contrast, defender firms adopt a more conservative position. They focus on holding a secure market position often in a narrowly defined segment. Competitive behaviour is based on price or quality, as both of these are key factors in maintaining the current market position. Innovation, which is characteristic of focusing on new markets or opportunities, is rarely a priority of these organisations. In comparison, analysers share elements of both defender and prospector firms by maintaining a secure position in a core market while seeking new market positions via product development. Finally, reactors lack a coherent plan for competing in an industry and do not exhibit the mechanisms or processes for adapting to the market place (Miles and Snow 1978).

Subsequent to the work of Miles and Snow (1978), in the 1980s Porter's approach to strategy (Porter 1980; Porter 1985) surfaced as a widely adopted paradigm. Porter's "generic strategies" are another example of the classificatory approach to organisational strategy. Porter's strategies are supported with his five-force framework. In the framework, the five forces that influence the firm are:

- Bargaining power of customers,
- Bargaining power of suppliers,
- Threat of new entrants,
- Threat of substitute products, and
- The intensity of competitive rivalry.

The five-force framework provided a systematic approach to understanding how the competitive forces firms face drive profitability and supports Porter's generic strategies.

Porter (1985) classifies strategies into three different categories. A *cost leadership strategy* allows firms to compete through lower costs of production, higher margins than competitors, and increased market share with lower priced products. A *differentiation strategy* allows firms to develop a competitive advantage by gaining customer loyalty by providing innovative products, innovative delivery methods and after sales support or through a strong brand. The third type of strategy is *focus strategy*, a strategy that is a cost leadership or differentiation strategy but applies to a narrow set of customers thereby focusing on a niche segment of the market.

Porter's views on organisational strategy and competitive advantage are well regarded for capturing the dynamics between competitors, suppliers and the firm. The five-force framework that describes competitive forces in an industry and how these forces determine profitability is widely referenced and generally accepted. However, one of the shortcomings of this framework and Porter's views on strategy is that both operate more at an industry or market level and less at the individual firm level. In application, Porter's views can appear overly simplified. For example, while individual firms may focus on a differentiation strategy, they can do this in many different ways. Some firms may be inclined to engage in higher risk innovative approaches (e.g., pure research, new product development) and others might be more inclined to differentiate through lower risk initiatives (e.g., partnering, outsourcing etc.). Nonetheless, research that focuses on firm performance has argued that well executed strategic orientations (cost leader strategy or differentiation) enable a firm to achieve above-average returns (Porter 1985).

The classificatory approach is a progressive improvement over the narrative approach because it allows researchers to assess a firm's strategic orientation against a

framework. However, one of the key limitations of the classificatory approach and the use of Miles and Snow typology (1978) and Porter's generic strategies (Porter 1980), is that they assume mutual exclusivity. Firms may choose to adopt a strategic orientation that cannot be uniquely identified based on the predefined categories.

2.1.3 Comparative Approach

The comparative approach is the final approach for assessing a firm's strategic orientation discussed by Morgan and Strong (2003). Many researchers have used this approach (e.g., Miller 1983) in an attempt to "identify and measure the key traits (dimensions) of a firm's strategy" (Venkatraman 1989, 946). Identifying and measuring orientations along key dimensions is an improvement over comparison across generic strategies, it allows for a finer level of detail and captures variation in strategies across firms. Venkatraman (1989) originally proposed six traits of competitive strategy that serve as the foundation of this comparison: aggressiveness, analysis, defensiveness, futurity, proactiveness, and riskiness. The concept of viewing strategic orientation in terms of dimensions of competitive strategy also paved the way for future research into different types of strategic orientations. Orientations such as Marketing Orientation (e.g., Jaworski and Kohli 1993), Learning Orientation (e.g., Sinkula et al. 1997) and Entrepreneurial Orientation (e.g., Covin and Slevin 1991; Lumpkin and Dess 1996) have been characterised based on variations of the dimensions proposed by Venkatraman (1989). Unlike the generic strategies and typologies presented by Miles and Snow (1978) and Porter (1980) the different types of strategic orientations characterised in terms of dimensions (e.g., proactiveness, risk-taking, etc.) allow for comparison between the strategic orientations of firms. However, across the different types of strategic orientations, the amount of research that has been conducted in each of the areas varies greatly.

Marketing orientation is perhaps one of the most researched and studied of the strategic orientations. Market-oriented firms "seek to understand customers' expressed and latent needs, and develop superior solutions to those needs" (Slater and Narver 1999:

1166). Marketing orientation places the highest priority on the profitable creation and maintenance of superior customer value (Day 1994; Slater and Narver 1999). It is further defined as "the organisation-wide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments and organisation-wide responsiveness to it" (Jaworski and Kohli 1993, 56). From an operational perspective, market orientation researchers are divided with respect to how they define the development and existence of a firm's marketing orientation; it is viewed as a managerial phenomenon (Jaworski and Kohli 1993), a cultural phenomenon (Narver and Slater 1990), and a systems phenomenon (Becker and Homburg 1999).

Entrepreneurial orientation is one of the lesser studied of the popular strategic orientations. Much like learning orientation and marketing orientation, there is little agreement with respect to what form a firm's entrepreneurial orientation takes. Covin and Slevin (1991) defined entrepreneurial orientation as the organisational processes that support the dimensions of risk-taking, innovativeness and proactiveness. Lumpkin and Dess (1996) later added two more dimensions to the entrepreneurial construct, autonomy and competitive aggressiveness. However, there are those that have described a firm's entrepreneurial orientation as a set of cultural values (e.g., Lee and Peterson 2000) and even as the traits and characteristics of individual leaders (e.g., Lumpkin and Dess 1996).

Overall, the comparative approach to strategic orientation has been generally accepted since Venkatraman (1989) proposed the initial dimensions of a strategic orientation. However, in the area of product and service orientation there has been little investigation into the dimensions that influence each of the orientations. In fact, these strategic orientations have received little attention from a research perspective. This study contributes to the body of literature associated with product and service orientations by further describing these orientations in terms of the capabilities that enable them.

2.1.4 Product Orientation

The product orientation construct has not received much attention from researchers relative to other strategic orientations. Among researchers, two dominant points of view have been taken regarding product orientation. Pelham (2000) contends

that firms with strong product orientations favour efficiencies and cost minimisation with respect to decision-making. Thus, firms that have successfully realised the benefits of a strong product orientation have done so by focusing on production efficiencies, cost minimisation and mass distribution (Kaufman et al. 2002). In an alternative view, Voss and Voss (2000) define a firm's product orientation as an organisation's commitment to the integration of innovation into the product development and marketing process. Voss and Voss (2000) adopt the stance that product orientation involves more than cost minimisation and mass distribution; it also involves a firm's new product development and marketing process. This study adopts the position that a firm's product orientation manifests itself in multiple functional areas of the organisation and focuses on identifying the capabilities that enable this product orientation across the various parts of the organisation.

It is interesting to note that the characteristics of a product orientation can be in conflict with a market orientation. Market orientation contends that firms make decisions placing the highest priority on customer needs and preferences, however, firms with strong product orientations often make decisions based on efficiencies and cost minimisation (Pelham 2000). In addition, from a new product development and marketing perspective, researchers have also pointed out that being too customer focused (i.e., marketed oriented) can lead to inertia and prevent innovation and the development of new products (e.g., Leonard-Barton 1992). Thus, it may be better to ignore your customer through the research and development and new product development processes; implying that co-existence of product orientation and marketing orientation may not be feasible or desirable.

Kaufman et al. (2002) point out that businesses across industries have successfully realised the benefits associated with a strong product orientation. For example, eMachines is cited as an organisation that has focused on efficiency and cost minimisation to produce personal computers at a substantial cost and price advantage over competitors. Kaufman et al. (2002) suggest that companies such as McDonald's and Kia Motors have also focused on the cost minimisation and efficiency aspects of a strong product orientation. Thus, in contrast to Voss and Voss (2000) who position product orientation primarily as a new product development and marketing function, Kaufman et

al. (2002) emphasise the production and delivery functions. The anecdotal evidence presented by Kaufman et al. (2002) is consistent with the findings of other researchers who found that a strong product orientation is associated with firm performance (e.g., Voss and Voss 2000; Wong and Mavondo 2000).

A key gap in the extant knowledge surrounding product orientation is around how strong product orientations develop and what the key processes are within the organisation that support the development of a product orientation. Specifically, there is little research that examines the organisational capabilities that characterise a firm's product orientation and the various levels of maturity at which these capabilities exist. This study focuses on understanding the capabilities that characterise a product orientation and the relative maturity levels at which these capabilities exist in product-oriented software firms.

One of the notable differences between product orientation and other strategic orientations is how literature has characterised the orientation in terms of definition. Marketing Orientation, Entrepreneurial Orientation and others have been characterised in terms of characteristics (e.g. risk-taking propensity, aggressiveness etc.). Researchers that have examined product orientation and specifically in the software industry have characterised product-oriented firms as those that earn the majority of their revenues from products instead of services (e.g. Roberts 1990; Voss and Voss 2000). Roberts (1990) examines the product orientation of software firms and uses the source of review as the determinant of product orientation, Voss and Voss (2000) who point out that source of revenue is associated with a firm's orientation.

Alajoutsijiirvi et al. (1999) and Roberts (1990) are among the very few researchers to study the application of product orientations in the software industry. Alajoutsijiirvi et al. (1999) propose that globalisation and productisation are keys to growth in the software business and that product-oriented software firms can use their product development capabilities to grow on a global scale. The characteristics of software make it relatively easy to customise for local markets and its intangible form, make it very easy to distribute within the global economy. This study builds on the work of Roberts (1990) and Alajoutsijiirvi et al. (1999) by characterising the capabilities

software firms require in order to build strong product orientations and understanding the varying degrees of maturities at which these capabilities exist in different software firms.

2.1.5 Service Orientation

Although the service orientation construct has received more attention from researchers than product orientation, the body of literature on service orientation is also relatively sparse and there is no known application of the service orientation construct to the software industry. Much like the entrepreneurial orientation construct, there are two common views on the level at which a service orientation exists; some define it at the organisation level (e.g., Lynn et al. 2000) whereas others have focused on defining and researching service orientation at the level of the individual (e.g., Hogan et al. 1984). Unlike entrepreneurial orientation, although service orientation is defined at different focal points (individual vs. organisation), researchers have attempted to unify the two perspectives.

At the organisational level, service orientation describes organisational policies, practices and procedures that support service excellence. Lynn et al. (2000) contend that service orientation exists when the organisational climate for service crafts, nurtures, and rewards service practices and behaviours known to meet customer needs. Lytle et al. (1998) postulate that the creation and delivery of exceptional service quality is a result of the organisation's service orientation. Furthermore, they characterise the organisational service orientation as the result of enduring organisational policies, practices and procedures that support nurture and reward excellent employee service behaviour (Lytle et al. 1998). Thus, this view begins to unify the individual vs. organisational perspectives by arguing that service orientations develop because of an organisation's policies, practices and procedures but are influenced by the behaviour of individual employees.

Hogan et al. (1984, 169) applied a different perspective by defining service orientation at the individual level as a "disposition to be helpful, thoughtful, considerate, and cooperative". Hogan et al. (1984) also proposed that the concept of service orientation could be assessed using measures of personality. This perspective draws

parallels with the views of Lumpkin and Dess (1996) on entrepreneurial orientation; they propose that entrepreneurial orientation can be measured at the individual level based on the existence of personality traits.

At the individual level, there have also been attempts to measure service orientation. The Service Orientation Index (SOI) is a scale that was developed from the Hogan Personality Inventory (HPI) (Hogan et al. 1984). The scale discriminated between employees who are more service-oriented (well-adjusted, likable, socially competent and willing to follow rules) and those who are not (rude, tactless and socially inept). Cran (1994) empirically validated the dimensions of a service orientation identified by Hogan et al. (1984) (adjustment, likeability and prudence). Additionally, Cran (1994) said that ambition may be another predictor of service orientation. Within the context of retail sales the two dimensions, extroversion and agreeableness, also affected service (Herley 1998).

Dienhart et al. (1991) attempted to measure the service orientation of employees in the restaurant industry. The findings of this research suggest that three dimensions compose a service orientation: organisational support, customer focus and service under pressure. Organisational support is the degree to which management encourages service, training and processes to support service. Customer focus includes items related to customer service interaction, enjoyment and satisfaction. Service under pressure focuses on the expectations of customers and management for delivery of service during busy hours. Dienhart et al. (1991), point out how these three elements incorporate the two conflicting views on service orientation, as a personality trait and a function of the organisation's environment.

The benefits of a strong service orientation have been studied in multiple contexts. In firms that offer primarily services, a service orientation contributes to increases in profit, growth, customer satisfaction and loyalty (Lynn et al. 2000). Firms with a strong service orientation, that is, those with organisational policies, practices and procedures support service excellence, often have a competitive advantage in mature western markets (Bowen et al. 1989). Research studies have consistently found that a firm's profit, growth, customer satisfaction, and loyalty are enhanced by organisational service orientation (e.g., Doyle and Wong 1998; Heskett et al. 1997; Jones and Sasser 1995;

Schneider and Bowen 1995). Moreover, the results of these studies span across multiple mature industries. This implies that firms can use a service orientation to improve customer satisfaction, resulting in increased retention and customer loyalty.

Much like the gap in extant knowledge in the product orientation literature, a key gap in the concept of service orientation is that lack of understanding about what it means for a firm to be service-oriented. It is generally accepted that at the organisational level, service orientation is facilitated through organisational policies, practices and support procedures (Lynn et al. 2000). However, there is little known about the specific parts of the organisation in which these processes need to exist and how 'good' the firm needs to be at specific processes. Specifically, it is unclear what capabilities firms require to support the development of a service orientation and the degree of maturity these capabilities need to exist. This research is the first to address the issue of understanding the type of capabilities that characterise a service orientation in the software industry both conceptually and empirically.

2.1.6 Summary

A review of the extant literature indicates that the product orientation and service orientation constructs have been developed although to a lesser degree than other strategic orientations (e.g. Marketing Orientation, Entrepreneurial Orientation). Researchers have applied the product orientation construct to the software industry; however, its definition has taken a different form than in other industries, focusing more on revenue sources instead of organisational characteristics. The service orientation construct has been applied at both the organisational and individual levels but has been applied to the software industry. This research further develops both of these constructs and applies them in the software industry. This study also acknowledges the existence of a hybrid orientation that is a mixture of both product orientation and service orientation.

Consistent with how these orientations have been defined and applied to the software industry (e.g. Roberts 1990; Voss and Voss 2000), this study theoretically defines a product-oriented firm as one that sources greater than 50% of its revenue from

the sale of products and a service-oriented firm as one that sources greater than 50% of its revenue from services. This is the "theoretical" definition because in practicality hybrid orientations exist and are broader in range than just an equal split at the 50% point (i.e. a firm with 49% revenue from products and 51% from services is from a practical perspective still hybrid-oriented).

The objective of this research is to characterise the capabilities that enable service orientations and product orientations in the software industry and to understand how these capabilities vary in terms of maturity. This study applies the concept of capabilities to describe how firms enable their strategic orientations. Capabilities can be used to explain how firms realise and operationalise different strategies. For example, Porter's low-cost strategies are enabled through a different set of capabilities than are differentiation strategies. Firms focusing on a low-cost strategy seek to build enabling capabilities in areas such as activity-based costing, inventory management and process efficiency. In contrast, firms focusing on a differentiation strategy will benefit from capabilities in areas such as idea generation and new product development.

Understanding how the orientations vary in terms of capabilities also provides insight into understanding how firms can develop these orientations. The following section of this chapter discusses different perspectives researchers have taken on viewing the organisation and its resources (including capabilities). The different perspectives provide frameworks for defining and examining organisational strategy.

2.2 Perspectives on the Organisation

Thus far, this document has discussed the issue of a firm's strategic orientation and the differences between the product and service orientation constructs. This section discusses three commonly used perspectives for analysing organisations, the *resource-based view*, the *capabilities view* and the *dynamic capabilities view*. Each of these perspectives is used to operationalise the concept of a firm's strategic orientation. Researchers have used these perspectives to understand how firms develop and sustain a competitive advantage (e.g., Barney 2001; Dyer and Singh 1998; Hall 1998). However, strategic orientations lead to competitive advantage (Miles and Snow 1978; Lau et al.

2008; Luo et al. 2005; Zhou et al. 2005), thus, these perspectives also can assist in understanding the existence and development of strategic orientations in the firm. Moreover, Venkatraman (1989) contends that organisations have deliberate or emergent strategic orientations based on a variety of internal (resources) and external (industry) factors. Organisations make decisions on where and how to deploy resources based on their strategic orientations and where they need to focus resources in order to maintain a competitive advantage (Venkatraman 1989). The concept of optimal resource allocation and sustaining/building competitive advantage is a central theme across the resource-based view, the capabilities view and the dynamic capabilities view of the organisation. This section begins with an examination of the resource-based view of the organisation and continues to discuss how the capabilities view is applied in this research study.

2.2.1 Resource-Based View

The resource-based view (RBV) of the firm explains differences between firms. Historically, the RBV has been used to explain how firms obtain and sustain competitive advantage (Barney 1991; Eisenhardt and Martin 2000; Winter and Nelson 1982; Prahalad and Hamel 1990). The RBV of the firm considers the organisation as a composition of "bundles of resources" that are distributed heterogeneously across the organisation with different resources developing over time (Alvarez and Busenitz 2001; Eisenhardt and Martin 2000). Furthermore, RBV also postulates that firms with resources that are valuable, rare, inimitable and non-substitutable can achieve sustainable competitive advantage by developing strategic orientations that cannot be duplicated by other firms (Alverez and Busenitz 2001; Eisenhardt and Martin 2000).

Resources are defined as those tangible or intangible assets that are tied semi-permanently to the firm (Grant 1991). In this context, a tangible resource (e.g., equipment, tools etc.) is easier to imitate compared to an intangible resource. Intangible resources are difficult to identify or quantify, and therefore are more difficult to imitate (Grant 1991). Similarly, Wernerfelt (1995) classifies resources as physical, human or organisational assets. Wernerfelt (1995) and Grant (1991) agree on the perspective that physical assets are tangible and as a result easy to imitate and easy to acquire. Conversely, organisational

resources are intangible and as a result hard to imitate and hard to acquire. The argument presented by Wernerfelt (1995) appears to be more comprehensive with the observation that human resources are tangible and hard to imitate but easier to acquire than intangible resources. By adding the "acquisition factor" to the definition of a resource, Wernerfelt (1995) added a new dimension to the definition of resources in the context of RBV.

RBV takes the position that resources are distributed heterogeneously across firms, and when firms have valuable resources that are rare and difficult to imitate, they can achieve competitive advantage by implementing value-creating strategies (Wernerfelt 1984). Tangible resources are less likely to be sources of competitive advantage whereas intangible resources that are difficult to imitate and replicate are more likely to yield opportunities to build competitive advantage. Applying these ideas to the concept of strategic orientations, the logical extension is that the intangible resources that are difficult to imitate contribute to the development of product and service orientations. Furthermore, the specific types of resources and the processes in which the resources are employed distinguish between the development of a product or service orientation. Prahalad and Hamel (1990) argue that "core competencies" which are intangible resources based on organisational and human skill, are the most likely source of competitive advantage. Thus, firms with a product orientation may have core competencies that are distinct from the core competencies of service-oriented firms. The introduction of the core competencies concept highlights that possession of resources alone does not promise the benefits of a strategic orientation and resulting competitive advantage. Capabilities and competencies are required to exploit the firm's resources.

Early contributions to the literature did not distinguish between a firm's resources and capabilities. However, according to Amit and Schoemaker (1993) resources are assets that the firm owns or controls whereas capabilities refer to its ability to exploit and combine resources through organisational routines to accomplish its objectives. Other researchers point out that what distinguishes resources from capabilities is based on the difference between "having" (i.e., what the firm has or owns) and "doing" (i.e., what the firm can do), and between tangible and intangible assets (Martens et al. 1997). Capabilities clearly fall under the "doing" and "intangible" categories. They refer to the

ability of the firm to deploy existing resources to perform some task or activity (Grant 1991).

Although the definition of the term "resource" has varied through time, a consistent theme within RBV is the relationship to competitive advantage. There is a consensus that the resources and the configuration of resources have the most significant impact on the firm's competitive advantage. The combination of the resource and resource configuration will determine if other firms can imitate the firm's position. Thus, in order to build or maintain a product orientation that can lead to competitive advantage, firms must focus on strategies to optimize the use of resources and configure them in ways that result in capabilities. Research has shown that in the right environment specific capabilities can lead to increased firm performance (e.g., Coates and McDermott 2002; Grant 1991; Prahalad and Hamel 1990).

The resource-based view of the firm has contributed significantly to aiding researchers in understanding the differences between firms. However, the general nature of the theory and the varying definitions of the term resource have received some criticism. RBV is criticised for lacking operational practicality in managerial settings. One of the issues contributing to this lack of practicality is that RBV does not take into consideration the concept of time. Specifically, it does not provide insight into how to sustain a competitive advantage once acquired or how to identify and exploit future sources of competitive advantage. From an operational perspective, RBV contends that managers should be able to:

- Identify and classify the firm's resources.
- Identify comparative levels of value associated with resources relative to competitors' resources and weaknesses.
- Assess rent-generating potential of resources.
- Select a strategy to best exploit resources relative to external opportunities.

Each of these steps has a number of associated challenges. Identifying a firm's capabilities is not a trivial task and one that the research literature poorly addresses. There is no clearly defined technique for identifying the value associated with resources.

Likewise, managers do not have a prescriptive technique for assessing rent-generating potential of specific resource configurations. Moreover, researchers have indicated that organisational rents cannot be obtained or sought; they are random occurrences of a number of different factors (Spender 1994). These issues contribute to the challenges associated with applying RBV in a managerial setting.

One of the other weaknesses of RBV is that it is not applicable in all contexts. In dynamic markets such as the software industry, it is arguable that there is no such thing as a "sustainable" competitive advantage (Brown and Eisenhardt 1998). In the software industry, the speed of technological development changes the new product development process, product manufacturing, distribution, service delivery, etc. Thus, competitive advantage, even if it is sustainable, cannot be based on resources that play a role in creating and product or service, because the resources themselves are ever changing. Some of the limitations associated with RBV are addressed through the capabilities view of the organisation.

2.2.2 Capabilities View

The capabilities view of the organisation has gained increasing interest in recent years, both in the domain of academic research and in business strategy. However, from a literature perspective the capabilities view still ties very closely to the literature stream focused on the RBV of the firm. The domain of evolutionary economics also recognises the capabilities view as a fundamental construct. Nelson and Winter (1982) defined routines and capabilities among the main building blocks of evolutionary theory. The capabilities construct is also referenced in technology and management research (e.g., Freeman and Soete 1997), knowledge management research (e.g., Kogut and Zander 1992), the domain of business history research (e.g., Chandler 1990) and domain of business strategy (e.g., Teece et al. 1997). This study examines capabilities in the context of strategic orientations. Specifically, the goal is to understand what capabilities characterise a firm's product and service orientation and how these capabilities differ in terms of maturity in relationship to a firm's product or service orientation.

Organisational Capabilities

A capability is defined as "the quality or state of being capable" (Merriam-Webster Online Dictionary 2010). This definition is ambiguous such that virtually any verb can be described in terms of a capability. Often the term capability is misused in reference to tactical processes or activities (Jacobides 2006; Ulrich and Smallwood; 2004). However, in the organisational context academic researchers adopt a more precise definition of a capability. Day (1994, 39) defines capabilities as "complex bundles of skills and collective learning, exercised through organisational processes that ensure superior coordination of functional activities". The definition Day (1994) presents is the mostly widely referenced in recent research (e.g., Winter 2000; Schoemaker and Amit 1997; Prahalad and Ramaswamy 2000). While widely accepted, this definition has been criticised for being narrow in scope by limiting capabilities to the functional, process and organisational level. More recent research portrays capabilities as extending beyond processes and functions. They operate at many levels inside and outside the organisation.

Birkinshaw (2000) and Dyer and Singh (1998) adopt a more broad-reaching definition of capabilities; proposing that a capability is a multi-level phenomenon, existing across firms, at the firm level and at the operational unit level. Some resources and capabilities are built jointly with stakeholders, while others emerge in one area of the company and are transferred to other units. Firms such as Home Depot and Wal-Mart exemplify the broader definition of capabilities; both firms have recognised capabilities in supply chain management and distribution. These capabilities span multiple levels of the organisation (from the warehouse floor to the back-office technology systems) and even transcend organisations (retailer, distributor, and manufacturer). Table 2 contains a summary of the most prominent research in the area of organisational capabilities.

Capabilities vs. Competencies

The terms capability and competency are often used interchangeably (e.g., Day 1994). The literature defines a competency as a combination of technological and

organisational skills within the organisation (McKelvey and Aldrich 1983). Nelson and Winter (1982) operationalise the idea of a competency by introducing the notion that a competency is a "routine" within the organisation or more generally, the firm's ability to act. More recently, researchers describe competence as a function of technology, governance process and collective learning within the organisation (Prahalad and Hamel 1994). All of these definitions make competencies sound similar to capabilities.

Table 2 – Key Contributions to the Capabilities Construct

Publication	**Area of Focus**	**Contribution**
Nelson and Winter (1982)	Evolutionary economics	Present the view of an organisation being composed of a set of capabilities and dynamic capabilities. These capabilities are key drivers in the evolution of organisations.
Prahalad and Hamel (1990)	Core competencies	Distinguish between a firm's capabilities, competencies and what it means for these properties to be "core".
Leonard-Barton (1992)	Core capabilities and rigidities in new product development	Capabilities as a knowledge set with four dimensions (employee knowledge and skills, technical systems, managerial systems and values and norms).
Kogut and Zander (1992)	Knowledge in the firm	Introduction of combinative capabilities and the notion that firms "learn" through recombining existing capabilities.
Day (1994)	Capabilities of market-oriented firms	Presentation of the capabilities approach to strategy (as a source of competitive advantage). Definition of market-sensing and customer-linking capabilities.
Teece et al. (1997)	Dynamic capabilities and competitive advantage	Development of the dynamic capabilities approach to building competitive advantage.
Eisenhardt and Martin (2000)	Dynamic capabilities and RBV	Present the view that dynamic capabilities are specific, identifiable processes.
Winter (2003)	Dynamic capabilities	Introduction of the capability hierarchy.
Becker et al. (2005)	Organisational capabilities and organisational change	Present the view that organisational change is linked to capabilities.
Ethiraj et al. (2005)	Organisational capabilities	Present the view that organisational capabilities are a source of competitive advantage and are context specific.

Teece (2000) distinguishes between the two constructs by presenting competencies as the well-defined routines that are combined with the firm's assets to enable distinctive functions to be carried out and capabilities as the mechanisms and

processes used to develop new competencies. Plakoyiannaki and Tzokas (2002) contend that competencies usually have a technology- or knowledge-based component and result from blending technology and production skills. In contrast, capabilities integrate aspects of knowledge, process and learning to yield unique outcomes.

The definitions of capabilities and competencies highlight a subtle contrast between the two constructs. Capabilities operate at multiple levels of the organisation; competencies exist at an operational level. Competencies are composed of skills and a set of routines that combine to facilitate the operation of the firm's business. Competencies exist in processes such as new product development, manufacturing or service delivery. Capabilities encapsulate multiple organisational processes and span multiple functions in the organisation.

Having a set of competencies does not necessarily imply the existence of a higher-level capability. The competencies may be unrelated, disparate and not complement each other, thus, not providing benefits across functions, processes or incorporating previous learning. Hence, a dimension of the capability construct that is not directly captured in previous research is the concept of configuration. The development of capabilities relies on a nearly optimal configuration of processes and the routines and tasks within those processes.

Although it will not be tested in this study, the hypothesis is that competencies must exist in order for capabilities to form. If competencies are routines in the organisation that centre on technology and process, then a capability can exist without a competency if the capability does not rely on technology or on some type of process. By definition, capabilities involve some aspect of the organisation's process. Thus, capabilities can be linked to specific lower-level competencies.

Core Capabilities and Core Competencies

Adding to complexity in the domain of capabilities and competencies is the use of the adjective "core" leading to the terms *core capabilities* and *core competencies*. The term "core" is used to identify the strategic nature of the competency or capability.

Within the literature, the terms *core competency* or *distinctive competency* identify competencies that are the source of a firm's competitive advantage. Prahalad and Hamel (1994) define a firm's core competencies as the tangible and intangible assets and skills that distinguish the firm from its competitors, creating a unique value proposition and a sustainable competitive advantage. In the context of this study, core competencies are the key enablers of a firm's product or service orientation. The specific nature of competencies and how they are employed determine if the orientation is product-focused or service-focused.

Similarly, *core capabilities* also exist. Core capabilities are those capabilities that differentiate the company strategically (Leonard-Barton 1992). Day (1994) points out that firms possess many capabilities, but core capabilities (or distinctive capabilities) are those that support the market position that is valuable and difficult to match. Based on this definition of core capabilities, it is conceivable that two firms can have capabilities in the same area (e.g., distribution) but the capability is a core capability for one firm and not the other. The same capability can support a firm's market position to varying degrees.

One of the key gaps in the literature relates to the use of the adjective "core" to define a capability or a competency. Given a set of known firm capabilities and competencies, there is no accurate or precise technique one can apply to identify which capabilities or competencies are truly core to the firm's business. Based on the definitions of the constructs, one can begin to distinguish between core and non-core capabilities or competencies by asking the following questions:

1. Does the competency distinguish the firm from its competitors?
2. Does the competency lead to a sustainable competitive advantage?
3. Does the capability differentiate the firm strategically?
4. Does the capability support a market position that is valuable and difficult to match?

While the preceding questions are a good start, they do not lead to an accurate or precise technique for distinguishing between core and non-core capabilities. What a CEO views

as being a market position supporting capability is not necessarily the same as what the firm's CIO may view as being a market-supporting capability. The literature does not prescribe an accurate or precise algorithm for identifying core capabilities/competencies from non-core capabilities/competencies.

Capabilities Can Lead to Rigidities

Is it always favourable to have specific capabilities and competencies within the firm? Based on the views discussed thus far, the answer is yes. However, in reality, capabilities and competencies do have their disadvantages. Leonard-Barton (1992) presents the view that a firm's core capabilities are not entirely positive in all situations. Introducing the concept of core rigidities, the opposite of core capabilities, Leonard-Barton (1992) takes a learning perspective on core capabilities and defines core capabilities as having four dimensions. Viewing the firm's capabilities as a knowledge set, the dimensions of core capabilities are:

1. employee *knowledge and skills,*
2. *technical systems* in which knowledge is embedded,
3. *managerial systems* that control and guide knowledge creation, and
4. *values and norms* that are associated with various types of knowledge and the processes of control and creation.

Leonard-Barton identifies how core capabilities enhance the development of the knowledge set in the organisation along each of the four dimensions. Employee knowledge and skills lead to excellence in the dominant discipline and pervasive technical literacy. Technical systems become part of the firm's capabilities supporting the execution of business processes. Management systems begin to foster the growth of capabilities by providing incentive systems and encouraging innovative capabilities. Moreover, along the values dimension capabilities empower employees and give the dominant discipline a high status within the organisation. All of these are positive effects

that capabilities have on the organisation. However, Leonard-Barton (1992) points out that core capabilities can lead to the development of core rigidities that do not benefit the firm.

Core rigidities, the opposite of core capabilities, are deeply embedded knowledge sets that hinder the organisation. Core rigidities influence each of the four dimensions in a negative way. Along the employee knowledge and skills dimension, they promote less strength in the dominant discipline – inhibiting the firm from improving areas that are not as strong as the dominant discipline. Technical systems also embody rigidities when skills and processes embedded in technical systems become outdated. Management systems are also sources of core rigidities with people favouring roles in the organisation that are perceived as adding more value than others. In the values dimension core rigidities surface as empowered employees begin to feel entitled to certain rewards or recognition and less dominant disciplines receive a lower status within the organisation.

The concept of core rigidities is a contrast to the view that core capabilities are always highly favourable. The notion that core capabilities in certain areas lead to the development of core rigidities in others brings forward the point that core capabilities themselves are a strategic construct and firms should ensure that the pursuit of capabilities in specific areas of business are in line with the firm's overall strategic intent.

The concept of core rigidities is relevant in the software industry and a particular challenge in the transition from a service orientation to a product orientation. The view presented in this study is that the capabilities construct contributes to a firm's strategic orientation. Specifically, firms with a product orientation need a specific set of capabilities and firms with a service orientation have a distinct set of specific capabilities. It follows then that based on the concept of core rigidities that each of these orientations has its own associated set of rigidities. An example of a core rigidity is highlighted by Christensen (2000) as he points out that being too customer focused can lead to momentum along current trajectories but when seeking new product innovations it may be beneficial to ignore current customers. The basis of this perspective is the observation that customers are resistant to change and are limited in their ability to provide creative input.

Consider the case of a service-oriented firm that is highly successful. The firm attributes much of its success (in the form of revenue) to being able to satisfy the needs of the customer. The firm has a capability in collecting "voice of the customer" information, translating this information into clear business needs/requirements and assisting clients in fulfilling these business needs and satisfying their requirements. This capability is crucial to the firm's success. However, the antithesis of this capability is a core rigidity. Relying on this capability, the services firm will find it difficult to innovate outside of the customer's current business processes, business model and resulting needs. The service-oriented firm that is guided by their capability to listen to the voice of the customer only has the ability to see what the customer sees and lacks the ability to look beyond the immediate needs expressed by the customer. This simple example demonstrates how core capabilities that contribute to product or service orientations can also embody core rigidities that prevent development along other strategic orientations.

2.2.3 Dynamic Capabilities View

The dynamic capabilities view builds on both RBV and the capabilities view of the organisation. RBV explains how organisations can take advantage of resource differences over time and configure resources to maintain competitive advantage. However, RBV does not explain how and why firms develop and sustain a competitive advantage in environments with rapid and unpredictable change (Eisenhardt and Martin 2000). In markets where change is common and unpredictable, the dynamic capabilities of the firm act as a source of competitive advantage. In response to the weaknesses found in the RBV approach, the dynamic capabilities view (DCV) of the firm has been developed. This research proposes that capabilities and dynamic capabilities contribute to the development and sustainability of strategic orientations and different types of strategic orientations can lead to the development of competitive advantage. In the perspective of this study, the dynamic capabilities view is critical to understanding how to sustain product orientations.

Dynamic Capabilities

The dynamic capability construct is defined a number of different ways within the strategic management literature. At a very basic level, dynamic capabilities are loosely defined as routines to learn routines (Eisenhardt and Martin 2000). They relate to an organisation's competencies, core competencies and operational capabilities. They differ from traditional capabilities in the sense that dynamic capabilities facilitate the adoption of new capabilities. More specifically, dynamic capabilities represent the firm's ability to "… integrate, build and re-configure internal and external competencies/capabilities to address rapidly changing environments" (Teece 1997, 510). Within the research literature, the concept of dynamic capabilities is linked to new product development processes (Helfat 1997). The most broadly accepted definition of dynamic capabilities comes from Eisenhardt and Martin (2000, 1107), "Dynamic capabilities are the antecedent organisational and strategic routines by which managers alter their resources base – acquire and shed resources, integrate them together and recombine them – to generate new value-creating strategies".

Identifying Dynamic Capabilities

As is the case with RBV, DCV also supports the view that the firm's resources and resource configurations are important. However, the types of resources that are of greatest value are more clearly defined in DCV. DCV regards resources as physical, human or organisational much like RBV. However, DCV supports the view that the assets which embody knowledge are the most important because they are difficult to imitate and not easy to acquire (Teece 2000).

The knowledge aspect of dynamic capabilities also relates to the idea that dynamic capabilities are "routines to learn routines" (Eisenhardt and Martin 2000, 1107). This definition of dynamic capabilities has been criticised as being recursive and tautological (e.g., Williamson 1999). However, other researchers contend that dynamic

capabilities themselves are identifiable and specific processes (Eisenhardt and Martin 2000; Helfat and Peteraf 2003; Teece et al. 1997).

For example, product development routines in which managers combine resources and integrate different functions of the organisation to produce revenue-creating opportunities are an example of an identifiable capability. In addition, transfer processes by which knowledge moves from one employee to another is an example of an identifiable capability that can follow a specific process. Eisenhardt and Martin (2000) argue that dynamic capabilities are not vague or tautological. They argue that dynamic capabilities often have extensive empirical research associated with them and that dynamic capabilities exhibit commonalities across firms.

Teece et al. (1997) have identified a number of dynamic capabilities. Examples include capabilities that *integrate resources* (e.g., product development routines), capabilities that *reconfigure resources* (e.g., resource allocation, replication, collaboration) and capabilities related to the *acquisition and release of resources* (e.g., knowledge-creation, alliance building and acquisitions, exit routines). Eisenhardt and Martin (2000) propose that these capabilities are not idiosyncratic or unique in each firm. They believe that there are certain commonalities or "best practices" for each process. However, there are multiple paths to the same dynamic capability. Different firms may have different capability development paths but successful firms often come up with very similar views of implementing common processes.

The identifiable characteristics of dynamic capabilities make them similar to the resources discussed in the RBV approach. As a result, by applying an RBV perspective, dynamic capabilities themselves are not the source of competitive advantage for the firm. Competitive advantage in high-velocity markets lies in using dynamic capabilities more effectively than the competition. Long-term competitive advantage lies in resource configurations that managers build using dynamic capabilities, not the capabilities themselves (Eisenhardt and Martin 2000).

While dynamic capabilities are commonly cited as a remedy to the development of core rigidities, more recent research suggest that there is risk in treating dynamic capabilities as a 'cure-all'. Schreyogg and Kliesch-Eberl (2007) present the view that the dynamic nature of dynamic capabilities presents the risk of dissolving the strength and

power of organisational capabilities. From an organisational perspective, this risk needs to be managed as firms seek to develop dynamic capabilities. From a research perspective, awareness of this risk is critical to ensuring that what are cited as dynamic capabilities are truly dynamic capabilities and not generalisations of tactical activities within the firm.

From an operational perspective, this research study will leverage a tool referred to as the CPX framework, originally introduced by Duhan et al. (2005). Other approaches exist for identifying organisational capabilities; however, the CPX framework is favoured for its robustness and structure. The framework provides a structured approach to defining capabilities in terms of their multiple dimensions (skills, knowledge, processes, differentiation etc.). The details of the elicitation process and specifics on how this study will apply the CPX framework are discussed in Chapter Four.

Dynamic Capabilities and Change

The dynamic capabilities of an organisation can behave differently depending on certain environmental factors. Eisenhardt and Martin (2000) argue that the behaviour and characteristics of dynamic capabilities within an organisation vary with market dynamism. When markets are moderately dynamic and change occurs incrementally in the context of a stable industry structure, dynamic capabilities resemble the traditional view of routines. In "high-velocity" markets when industry structure is less clearly defined and more fluid, dynamic capabilities take on a different character (Eisenhardt and Martin 2000). In this environment, dynamic capabilities are simple and unstable processes that rely on quickly created new knowledge and iterative execution to produce adaptive but unpredictable outcomes. Therefore, dynamic capabilities can behave in different ways at different times, depending on the state of market.

Extant literature also proposes that dynamic capabilities lead to firm development. Through the process of firm development, dynamic capabilities themselves change. The changing of dynamic capabilities over the course of time and integration of the firm's development is related to the concept of organisational learning. In the literature associated with organisational learning, dynamic capabilities can be defined as learned

and stable patterns of collective activity through which the organisation systemically generates and modifies its operating routines in pursuit of improved effectiveness (Zollo and Winter 2002). Thus, dynamic capabilities arise from learning, as they are part of the firm's systemic methods for modifying processes.

Capability Hierarchy

Winter (2003) presents an interesting perspective on dynamic capabilities in comparison to capabilities. Winter (2003) introduces the concept of capability hierarchy – a classification scheme for different types of capabilities. At the bottom of the hierarchy is concept of the "zero level" capability. To understand zero-level capabilities, consider a firm in an equilibrium state. The firm at equilibrium continues to conduct business by selling its products and services to the same customers in the same proportions over time. In this context, the capabilities the firm has and the capabilities the firm is using to conduct business are zero-level capabilities. Zero-level capabilities keep the firm operating in its current state; Winter (2003, 992) refers to these as the "how we are living now" capabilities. Hence, zero-level capabilities allow the firm to conduct its day-to-day business.

In contrast, Winter (2003) distinguishes a first-order dynamic capability as a capability that supports the creation of new markets, new products or new services. Based on this definition, dynamic capabilities support processes that are less routine than zero-level capabilities. First-order dynamic capabilities enable a firm to routinise the response to familiar types of change.

Within this logical framework, Winter (2003) also acknowledges that higher-order dynamic capabilities exist. Investments in organisational learning may facilitate the creation and modification of dynamic capabilities. That is, higher-order dynamic capabilities can lead to the development of lower-order dynamic capabilities. The concept of higher-order capabilities supports the view that regardless of the type of strength a firm develops, a competing firm can do better by developing strength in a different or related area. Moreover, the concept of high-order capabilities also indicates that firms can

internally acquire a base set of higher order dynamic capabilities that facilitate the development of other lower-order dynamic capabilities.

Winter also points out that in the case of high-order capabilities, firms need to determine the level of capability that will suit the organisation's needs because of the cost associated with investments in organisational learning. Capability hierarchy is a useful conceptual view of how capabilities in the firm related to dynamic capabilities. The following section presents an alternative view of dynamic capabilities within the firm.

Dynamic Capabilities as Routinised Processes

Kylaheiko et al. (2002) provide a view of the firm as large and growing knowledge repository. Capabilities in this context are processes or routines within a firm (Winter 2003). The set of technological or organisational capabilities within the firm are static routines or processes. Each routine or process embodies a certain subset of knowledge within the firm. The set of dynamic capabilities within the firm are dynamic routines (Winter 2003). Dynamic routines allow the firm to learn by learning and promote the dissemination of knowledge within the firm. Dynamic capabilities enable incremental change within the firm through learning and growing the knowledge base in the firm.

While this view of dynamic capabilities is accepted and dynamic capabilities are commonly referred to as routinised processes, Teece (2007) challenges this perspective on dynamic capabilities by identifying that certain actions involved in a dynamic capability cannot be routinised. Teece (2007) presents the view that organisations have behavioural competencies as well as knowledge/skill competencies. While knowledge and skill competencies can be used to sense market and technological opportunities, they are less effective in seizing opportunities. It is in these cases that behavioural competencies are required. Behaviour itself is not routinised; it is a function of judgment, passion, conviction, superior insight and leadership (Teece 2007).

Dynamic capabilities generate value when resources are re-configured to create "new combinations". Teece (2007) points out that this is where the entrepreneurial aspect

of management becomes paramount. The creation of the new combinations does not follow a routine; in fact, many times it is unclear how to configure resources to obtain value. The act of determining the new resource configurations requires a deep knowledge of the firm's internal capabilities. In addition, firms contain a number of tangible and intangible assets the latter are often not recognised or not obviously identified. In these cases, the dynamic capability cannot easily be routinised; it requires the concept of a behavioural competency. In these cases, to make the decisions, identify the resource combinations that exploit a dynamic capability, judgment, passion, conviction, superior insight and leadership are required (Teece 2007). Hence, the view that dynamic capabilities are a set of routinised processes does not always hold true because there are cases where behaviour is required to obtain value from a dynamic capability and the behaviour cannot be routinised.

This research focuses on understanding the contrast between firms in the software industry in terms of their capabilities. From a classification perspective, in the capability hierarchy (Winter 2003), the capabilities that distinguish product-oriented firms from service-oriented firms can take the form of zero-level capabilities or higher-order capabilities. Capabilities that distinguish between the two orientations can be dynamic in the sense that they allow the firm to generate new capabilities or static in the sense that they do not contribute to new capability development but provide the firm with a competitive advantage and differentiate it from its competitors. The capabilities elicited in this research span the hierarchy. The research focuses on identifying the capabilities that distinguish between the two orientations and the maturity of these capabilities, not on classification within a hierarchy.

Given the complexity associated with the capabilities and dynamic capabilities constructs, one of the natural questions that arise is: How did these capabilities develop? Do they merely appear, and, if so, how? Researchers have developed a framework to address these questions and provide a model for measuring the development of capabilities. This framework is used in this research to evaluate the maturity of capabilities within software firms.

2.2.4 The Capability Maturity Model

The Capability Maturity Model (CMM) is a maturity framework that allows organisations to gage and improve their capabilities (Paulk 1996). The original CMM developed by the Software Engineering Institute (SEI) at Carnegie Mellon University (CMU) focused exclusively on characterising the maturity of processes related to the process involved in software development, referred to as the Capability Maturity Model for Software (CMM-SW) (Paulk et al. 1991). The maturity model is based on the collective knowledge acquired from software process assessments and feedback from both industry and government.

The CMM itself describes five different levels of process maturity. For each level of maturity, the CMM provides a description of the characteristics the firm exhibits with respect to the capability. Since its original inception, the SEI at CMU has adapted the original CMM to make it generic and applicable to capabilities that are process- and people-focused, not just technology-focused (e.g., Curtis et al. 1995). The Capability Maturity Model for Software describes capabilities in terms of five different levels of maturity: Initial, Repeatable, Defined, Managed and Optimising. Table 3 describes the characteristics of each level CMM in the context of the software firm. This research study used the CMM to evaluate the degree to which capabilities exist within firms.

Table 3 – Capability Maturity Model for Software

Level	Name	Process Characteristics
1	Initial	The capability is characterised as ad hoc, and occasionally even chaotic. Few capabilities are defined, and success depends on individual effort and heroics.
2	Repeatable	Basic project management capabilities are established to track cost, schedule, and functionality. The necessary discipline is in place to repeat earlier successes on projects with similar applications.
3	Defined	The capabilities associated with management and engineering activities are documented, standardised, and integrated into a standard software process for the organisation. Projects use an approved, tailored version of the organisation's standard software process(es) for developing and maintaining software.
4	Managed	Detailed measures for capabilities and quality are collected. Both the capabilities and outputs are quantitatively understood and controlled.
5	Optimising	Continuous capability improvement is facilitated by quantitative feedback and from piloting innovative ideas and technologies.

The alternative to using a maturity model framework is to use a traditional Likert scale response coding in which the respondent indicates the degree to which he agrees or disagrees with statements. However, using a more standardised maturity model that provides consistent descriptions for what it means for a capability to be mature vs. immature reduced some of the subjectivity in the evaluation process and provided a consistent point of reference.

Figure 2 summarises how the theoretical constructs discussed thus far are used in this research study. Firms with service orientations and firms with product orientations are the focus of the research. The research focuses on identifying the capabilities that distinguish between product orientations and service orientations. In addition, the study explores the relationship between the orientations and respective capabilities. The following section of this chapter provides insight into how organisations change and evolve over the course of time. This discussion focuses on how orientations and underlying capabilities develop and evolve.

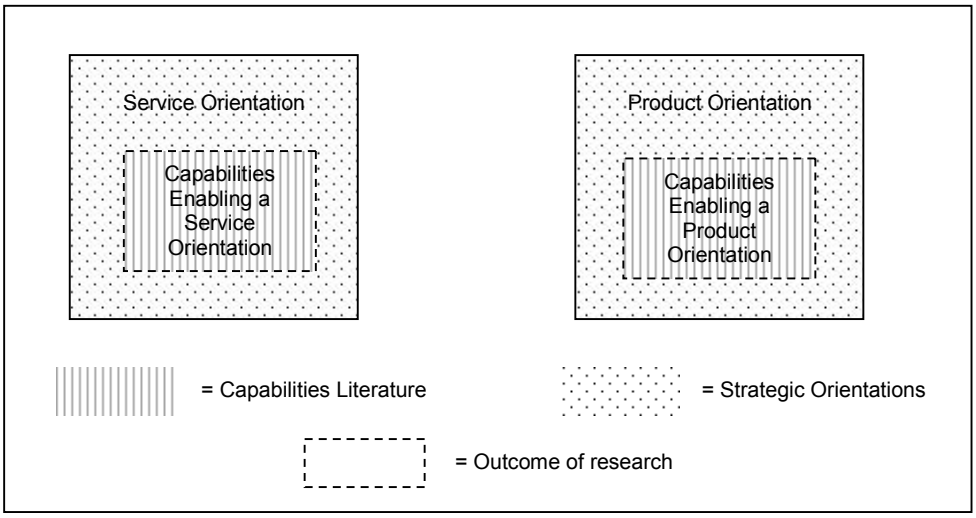

Figure 2 – Application of Strategic Orientation and Capabilities Literature

2.3 The Development of Organisations

This research focuses on identifying the capabilities that distinguished product-oriented firms from service-oriented firms. Addressing the specifics of how, why and the context under which strategic orientations change is outside of the scope of this research. These are related research questions that are not directly addressed by this research. However, understanding how and why organisations go through change, may aid in understanding the nature of product orientations and service orientations themselves. Specifically, organisational change and development could be a function of the specific capabilities that enable product orientation or service orientation. This section provides a brief overview of the different theories that explain the development of organisations. The perspective on organisational development is applied to the findings of this research.

One of the shortcomings in the literature focused on strategic orientations is that it depicts a firm's orientation as static. However, in reality, firms are consistently going through the process of building, strengthening or transitioning between strategic orientations. Specifically in the context of this research, software firms are undergoing constant change and often transitioning between product and service orientations (in both directions) or evolving the position of the organisation by maturing an existing orientation.

Expressing a firm's strategic orientation in terms of organisational capabilities addresses some of the shortcomings in the extant literature as it offers a perspective that is more dynamic. Capabilities themselves are often used to understand organisational change and evolution (e.g., Becker et al. 2005; Leonardi 2007). Since organisational capabilities embody the knowledge and processes within the firm, if the organisation is going to change over time these capabilities need to evolve as well (Winter 2000). Becker et al. (2005) contend that organisational capabilities reflect the firm's drivers for change and capture the pathway for change to occur. Thus, understanding how organisations change and develop over the course of time provides insight into how capabilities develop over the course of time. An understanding of how capabilities change contributes to an understanding of how to influence a firm's strategic orientation.

In the literature, there are several different theories to explain how organisations change and develop. These theories can be categorised into a general grouping based on common perspectives. Van de Ven and Poole (1995) introduced a classification framework that distinguishes between Life-cycle theories, teleological theories, dialectical theories and evolutionary theories. Each perspective takes a different approach to addressing the concept of organisational change and development. The subsequent sections discuss each of the four theories before concluding evolutionary theory is the most appropriate for modelling the change of organisations in the context of strategic orientations.

2.3.1 Lifecycle Theory

Lifecycle theory most closely resembles change in the form of organic growth. It operates on the premise that growth is the ultimate goal of the firm (Van de Ven and Poole 1995). In lifecycle theory, change and development in the positive direction are synonymous with growth. The pattern of event progression is linear and irreversible. There are predetermined development stages or states that make up a firm's unique lifecycle, and there is a linear sequence of prescribed and defined events that unfold guiding progression through the different stages of development. Each stage of development is a necessary precursor to subsequent stages.

Lifecycle theory is closely modelled after biological human development, a series of prescribed, linear, irreversible stages. Dooley and de Ven (1999) point out that a similar type of "genetic code" drives the development of an organisation. While this is not an intuitive connection, if one considers the development of an organisation as a function of acquiring skills then it makes sense that there certain physical or cognitive prerequisites to developing certain skills. The firm's genetic code then determines the firm's ability to acquire skills.

Van de Ven and Poole (1995) point out that lifecycle theory explains the development of an organisation in terms of institutional rules or programs that require developmental activities to progress in a prescribed sequence. This is the case in highly

regulated industries such as pharmaceuticals. Alternatively, there are also examples of more natural and unregulated sequences that lead to organisational development. A firm such as OpenText has not followed a prescribed sequence of steps to reach its current size and scale. Similarly, a firm such as CGI has not followed a prescribed set of linear steps to reach its current size. The notion of a prescribed sequence of irreversible steps does not model the actual change and development patterns of firms in the software industry.

2.3.2 Teleological Theory

Teleological theory is rooted in the belief that the development of an organisation proceeds towards a goal or an end state (Van de Ven and Poole 1995). Organisational development is an iterative process beginning with goal formulation, implementation, evaluation and goal modification. Goal modification reflects the adaptive nature of the firm whereby it has the ability to learn in the previous steps of the process and change future direction. Within teleological theory, development moves the firm towards its final state. Teleological theory is more creative and less restrictive than lifecycle theory. Unlike lifecycle theory, teleological theory does not propose a sequence of events that a company follows during development. As a result, the theory supports the view that there are a number of unique and equally effective paths to achieving a goal.

The less restrictive conditions of teleological theory make it applicable in a number of situations. However, the theory provides little insight into the details of how the firm works towards its desired goal. From an organisational perspective goal definition (e.g., achieve Fortune 100 status) is only the beginning. The details of how change is triggered and effectively retained are not explained by teleological theory.

2.3.3 Dialectical Theory

A third school of thought with respect to organisational development is *dialectical theory*, which centres on the concept of conflict. Dialectical theory assumes that organisations exist in a pluralistic world where colliding events, forces or contradictory

values compete for control (Van de Ven and Poole 1995). Opposition or conflict can exist internally or externally to the firm. Internally, the firm may have conflicting goals or multiple factions competing for priority and resources. Externally, conflict may result from the organisation engaging in competition with other firms or battling with regulatory bodies.

Development of the organisation as defined by dialectical theory results from modified control structures and changes in values and beliefs that result from conflict. In this model, development is an iterative process whereby conflict occurs, and through conflict there is synthesis. At this point incremental development has occurred and the process will begin to repeat as conflict begins. Thus, the theory proposes that conflict is a prerequisite for change and development in organisations.

From a practical perspective, the application of dialectical theory raises one significant question – is it possible for change or development to exist without conflict? The theory proposes that conflict is required to 'disrupt' the existing control structures and values. However, it is conceivable that there are situations where there is no disruptive conflict internally or externally but the organisation can still experience change or development. In the scenario of a relatively successful firm, organisational development can occur through the increasing revenues resulting from increased sale of existing products. In this example increased sales could be triggered by improved worker productivity or reduced input costs, neither of which is a significant source of conflict.

2.3.4 Evolutionary Theory

A fourth school of thought with respect to organisational development is *evolutionary theory*. The foundation of evolutionary theory is in Darwin's work, and the application of Darwin's theory of evolution to develop the concept of socio-cultural evolution. Socio-cultural evolution is the process of change and development in human societies that results from cumulative growth in their stores of cultural information. As cultural norms and behaviours become well defined and propagated, socio-cultural evolution takes place. Campbell (1969) wrote one of the first and most influential papers

applying Darwinian Theory to the evolution of human culture. Campbell provided logical arguments for why Darwin's theory of evolution was relevant to organisations. First, he presents the view that human cultural information is disseminated from person to person through teaching and imitation, much in the same way genes are transmitted from person to person through the course of reproduction. There are differences between cultural and human evolution, but Campbell's view is that the similarities between the two processes can be explained using Darwinian theory.

Campbell also argues that the processes of cultural and genetic evolution are linked. Cultural evolution is slightly different from genetic evolution in that individuals have some choice over the types of cultural views they adopt, whereas they have no choice in the types of genes they inherit. The link between culture and genes is seen in how culture is an important factor in the environments in which people live, and this generates selection pressures on genes.

The process of natural selection also dominated Campbell's view on cultural variation. He argued that natural selection is the key force in cultural evolution. A simple example to demonstrate this is that some people are prone to smoke. Assuming this habit is mainly cultural and not genetic, the higher rate of death among smokers will remove them from the pool of people who will be imitated by others. Therefore, selection on cultural variation is just as much a cause for evolution as selection on genetic variation. This example demonstrates Campbell's application of Darwinian Theory to explain socio-cultural evolution.

Organisational evolution can be thought of as a specialised example of socio-cultural evolution. The domain is concerned with change and development within the context of the organisation and specifically the rules and norms that govern the organisation. Similar to socio-cultural evolution, biological evolutionary concepts have been adapted to explain the origins and proliferation of new organisations

The evolutionary approach was first introduced by Alrich (1979), who credits much of the work by Campbell (1969) for serving as a foundation. Campbell (1969) first noticed that organisational evolution can be described through three generic processes - variation, selection and retention. Alrich (1979) built on Campbell's work by further

exploring how organisations generate variation, what factors determine selection of variations and how selected variations are retained.

Variation

Variation is the foundational process for evolution. Any departure from what is defined as routine or tradition is part of the variation process. Variations can be intentional or unintentional. Intentional variations result from actions taken by individuals in an organisation to change the current state of the firm, often to solve a problem or improve a situation. Unintentional variations however result more from accidents, chance or creativity. The higher the frequency of variation, regardless of type, the greater the opportunities are for change (Aldrich 1979).

Organisations that seek out intentional variation often initiate formal change initiatives, incent employees and invest in encouraging unfocused variation or creativity. Exploratory variation is often built into specific firm projects. In these types of projects, "intelligent failure" is encouraged as a method of constructive learning. Likewise, employees in firms are often encouraged to innovate and bring new ideas forward, linking ideation to compensation. In addition, employees are often moved from one group or organisational unit to another in an attempt to disseminate knowledge and break some of the routines. All of these are sources of intentional variation.

Unintentional variation is significantly more difficult to predict or generate. There are few known strategies for firms seeking to generate unintentional variation. Unintentional variation commonly results from trial and error activities, learning, luck, imitation, mistakes and passion (Kundera 1980). How can this be generated? The current view in the literature is that it cannot. Randomness, luck, passion etc. cannot be controlled – they just happen. However, an alternate view is that these events are a function of the firm's resources. If employees are motivated, passionate and learning opportunities exist, randomness is a function of individuals within the firm. Thus while unintentional variation cannot be controlled or generated the same way intentional variation can, it does depend on the type of resources that exist within the organisation.

Selection

The second process in the evolutionary approach is the concept of selection. Selection is the process that forces differentially selecting or selectively eliminating certain types of variations. Certain types of variation in specific types of organisations are more likely to acquire resources and gain support than others. The market, competition and the firm's structure determine the criteria by which these variations are selected.

Alrich (1979) classifies selection processes in two ways, *within organisation selection processes* and *organisation and population-level selection processes*. The former grouping characterises selection factors such as internal diffusion, imitation, and incentive systems within organisations. All of these processes influence the types of variation that will be retained. In contrast, the latter is concerned with the selection processes within the organisation's environment. This includes characteristics such as labour laws (minimum working age, unions etc.) and resource availability within the population.

Retention

The final stage in the process of organisational evolution is retention. This step refers to process in which positively selected variations are retained. Retention is the act of preserving, duplicating and reproducing selected variations. Retained variations are embodied by activities that are repeated in the future. Retention is the crucial stage that enables an organisation to build on previous learning.

Alrich (1979) reverts to the internal/external view of the organisation to categorise different types of retention. *Retention within organisations* is characterised by the documents, information management systems and procedures that organisations institute. *Organisation and population-level retention* refers to the organisation's ability to retain the collective pool of competencies and resources utilised by all firms in the

environment. Typically, these resources are considered human resources, however, technology and natural resources are also included in this group.

The processes of variation, selection and retention offer a balance between structure and flexibility, allowing evolutionary theory to be applied effectively. Unlike lifecycle theory, evolutionary theory views the firm as continually changing and does not prescribe a final state or sequence of linear steps to achieve this final state. This is an important characteristic to capture because it is conceivable that firms' progress towards building capabilities to support a given orientation, the pursuit could be unsuccessful resulting in a regression of strategic position. In addition, it is possible that the development of capabilities to support a desired orientation could result in out-weighing rigidities that regress the overall strategic orientation of the firm (Leonard-Barton 1992). Thus, the iterative and non-terminating characteristics of evolutionary theory make it applicable to the study of strategic orientations. In the context of this research, the evolutionary perspective is used to more effectively interpret the findings of the research and begin to propose future research in the area of firms transitioning across strategic orientations.

2.4 Summary

The extant literature represents multiple approaches for characterising organisational strategy (Morgan and Strong 1998). Over time the different perspectives have focused more on understanding the unique differences between different strategies. The narrative approach qualitatively describes the holistic nature of a strategy (Andrews 1971). The classificatory approaches define organisational strategies and use a categorisation approach to group like firms together based on strategy. The categories then define types of strategies (e.g., Miles and Snow 1978; Porter 1985). More recently, researchers have adopted the comparative approach and focused on identifying and measuring the key traits (dimensions) of a firm's strategy (Venkatraman 1989). Moreover, researchers who have employed this approach have indeed found that different types of strategic orientations are composed of unique dimensions, as is the case with Market

Orientation and Entrepreneurial Orientation (e.g., Lumpkin and Dess 1996; Jaworski and Kohli 1993).

This research focuses on understanding product and service orientations, two of the strategic orientations that have not received as much attention in the extant literature. However, researchers who have studied these orientations have identified unique characteristics with respect to these orientations (e.g., Roberts 1990; Voss and Voss 2000; Kaufman et al. 2002). Researchers contend that product orientations result from focusing on product efficiencies, cost minimisation, mass distribution, new product development and marketing processes (Kaufman et al. 2002; Voss and Voss 2000). In contrast, researchers have noted that service orientations result from organisational focus on policies, practices and procedures to support service excellence (Lytle et al. 1998; Lynn et al. 2000). The extant literature pertaining to product orientations and service orientations highlights key differences in the two strategic positions.

The capabilities literature is closely tied to the concept of an organisation's strategy; strategic orientation is a firm's position that supports a competitive advantage (e.g., Miles and Snow 1978; Lau et al. 2008; Luo et al. 2005; Zhou et al. 2005). In addition, organisational capabilities are the source of a firm's competitive advantage (e.g., Barney 2001; Dyer and Singh 1998; Hall 1998). This research applies the capabilities construct to operationalise the abstract concept of a firm's strategic orientation. Specifically, this research focuses on identifying the organisational capabilities that distinguish between product orientation and service orientation. The extant literature related to organisational strategy indicates that there are differences between the two orientations. Through the identification of the capabilities that enable product orientation and service orientation, this research tests the hypothesis that:

H1: Service orientations and product orientations are distinguished by different organisational capabilities.

The following chapter discusses the specifics of the software industry and provides insight into what the key differences may be between product-oriented and service-oriented software firms.

3.0 The Software Business

The software business is unlike many others. The cost of making a single copy of a software product vs. making a million copies of a software product is virtually the same (Cusumano 2004). Software investments can result in substantial productivity gains and strategic advantage. In addition, software is also a business with up to 99% gross profit margins for product sales (Reifer 2002). In the software business, productivity of the best employee and the worst employee can be up to a ten- or twenty-fold difference (Cusumano 2004). Unlike any other industry, 75% to 80% of product development projects are commonly late and over budget (Pressman 2004). Unlike other products (e.g., automobiles, consumer electronics), software products are often released with known defects. Software firms are able to release products that are less than perfect because there is a low cost associated with repairing products that are currently in use. In addition, because software products are licensed and not sold, there is little to no liability associated with releasing software with known defects (Kaner 1995). Erickson (2005, 92) points out that "The intangible value in software is higher than that of virtually any other type of product."

Software products also have unusually high switching costs across vendors. Once committed to a specific vendor's product, the high costs associated with switching vendors and products creates a lock-in effect (D'Costa 2003). From a customer point of view, software also has the ability to "lock in" to a particular vendor because of decisions made decades ago that not easily be reversed. Moreover the rapid change and short life-span of software makes it unique compared to other industries (e.g., Davidow, 1986; Grunenwald and Vernon, 1988; MacInnis and Heslop, 1990; Moriarty and Kosnik, 1989). Customers are also directly and indirectly impacted without necessarily realising it. Beyond typically considered desktop applications, software controls a range of items we rely on daily, including automobiles and power grids.

This chapter discusses the software business and provides context on the Canadian software industry. The chapter discusses the unique characteristics of the software industry and explores the differences between product-oriented and service-oriented software firms. The discussion in this chapter results in hypotheses regarding the

capabilities that characterise product orientations and service orientations. Specifically, it is proposed that service orientations are distinguished by capabilities that relate to people, customers and knowledge management. In contrast, product orientations are distinguished by capabilities that focus on technology, process, marketing and partnerships.

3.1 The Canadian Software Industry

This research focuses on firms in the Canadian software industry. A recent publication by Industry Canada reports on the composition of the Canadian Information Technology sector; the following data is sourced from the *Canadian ICT Sector Profile* published in 2009 available online at (http://www.ic.gc.ca/ict). Industry Canada reports that there are approximately 31,500 companies that comprise Canada's Information and Communications (ICT) sector. Industry Canada further sub-classifies the ICT industry into three sub-sectors: *ICT Services* (software, computer services and communications), *ICT Manufacturing* (hardware manufacturing) and *ICT Wholesaling* (equipment distribution, rental and leasing). Table 4 summarises the distribution of firms in the Canadian ICT industry. Note that this research is primarily concerned with the firms that comprise the largest sub-sector classification within the ICT Industry – the ICT Services sub-sector and the 78.6% of the firms in this sub-sector that focus on Software and Computer Services.

Table 4 – ICT Industry Composition in 2008

ICT Sub-Sector	**Percent of Industry**
ICT Services – Software and Computer Services	78.6
ICT Services – Communications Services	3.9
ICT Manufacturing	6.9
ICT Wholesaling	10.6

Source: Industry Canada, ICT Sector Profile (2009)

From a size perspective, with firm size measured by number of employees, the majority of firms in the sector are relatively small. In 2008, there were approximately 100

companies with more than 500 employees and 25,800 companies with fewer than 10 employees. These smaller firms accounted for 82% of the firms in the sector.

Overall, Canada's ICT Industry is experiencing growth from a revenue perspective and contributing significantly to Canadian GDP. Industry Canada reports that overall ICT sector revenues grew by 2.8% in 2008. Total revenues rose from C$130.8 billion to C$155.3 billion between 2002 and 2008. This represents a 19% overall increase in total revenues (average 2.9% annual growth). While overall growth has been positive, there has been a noticeable shift in the performance of the ICT sector at the sub-sector level. In general, at the overall ICT sector level, there has been a shift in revenue derived from ICT Manufacturing to ICT Services. Since 2002, revenues from manufacturing have declined by 7% and services review grew by 33.4%. Between 2002 and 2008, the IT Service sub-sector accounted for 81.7% of the growth in the total growth of the ICT industry. Put in context relative to the entire Canadian economy, in 2008 the ICT industry contributed C$59.2 billion to Canadian GDP (in 2002 constant dollars). This represented 4.8% of Canadian output in 2008, up from 4.2% in 2002. On average, annual growth in the ICT industry has been 4.7% since 2002 (almost twice as fast as the overall economy at 2.4%), and ICT firms have accounted for 8.9% of the Canadian GDP growth since 2002.

In addition to growth in the number of firms and overall revenues, the ICT industry in Canada is also a significant contributor to well-paying jobs. Employment in the ICT industry dropped in 2007 for the first time in five years but increased in 2008 by 2.8%. Over the period from 2002 to 2008, employment rose by 10.4% to the point where in 2008, 3.3% of all Canadian workers were employed by the ICT industry. Specifically highlighting the significance of software in the Canadian ICT industry, between 2002 and 2008, Industry Canada reports that the largest portion of the employment gains were attributed to software and computer services firms. Overall employment in these areas increased by 16.2%, while decreasing by 3.3% in ICT Manufacturing and modestly increasing by 2.9% in ICT Wholesaling between 2002 and 2008.

Perhaps one of the most distinguishing factors between growth in the ICT industry and others is that growth in employment in the ICT industry represents the growth of a highly educated workforce. In 2008, 42.1% of individuals working in the ICT

industry had a university degree compared to the national average of 23.9%. Specifically as it relates to this study, software and computer services firms within the overall ICT industry had the highest proportion of university-educated workers at 51%. The higher education levels can be attributed to the fact that the software industry is one of the fastest growing knowledge-intensive industries (Tsang 2005). Employees in the ICT industry are also compensated higher than the national average. The average salary in 2008 for a worker in the ICT industry was C$61,971, which is 47% higher than the economy-wide average of C$42,143. Once again, within the ICT industry firms in the IT Services sub-sector, specifically computer services and software focused firms stood out as their employees had the highest average salary at C$68,126.

The 2009 edition of the Branham300 survey also provides insight into the strength of the Canadian ICT industry. The report indicates:

- Total revenues for firms appearing on the Branham300 2009 edition are US$75.97 billion, an 18% increase from 2008.
- The top 25 Hardware and Infrastructure Companies experienced a 33% increase in revenue compared to the previous year with a total of US$35.88 billion.
- The top 25 Professional Service firms experienced a revenue increase of 5% reaching US$7.82 billion.
- The top 25 Software firms experienced a revenue decrease of 9% from the previous year with a total of US$3 billion.

It is important to note that the 9% decrease in overall revenues for the top 25 software firms is attributed to a significant change in the landscape between 2007 and 2008. Firms such as DataMirror, Workbrain, Cognos and Emergis were all acquired and were included in the 2008 edition of the Branham300 but could not be included in the 2009 edition (as they were acquired by firm's outside of Canada). These four firms combined for revenues of almost US$1.2 billion or 36% of the top 25 software company revenues in the 2008 edition of the Branham300.

Overall, the composition, size, strength and workforce of Canada's ICT industry make it ideal for the focus of this study. The industry as a whole is growing and contains a mixture of both software product firms and service firms; this mixture supports the identification of capabilities that characterise product and service orientations. There is rapid change within the industry through acquisitions and new entrants. Firms navigating this climate will be interested in the findings of this research, as they aid in building and strengthening their product or service orientations. Lastly, the industry has a highly educated workforce. These individuals will allow firms interested in applying the findings of this research to implement the changes necessary to build or strengthen capabilities in the requisite areas.

Beyond the execution of the research study, Canadian firms stand to benefit greatly from the findings of this research study. Canadian software firms seeking to build a strong product-orientation can use the findings of this study to understand specifically what capabilities support a strong product orientation. Strong product orientations can enable Canadian firms to compete more effectively with larger U.S. software firms that have more resources at their disposal. In addition, Canadian firms have the potential to benefit significantly by exporting software products to larger markets such as the U.S. and Europe. Similarly, Canadian firms seeking a service orientation can apply the findings of this research study to understand specifically which capabilities enable a service orientation. A service-orientation can help firms diversify revenue streams by complementing product offerings. This is particularly advantageous in difficult economic climates when capital is scarce and firms need to exploit other avenues to obtain R&D funding. Thus, for reasons of practicality, suitability and applicability, the Canadian software market is the focus of this research.

3.2 Software Products vs. Software Services

Product-oriented software firms operate in a different paradigm than service-oriented software firms. A product-oriented firm is committed and able to succeed in developing and selling new products (e.g., Microsoft). Thus, in firms with product

orientations the majority of revenue comes from product sales (Roberts 1990; Voss and Voss 2000). In contrast, a software firm with a service orientation is committed and able to succeed at providing software services (e.g., Accenture). In these firms, the majority of revenue generated by the firm is the result of sales from services. Hybrid firms obtain revenue from a mixture of both product and service sales.

From a theoretical perspective, a service orientation is a term to describe organisational policies, practices and procedures that support service excellence. In firms that offer primarily services, a service orientation contributes increases in profit, growth, customer satisfaction and loyalty (Lynn et al. 2000). In contrast, a product orientation is defined as an organisation's commitment to integration of innovation into the product development and marketing process (Voss and Voss 2000). Thus, each type of orientation focuses on effective development and delivery of the products or services that the firm offers.

Beyond the initial definition of the product and service orientation constructs, research in these two areas is in its infancy. There is little published with respect to product orientations and slightly more although still a sparse body of literature pertaining to service orientations (discussed in Chapter 2). Much of the work in the area of service orientations focuses on the food service and hospitality industries (e.g., Kelley 1992). Fang et al. (2008) examined the impact of transitioning to a service orientation on firm value in the context of manufacturing firms; concluding that above a certain threshold (20% – 30% of firm revenue) service offerings have positive impacts on firm value by complementing product sales. However, this research is the first to examine the concepts of product and service orientations in the context of software firms. Firms in the software industry fall into three categories, those that sell primarily products, those that sell primarily services and firms that sell both products and services. Depending on whether a firm sells products, services or both, there are a number of implications that follow.

Software firms with a product orientation generate the majority of their revenue from sales of packaged software. The software business is unique in that there is a large investment required to build a product (write the software), however, the marginal cost of producing an additional unit is negligible (making a copy of a CD). Even when compared to firms in other service-oriented industries, the software industry is one of few industries

in which the marginal cost of production is very low. Gross profit margins in the airline industry for example are approximately 5%, while gross margin in the software industry is about 90% (Coulombe 2000).

Product-oriented firms invest in research and development initially in an attempt to build a product and, once the product is available, the focus is on sales. Thus, the key to success for a product-oriented software firm is to build once and sell millions of copies of their software. Kaufman et al. (2002) point out successful firms realise the benefits of product orientation based on the belief that production efficiencies, cost minimisations and mass distribution can be used effectively to deliver goods and services to the consumer at attractive prices.

Service-oriented software firms, conversely, generate most of their revenue from the sale of services. Services typically take the form of building custom software, configuration, and support of existing software or implementation of packaged software solutions. In the world of software services, revenue is generated through providing service per hour for an agreed upon rate (e.g., C$180 per hour).

From a definition perspective, firms that sub-contract or outsource components of their processes can still be considered product-oriented, service-oriented or hybrid-oriented. The outsourcing or subcontracting activity does not influence the industry the firm is in but impacts the firm's operating model. That is, product, service and hybrid orientations can be realised through different configurations of resources and capabilities. Firms such as Oracle and Microsoft outsource and subcontract portions of their software development and are considered product-oriented. Firms such as Accenture and Computer Sciences Corporation sub-contract key roles and outsource portions of engagements and are considered service-oriented.

One of the benefits of a strong product orientation is the ability to take part in globalisation. It is easier to deliver packaged software to a global market in comparison to specialised software services. Product-oriented software firms are able to build their products such that they can be customised for specific markets (e.g., changing language and currency settings) without changing core functionality (i.e., no additional customisation). On the unique challenge facing product-oriented software firms, Koenig (2005, 115) indicates that "customers and prospects want solutions that meet 100 percent

of their needs, and because we sell across multiple customers, we have to generalise our product to try to create a situation where one size fits many." Thus, once a product is developed for a global market, the challenges are centred on mass appeal, global marketing and mass distribution. The marginal cost of entry into a new market is relatively low with respect to the core product offering.

In comparison, the service-oriented firm faces the challenge of offering customised services to each market that it wants to reach. Challenges for the service-oriented firm include consistent delivery in multiple markets. The need to have software professionals (developers, managers) dedicated to serving each market and physically present in each market increases costs and complexity associated with delivery. Service-oriented firms still have the challenge of marketing their brand in different markets. Thus, the marginal cost for service-oriented firms to enter new markets is much higher than in the case of product-oriented firms. In addition, service-oriented firms face the disadvantage of trying to sell services that are difficult to value prior to delivery. A customer does not know if the particular service is "worth" the cost until after the service has been delivered. Software products on the other hand, can be valued easier prior to purchase by evaluating the functionality provided by the software product against its cost.

A critical component to understanding the differences between product and service orientations is clarifying the differences between products and services. Products are commonly defined as tangible and stable outcomes of work tasks. Services on the other hand are more ambiguous to define. Moeller and Schneider (1986) adopt a simple yet comprehensive definition to distinguish between products and services:

- Service innovations are more easily copied by competitors.
- Services require simultaneous production and consumption.
- Services are more people oriented.
- Services are more intangible than products.

All of these characteristics of services can be applied to the software industry. Competitors more easily copy service innovations in software. Services in the software industry do require simultaneous production and consumption. Services in software are

typically more people oriented (people are more involved in delivery and receipt of services). Lastly, software delivered in the form of services is often more intangible than products. The actually software itself is intangible. However, in case of packaged software products, the CD on which the software is encoded is corporeal, as is licensing documentation, product documentation and support agreements. In the case of software services, there are typically fewer tangible components involved in delivery.

From a sales and marketing perspective, product-oriented firms vary significantly compared to service-oriented firms. Hoch et al. (2000, 106) observed that the primary marketing goal of a service-oriented software firm is to win the trust of clients. The act of hiring a service-oriented software firm is an act of trust. You cannot test drive the output of a service-oriented software firm until they are hired. For this reason the reputation of a services firm in the software industry is critical to customers (Hoch et al. 2000). As a result, once service-oriented firms gain clients, they focus on building their trust and deepening customer loyalty. In contrast to product-oriented software firms, the objective of marketing in service-oriented firms is not growth specifically but about finding the mix of revenue from the right customers. In product-oriented firms, on the other hand, Nies (2005, 35) describes the marketing emphasis as "narcissistic", highlighting the obsession with marketing of brands and products.

In terms of the scope of the marketing function, product-oriented firms rely more on traditional marketing (e.g., advertising and brand promotion) and partnerships with third parties to reach their customers. Sink (2006, 154) contends that "Marketing is not just telling the world about your product. Marketing is also deciding what product to build", highlighting that marketing for product-oriented firms begins in the product development stage. Cook (2005) points out that the most expensive part of a product is the distribution channel, highlighting its importance to a firm's strategy and business model. Product-oriented software firms such as Microsoft and IBM use third-party sales channels to push their products into the market. An example of this is the relationships these vendors have with hardware manufacturers. Nearly any PC purchased from a leading hardware manufacture comes pre-installed with software from multiple vendors. This is in contrast to service-oriented software firms. For example, Hoch et al. (2000, 175) report that, "When we asked several services firms about their advertising budgets,

several indicated they didn't understand the question. Nearly a third of the companies we talked to did not allocated a budget for advertising at all."

From a software engineering point of view, a number of basic differences between product-oriented and service-oriented firms can be observed. Product-oriented firms that produce software typically retain ownership of the software product and license its usage to customers (Allison, Dunn and Mann 2006). Because software is licensed and not sold, product companies also have limited liability with respect to product performance. As a result, they are able to release software with known defects into the market (Kaner 1995). Product-oriented firms also benefit from the fact that it is relatively easy for them to update and upgrade software that has already been released (e.g., service packs, patches), making it possible for them to release less-than-perfect versions of their products. In contrast, service-oriented firms often turn over ownership of software to their customers or, in some cases, never have ownership of the software. They are often held to strict performance requirements defined by their clients and, because of the customised or proprietary nature of the end product, they are unable to release updates or service packs after turning over the final product to the client.

The fact that software delivered by services firms is often custom-developed also results in significant differences between the two models. The custom nature of software delivered through a services model implies that service-oriented firms may contribute to greater opportunities for differentiation for customers by delivering something unique. Product-oriented firms, meanwhile, deliver relatively the same functionality to each customer. The custom nature of delivery from service-oriented firms also influences the role and use of patents between the two orientations (Allison, Dunn and Mann 2006). Product-oriented firms produce more patents than service-oriented firms and typically stand to benefit more from doing so. In a services-based model where the end output or asset needs to be created repeatedly and is typically customised for each client, patents are less useful on the end deliverable.

From an organisational perspective, employees of service-oriented software firms are often closer to the end-user than are the employees of product-oriented software firms. Through the process of delivering or providing a service, employees of a service-oriented firm interact with end-users. These interactions allow employees (and thus the

organisation) to learn more about the preferences of the end-user. Lynn et al. (2000) recognise this connection between employees and customers contending that service orientations exist when the organisational climate for service creates, nurtures and rewards service practices and behaviours known to meet customer needs. Product-oriented firms, on the other hand, are in most cases not as close to the end-user of their products. In these firms, employees in research and development functions can become alienated from the needs of customers.

Product-oriented firms also differ from service-oriented firms in the way that each takes into account customer preferences. Product-oriented firms consider larger markets and the many factors associated with them (demographics, demand etc.), while service-oriented firms focus on specific customers. Service-oriented industries provide differentiation to satisfy the large variety of consumer preferences and needs. Firms often use IT service providers to create software that will support differentiation from competitors or build new competencies. In some cases, IT service providers customise commercial software products to support the desired differentiation. One such example is in the mobile communications industry. Hardware manufacturers produce mobile phones in numerous shapes and sizes. Likewise, wireless software firms (e.g., Microsoft, RIM, Symbian etc.) produce software that runs on these devices. Communications service providers start with these products and then build and bundle services on top of the base hardware and software. The service options themselves can be customised (through bundled pricing, customisation etc.) without increasing costs significantly. Similarly, in the software industry, product-oriented firms offer standard products with minimal variety to support mass production. Service-oriented software firms often build on software products to enable additional differentiation. Thus, innovation possibilities are probably considerably greater for service-oriented firms vs. product-oriented firms. Table 5 summarises some of the key differences between products and services and in the software industry.

Many of the benefits associated with strong product orientations are financial. Average earnings per employee are higher in product-oriented software firms than in service-oriented software firms. Analysis of the data from the Branham Group 2009 edition survey indicates that the top five product-oriented firms had average revenue per

employee double that of the top five service-oriented firms. Despite the vast differences in economics, processes and outputs between service-oriented and product-oriented software firms, there is little research that focuses on identifying or understanding the implications of these differences. In the academic literature, researchers focus on related topics in software processes such as portfolio management and design quality improvement (e.g., Cooper et al. 1998; Mantyla 2004). These research streams are primarily concerned with product development processes, release management and other software development processes. Other bodies of literature focus on software definition and classification (e.g., Morisio and Torchiano 2002; Torchiano et al. 2002), software selection (e.g., Kontio 1996) and software assessment (e.g., Ochs et al. 2001; Nothhelfer 2001). This research focuses on the software business and better understanding the differences between product-oriented and service-oriented software firms. The inherent differences between software products and software services manifest themselves in various aspects of the organisation. Consider the case of two of Canada's most successful technology organisations, OpenText and CGI. The following comparison of two software firms highlights some of the key differences between firms with a service orientation and those with a product orientation.

Table 5 - Characteristics of Products and Services in the Software Industry

Products	**Services**
Created through a formalised product development process	Created through ad-hoc process as needs are identified
Appeal to mass market or niche segment of the market	Appeal to individual firms
Require minimal to no customisation	Customised to suit the needs of an individual firm
Do not require direct interaction with the customer to produce	Require a high degree of customer interaction and in some cases involvement to produce
Little to no marginal cost of production	Cost of production is relatively constant

3.3 A Comparison of Two Canadian Software Firms

OpenText is arguably Canada's most successful software company over the past decade. Data obtained from annual reports of OpenText indicate that the company is the world's largest independent provider of Enterprise Content Management (ECM) software. The company has experienced 24% revenue CAGR in the ten-year period between 2009

and 1999. Conducting business in 114 countries with over 50 million users, OpenText is an example of a software organisation with a strong product orientation.

CGI is Canada's largest IT services firm by revenue and number of employees. The company employs 26,000 IT professionals around the world in 107 different offices with clients in 19 countries around the world. CGI earns 100% of its C$3.83 billion dollars (2009) of revenue from IT services (managed services, consulting, and system integration). CGI is an example of a Canadian software firm with a strong service orientation. While both OpenText and CGI are both successful in the software industry, they conduct business in fundamentally different ways and offer different types of outputs to their clients. The following sections illustrate the inherent differences between the two organisations.

Sales

From a sales point of view, OpenText uses a reseller/distributor channel to get its packaged products to its customers. While the company has a direct channel, 25% of its total sales come from resellers and distributors. OpenText also relies heavily on an alliance program to generate leads that are converted into sales (more than 100 partners worldwide). The firm has alliances with consulting firms or system integrators who recommend and help integrate/implement their products. Alliances also exist with other technology companies who build their products to co-operate with the OpenText set of products. OpenText and other software product firms rely to varying degrees on partner service-oriented firms to sell their products in the market.

CGI and other IT Services firms have a less structured process for selling their services. Intuitively, one would think that the alliances with software product firms would benefit an IT Services firm like CGI just as the alliance benefits a firm like OpenText. However, these alliances are less effective for IT Services companies through the sales process. There are two primary reasons for this.

The first is that IT Services companies are limited in the number of product firms they can collaborate with. For CGI to collaborate with a software product firm, they must ensure that they have an adequate number of trained professionals available with an

expertise focused on the specific product. Thus, for CGI to collaborate with 100 different companies that provide the same type of software products, the firm would need to maintain a minimum number of resources that have skills with each of the 100 different products. This is not feasible. In the case of the software product company, collaborating with additional IT Services firms does not have such significant operational implications. Once a partner program is established (with associated training material, communication plans etc.) there is little difference between enrolling 10 or 100 firms in the program.

The second reason is that successful IT Services companies are product agnostic. They are not tied to a specific product line or vendor. Moreover, they are focused on a set of industries (e.g., Financial Services, Manufacturing) or technology solutions (e.g., Integration, Outsourcing). IT Services companies often have close relationships with the enterprise clients and are used as trusted advisors – organisations count on them to recommend solutions that are in the best interests of their company not based on an alliance with a software product. Thus, IT Services do not leverage alliances with software product firms as effectively as the product firms can. Examples of this product agnostic position exist in other services-based firms as well (e.g., Deloitte Consulting LLP, Accenture etc.).

Technology services are sold primarily based on relationships. Word of mouth and recommendations are far more powerful than any type of marketing or promotion. Edvardsson et al. (2008) point out that one of the most significant differences between product-oriented businesses and service-oriented businesses is establishing the relationship with the customer. Service-oriented businesses are much more relationship intensive than product-oriented businesses. This is because it is often difficult to prove the value of a service until after it has been delivered. For example, one can view a running product and evaluate how useful it would be in their organisation. Services, however, are different. The value of a service can only be determined once it has been delivered. Thus, there must be a certain level of trust that the service is of value and will lead to the anticipated benefits.

Fulfilment

Once the sale of either a product or service occurs, the focus shifts to fulfilment of the sale. In the case of a product, fulfilment is often referred to as implementation, and in the case of a service, fulfilment is often referred to as delivery. OpenText and other software-product firms consider fulfilment complete when the client receives the software (via download, CD or other media). However, as with most enterprise software there is a component of design, integration and deployment that is required for the software to form a usable solution (the implementation process). To complete this process, OpenText and other software product firms rely on system integrators. OpenText does maintain a small professional-services practice to provide subject matter expertise with respect to product usage, design and integration. However, because of their global customer base, IT Service partner organisations are relied upon to implement products. In addition, IT Services firms are also required to complete implementation because they have an understanding of the client's technology architecture or expertise with other products that will be used to create a complete solution. The use of OpenText's professional services resources is in addition to the purchase of the product and involves additional cost. For OpenText, fulfilment involves delivery of software, and this does not necessarily require human resources to deliver the purchased product.

For an IT Services firm like CGI, meanwhile, the fulfilment process is about delivering the purchased service. Delivery could mean participating in or leading an implementation; it could mean providing advisory services; it could mean providing staff augmentation, or it could mean customising a piece of software. The delivery process may result in many different outcomes (e.g., customisation of existing software, development of new custom software etc.) but will in all cases involve people resources. This is a key difference between software-product companies and IT Services companies. IT Services are more labour intensive with respect to the fulfilment process.

Maintenance/Support

From a maintenance and support perspective, OpenText and CGI differ with respect to their roles and responsibilities. OpenText supports their product through upgrades, patches, training material etc. They have an obligation to ensure that the product as licensed is performing as promised and to provide the enterprise customer with an upgrade program as new version of the product becomes available. OpenText doesn't handle daily maintenance and support (administration) of the OpenText product, once it has been implemented. Enterprise customers either build the capability to perform this support or administration in house, or they contract this work to IT Services firms.

For a firm such as CGI, upon delivery of a service, there may or may not be a maintenance or support component required. In the case of an advisory service, maintenance or support post service delivery is not required. However, in the case of a custom software development engagement support maybe required once the service is delivered. In such cases, CGI may be contracted to continue and provide on-going maintenance/support or the enterprise customer may chose to acquire and deploy resources internally to perform support. An important distinction between IT service firms and software-product firms is that software-product firms have a more clearly defined scope with respect to responsibility in support and maintenance. Their scope of responsibility is specific to the software product and ensuring the operation of the specific software. IT services firms, however, when contracted to provide maintenance or support can have a much broader scope. They are usually responsible for an entire solution that may involve multiple products integrated together, as well as proprietary applications. This has implications with respect to the types of skills and resources IT service organisations require in comparison to software product companies.

Through examining the high-level business process steps of sales, fulfilment and maintenance/support, it is clear that there are inherent differences between product-oriented and service-oriented firms. Table 6 summarises some of these differences. The high-level process steps are the same; all organisations engage in some type of sales activity, fulfil the sold goods/service and play some type of role in maintenance/support activities. However, how the processes are executed and the sub-processes that comprise

each of these higher-level process steps are different for product-oriented firms vs. service-oriented firms.

Table 6 – OpenText vs. CGI

Business Process	OpenText	CGI
Sales	• Reliance on alliance partners and IT Service firms • Direct sales as well as reseller and distributor channels	• Relationship based sales model • Focus on building client relationships • Balance product firm alliance with market demands and internal resource constraints.
Fulfilment	• Focus on delivering the packaged product • May play a Subject Matter Expert (SME) role implementation • Less labour intensive; may or may not involve human resources	• Service delivery varies based on type of engagement (e.g., advisory, outsourcing etc.) • Labour intensive
Maintenance/Support	• Clearly defined scope focused on the software product • Learning and knowledge are easily transferred across clients	• Scope of engagement is defined by service contract • Requires knowledge of the client's technology environment

3.4 Summary

The software business is unique from other industries. The marginal cost of production for software products is small (Cusumano 2004; Sink 2006). Profit margins for product sales can be up to 99% (Reifer 2002). The productivity between top performing employees and those that are not varies by 10 to 20 fold (Cusumano 2004). It is common in the software industry for projects to be late or over budget; 75% to 80% of projects suffer from delays or cost overruns (Pressman 2004). In addition, the software industry contains a mix of both successful product-oriented and service-oriented firms (e.g., OpenText, CGI).

The uniqueness of the software industry makes it of great interest to this research. However, the unique characteristics of the industry may limit the generalisability of the research findings, as they are likely to be unique to the industry. Despite the potential challenge with generalisability, this research focuses on the software industry as the setting for understanding the capabilities that distinguish between product-oriented and

service-oriented firms. The size and importance of the software industry make it of significant interest on its own. In addition, there is an emerging body of literature in the study of the software business (e.g., Hoch et al. 2000; Nies 2005, Cusumano 2008); the findings of this research contribute to this body of literature.

In addition to the uniqueness of the software industry as a whole, this chapter also discusses specific differences between product orientation and service orientation in the software industry. While there is insufficient literature to identify specific capabilities that characterise the two orientations, the specific differences and unique characteristics associated with each orientation shed light on the types of capabilities that may distinguish between the two orientations. These differences and characteristics lead to further development of the primary hypothesis by further hypothesising on the specific capabilities that distinguish between the orientations.

In the case of service orientations, Moeller and Schneider (1986) contend that by definition, services are more people-oriented. The service orientation literature is consistent in the view that service orientation results from policies, practices and procedures that support and reward employee service behaviour (Lynn et al. 2000; Lytle et al. 1998). Specifically in service-oriented software firms, employees are critical to the delivery of the service as in many cases they are what is being sold. Sink (2006, 116) also says that the focus should be on hiring people who care about customers. In the case of service-oriented firms, the sales process and revenue are a function of trust at the individual level between employees and customers (Hoch et al. 2000). From an output perspective, Nies (2005) points out that the customer has more control in software system specification in the case of software services relative to software products.

Empirical comparisons between firms such as OpenText and CGI highlight the relationship between people, customers and service orientation. Table 6 summarises some of the key differences between the two firms. From a people and customer perspective, the sales model for CGI is more people and customer intensive than is the case with OpenText. CGI's sales model is based on relationships between employees and customers. Similarly, down-stream fulfilment and support of services is directly tied to the quality, skills and number of employees available and their understanding of the customer's business/environment.

Based on the perspectives offered in the extant literature, it follows that capabilities that related to people (employees) and customers likely distinguish service-oriented firms. Specifically, the following two hypotheses follow:

H2: Service-oriented software firms are characterised by people intensive capabilities.

H3: Service-oriented software firms are characterised by customer intensive capabilities.

In the case of product orientations, the extant literature contends that the benefits of this orientation are reached through focus on production efficiencies, cost minimisation, mass distribution, new product development and marketing processes (Kaufman et al. 2002; Voss and Voss 2000). Specifically within the software industry the efficiency of production and cost of development/delivery is a function of technology capabilities and maturity of development processes. On the production side, product-oriented firms have the objective of building a product once and distributing it to multiple customers with few to no changes. Inherently, this is technically more challenging than the case of service-oriented firms, where the solution needs to be built once. The solutions developed by product-oriented software firms must be technically resilient to security attacks in unknown situations, operate on multiple types of hardware, integrate with other (at times unknown) software and scale to meet the needs of the most customers. Moreover, the architecture and design of the software needs to be compatible with future releases and accept patches, technical considerations that are rarely the case in the services model. Top CEOs in the industry also indicate that staying ahead of the technology curve is critical in the success of product-oriented firms in the software industry (Nies 2005; Cook 2005; Lippman 2005). In product-oriented software organisations, the firm is responsible for the technical specification and architecture of the solution, whereas service-oriented firms can leverage customer capabilities to supplement their own capabilities. Thus, from a capabilities perspective, product-oriented software firms are likely distinguished by capabilities in the area of technology. The

greater the technical capability, the more effective the product-oriented software firm is at efficient production and minimising cost overruns. The hypothesis that follows is:

H4: Product-oriented software firms are characterised by technology intensive capabilities.

The differences in how product-oriented and service-oriented firms approach and use the marketing function also highlight distinguishing capabilities. Marketing is critical to the success of product-oriented software firms, from the new product development process to distribution (Sink 2006; Hoch et. al. 2000; Nies 2005), because their objective is to sell as many copies of a product as possible. Hoch et al. (2000, 122) point out that "While software is a technical business, the fate of software product companies – be it mass market product or enterprise solution firms – largely depends on marketing." Product-oriented software firms use marketing and third parties as a critical part of their go-to-market strategy for reaching their customers (Cook 2005; Hoch et al. 2000). Services-oriented firms however, do not use marketing and partnerships to the same extent. They often have significantly less (if any) budget allocated for marketing and rely more on their relationships to build revenue streams (Hoch et al. 2000). This leads to the hypothesis that marketing and partnership capabilities distinguish product-oriented software firms from service-oriented software firms. Specifically:

H5: Product-oriented software firms are characterised by marketing and partnership intensive capabilities.

The hypotheses developed in this chapter are examined in detail through the analysis in Chapter 5 and the discussion that follows in Chapter 6. Chapter 4 discusses the details of the research method including the interview process, study population, survey instrument and sample demographics. Chapter 4 concludes with a discussion of potential sources of bias and is followed by the analysis of the data.

4.0 Research Method

4.1 Introduction

This research was executed in two phases. Phase one was qualitative and focused on eliciting the capabilities that characterise product orientations and service orientations. A key informant interviewing approach was used to elicit capabilities from industry experts. Phase two of the research was quantitative. The second phase focused on validating the capabilities elicited in the first phase. A survey instrument was used to gather data and measure the maturity of capabilities. This chapter describes the methods associated with the research in detail.

4.2 Unit of Analysis

The unit of analysis in this study was Canadian software firms. From a practical perspective, Canadian software firms were more accessible given their geographic proximity and the personal network of the researcher. In addition to practicality, the Canadian software industry also contains a mix of product-oriented and service-oriented firms. Firms such as OpenText and Corel represent firms with a strong product orientation. Firms such as CGI represent organisations with a strong service orientation. Moreover, the software market also contains a number of software firms, such as Redknee, that are not clearly product-oriented or service-oriented but are a hybrid of the two orientations. As reported in the 2008 version of the Branham Group Study, Redknee earned 60% of revenue from product and 40% of revenue from services. The composition of the Canadian software industry made it an ideal study population for this research.

With the large number of multi-national software firms operating in Canada, it is important to clarify the definition of a Canadian software firm. The Branham Group's definition of a Canadian software organisation is one that meets the following criteria:

1. The company was founded in Canada and their headquarters remain in Canada.
2. Over 50% of their employees are located in Canada.
3. Corporate direction is determined in Canada.
4. Over 50% of their R&D activities conducted in Canada.

The definition set forth by the Branham Group sufficiently excludes organisations such as Microsoft and Oracle, whose Canadian operations are primarily sales offices with little strategic influence or responsibility for R&D activity. In addition, organisations such as Microsoft and Oracle have their strategic directions set by their U.S. headquarters. Thus, this research study adopted the Branham definition of a Canadian software organisation to filter out such organisations.

4.3 Phase One – Capability Elicitation

4.3.1 Introduction

The objective of the first phase of this study was to elicit capabilities that characterise product-oriented and service-oriented firms. Strauss and Corbin (1990, 17) define qualitative research as "any kind of research that produces findings not arrived at by means of statistical procedures". Based on this definition, the capability elicitation process was qualitative in nature. Among researchers, there is some debate about the validity or value of qualitative research. Quantitative research is often deemed as more "scientific" and thus more valuable. This study used a qualitative approach for the first phase of the study because it was the most appropriate in eliciting capabilities.

4.3.2 The Qualitative Approach

Quantitative researchers seek causal determination, prediction and generalisation of findings; in contrast, qualitative researchers instead seek illumination, understanding, and extrapolation to similar situations (Hoepfl 1997). Given that these two goals are different, the two different types of research may yield different results. Moreover, there are different factors taken into consideration in the different research paradigms. Cronbach (1988) points out that statistical (quantitative) research is not able to take into consideration the interaction effects that take place in social settings. In contrast, qualitative inquiry accepts the complex and dynamic quality of the social world. This is a key observation since capabilities themselves are a function of the social world within the organisations in which they are formed (Hoepfl 1997).

Other researchers have embraced both quantitative and qualitative research approaches. Patton (2002) advocates that the two types of research result in a paradigm of choices to support methodological appropriateness as the primary criterion for judging methodological quality. Qualitative research is an appropriate research paradigm in situations in which the researcher would like to understand any little-known phenomenon (Strauss and Corbin 1990). In addition, Strauss and Corbin (1990) contend that qualitative research is appropriate in situations in which the researcher is interested in gaining new perspectives on things that are known, or to gain more in-depth information that may be difficult to convey quantitatively.

Hoepfl (1997) also points out that qualitative methods are appropriate in situations in which the researcher first needs to identify the variables that will later be tested quantitatively or where the researcher has determined that quantitative measures cannot adequately describe or interpret a situation. This research followed this model. The first phase focused on identifying capabilities and the second phase applied quantitative techniques focusing on measuring and validating the capabilities from the first phase. Researchers have said that both qualitative and quantitative research approaches can be combined effectively in the same research study (e.g., Jick 1979; Strauss and Corbin 1990; Patton 2002; Russek and Weinberg 1993). Jick (1979) points out that the triangulation of methods allows examination of the same phenomenon from

multiple perspectives and allows the weakness in one method to be compensated for by the strengths in another. Russek and Weinberg (1993) contend that both quantitative and qualitative techniques produce data and insights that neither type of analysis provides alone. This study was designed and executed using both qualitative and quantitative approaches for similar reasons. Neither type of analysis alone could have adequately addressed the research problem.

From an empirical perspective, very few research studies have attempted to elicit organisational capabilities. There is research in the domain of human resources that focuses on eliciting job capabilities at the level of the individual (e.g., Bank 1988; Wei and Salvendy 2003; Wei and Salvendy 2004), but no significant research has elicited capabilities at the organisational level. The capabilities literature focuses heavily on defining organisational capabilities, competencies, and dynamic capabilities, but there is very little that looks at these constructs from an empirical perspective. This study is one of the first to apply the theory behind these constructs in an empirical study. By eliciting capabilities associated with product and service orientations, this research also qualifies as an attempt to better understand a phenomenon about which little is known, thus making the first phase of the research a suitable candidate for a qualitative research approach.

4.3.3 Interview Process

In the first phase of the research, 15 interviews were conducted with industry experts. The interviews focused on eliciting the capabilities that characterise product and service orientations and utilised open-ended questions to elicit capabilities from the interviewees. The conclusion of the first phase of the research resulted in a list of 25 capabilities characteristic of firms with either product orientations or service orientations. The following sections discuss the details of the interviewing process.

Interview Candidates

As suggested by Perry (1998), interview candidates were identified using a purposeful sampling approach rather than a random sampling approach. A purposeful sampling ensured that the researcher had the opportunity to evaluate each interview candidate for suitability as well as the requisite knowledge and experience. Experience in the software industry and experience with firms that have product or service orientations were the two most significant factors considered in identifying interview candidates. The focus was on trying to recruit individuals with greater than five years of experience in the software industry. In addition to tenure in the industry, consideration was also given to the roles individuals have held and the perspective they would be able to offer.

The primary source for identifying potential interview candidates was the professional network of the researcher executing this study. This network included contacts within previous employers, partner firms and clients. Table 7 describes the final set of interviewees. As an initial target, the goal for the first phase of the research was to conduct 10 interviews and then determine if further interviews were required. In the end, 15 interviews were completed. Seidman (1991) points out that qualitative research does not have strict guidelines to follow with respect to when the data collection process should end. However, criteria that are typically considered are exhaustion of resources, emergence of regularities and overextension or increasing scope beyond the initial intent of the research study (Guba 1978). Perry (1998) also indicates that in case-study research there is no ideal number of cases but concludes that between 12 and 15 cases appears to be an accepted maximum among researchers. More recently, Guest et al. (2006, 76) suggest that a "magic number" of six interviews is recommended as a minimum and 12 as the upper bound. They indicate the range between six and 12 as the point where returns begin to diminish in terms of new information, resulting in data saturation. In the case of this study, the interviewing concluded when no new information resulted from additional interviews.

Table 7 – Interviewee Demographics

Interviewee	Years of Industry Experience	Profile
1	12	Senior Manager in a large professional services firm
2	9	Owner/CEO of mid-sized software development firm
3	10	Independent technology consultant
4	20	Senior Manager in a consulting firm focusing on Insurance industry software
5	11	Manager in a software firm focusing on building enterprise security software
6	15	Senior Manager in a large professional services firm.
7	19	Director of the software development group within a large financial services firm.
8	12	Manager in a large software firm providing consulting, outsourcing and offering software products.
9	25	Vice-President of mid-sized software firm providing products and services
10	30	Partner in a large professional services firm.
11	20	Director of Product Management in a large wireless software firm.
12	24	Vice-President of Software Development in a large software firm.
13	19	Associate Partner in a large professional services firm
14	33	Regional Managing Partner in a large professional services firm
15	22	Senior Vice-President in the Application Development arm of a large Canadian bank.

Interview Taping

A key issue in data collection was the question of recording the interview. Specifically a decision was required on whether or not to use a recording device in the interview to support capturing information. Qualitative researchers are divided on whether this is an effective practice. Hoepfl (1997) contends that use of an electronic device for recording vs. pen and paper notes is a matter of preference. Patton (2002) indicates that a tape recorder is an indispensable aid. An advantage of using a recording device is that it may allow the interviewer to focus on the interview instead of taking notes. However, Lincoln and Guba (1985) do not support the use of recording devices because of the intrusiveness and the possibility of technical failure.

This research made use of a recording device to capture the discussion in interviews. All of the interviewees were asked for permission in advance to record interviews. None of the interviewees expressed reservation in recording interviews.

Interview Structure

By definition, qualitative interviewing involves the use of open-ended questions that can vary based on the situation (Seidman 1991). Patton (2002) contends that qualitative interviews fall into three categories: informal or conversational, semi-structured and standardised open-ended interviews. Conversational interviews are rarely consistent across interviews. Standardised interviews involve asking the same questions in each interview with no variation. Between these two extremes is the semi-structured interview that involves a base set of questions for inclusion in each interview, with additional questions that can be used depending on the responses and discussion.

This research employed a semi-structured interview approach. The semi-structured approach allowed the researcher to probe further into areas based on the interviewee's responses to a standard set of questions. The semi-structured approach also allowed the researcher to ask questions specific to the interviewee's prior experiences in the software industry. The approach was necessary for eliciting capabilities because capabilities are a sufficiently abstract concept that interviewees would have had difficulty identifying capabilities without a model for focusing their thoughts.

Interview Aids

To support the execution of the interviews, three interview aides were used in all of the interviews. Each interview aide assisted with either framing the discussion or data collection. An interview guide was used to prompt the interviewer with questions and ensure all question areas were covered. Deloitte Consulting's IndustryPrint was used to facilitate elicitation of capabilities. Lastly, the CPX framework (Duhan et al. 2005) aided in structuring the representation of capabilities.

The interview guide was structured as a list of questions or topics that the researcher covered in each interview. It was prepared ahead of time and used to ensure a degree of consistency across interviews with respect to questions and discussion topics. The use of an interview guide (also referred to as an interview schedule) is a common

practice in qualitative interviewing. Typically, it is used to make the interview process more systematic, comprehensive and helps to keep interactions focused (Lofland and Lofland 1995). A copy of the interview guide is in Appendix A.

Deloitte Consulting's IndustryPrint is a process model that describes the different process/functions executed in organisations. The tool contains industry-specific process models (e.g., technology, telecommunications, financial services etc.) that capture the nuances and differences in organisational processes by industry (e.g., banks have different processes than manufacturing firms). A version of IndustryPrint specific to software firms was taken into each interview. The IndustryPrint model assisted in focusing the discussion on organisational capabilities. The model was presented to the interviewee to prompt thought and discussion related to each of the key processes areas the interviewee deemed critical to software firms.

The process model begins with 'level 0' processes (e.g., New product/service development, Sales, Fulfilment etc.) and provides a description of sub-processes that are described as 'level 1', 'level 2' and 'level 3'. Use of the IndustryPrint process model guided interviewees to ensure that all process areas and functions received consideration, avoiding a potential bias in favouring of processes and functions to which the interviewee may be more familiar or that happen to be top-of-mind. A proprietary industry model was used, as it was more comprehensive than anything available in published literature.

In addition to the IndustryPrint tool, capabilities themselves were captured using the CPX framework as described by Duhan et al. (2005). The CPX framework is a tool for capturing the multi-dimensional aspect of an organisational capability. This tool was not given to the interviewee or referenced in the interview directly. However, the researcher used its structure to guide the discussion in the interview and guide data collection. The interview was structured to obtain details related to all of the dimensions of a capability that are identified in the CPX framework. The tool was used after interviews to rationalise and organise the data obtained from the interviews. Table 8 depicts the CPX framework.

The CPX framework helped to distinguish between capabilities, competencies and routine skills that are not true capabilities. The CPX framework ensured the identification of true capabilities (instead of statements of trivial ability) by validating that the

capabilities indeed have some influence on the customer or suppliers and are deployed within the business (utilised to generate value and not just possessed). In addition, Day (1994) points out capabilities provide organisations with a competitive advantage in their target markets. Eisenhardt and Martin (2000) indicate that capabilities differentiate firms from their competitors. The CPX framework includes both of these characteristics as evaluation criteria to ensure that the researcher elicited true capabilities.

Table 8 – The CPX Framework

Capability:	Identifier and summary of essential skills
Competencies:	Key skills, technology and knowledge that are at the heart of this capability
Processes:	How competencies are deployed, organised, coordinated and embodied in the business
External:	How this capability connects with customers and/or suppliers
Evaluation: How does this capability differentiate from your competitors? How does this capability give competitive advantage in the target market?	

An alternative approach to use of the CPX framework is the capability audit approach presented by Ulrich and Smallwood (2004). The approach is intended to capture a high-level picture of an organisation's position in terms of capabilities. The challenge, however, with this model is that the researcher must predetermine the capabilities that the firm is evaluated against. In addition, the capability audit approach does not provide a structure for defining exactly what a capability is and how it is composed. The CPX framework is suitable for this research because of the structure that it provides for capturing the components of a capability and questions to evaluate the difference between a capability and routine activities.

4.3.4 Interview Results

The objective of the interviews was to identify a candidate list of capabilities that characterise product-oriented and service-oriented firms in the software industry. The raw output of the interviews consisted of a combination of electronic recordings and written

notes for each interview. This data was analysed and synthesised into a list of 25 capabilities.

Glaser and Strauss (1968) describe the primary goal of qualitative research as the generation of theory rather than theory testing. Based on this view, theory is not a final product or outcome but more an evolving entity or process. As a result, the qualitative analysis does not result in a definitive position but in the case of this research, a theory with respect to the capabilities that characterise product and service orientations. Bogdan and Biklen (2003, 145) argue that qualitative analysis involves "working with data, organising it, breaking it into manageable units, synthesising it, searching for patterns, discovering what is important and what is to be learned and deciding what you will tell others". There is also consensus among researchers that qualitative research requires more creativity that quantitative research (e.g., Hoepfl 1997; Patton 2002). Data needs to be examined in terms of meaningful categories in a holistic fashion.

Strauss and Corbin (1990) propose that qualitative analysis begins by identifying the themes that emerge from raw data also referred to as "open coding". During open coding, researchers identify and tentatively name the conceptual categories into which the phenomena observed will be grouped, the goal being to create descriptive, multi-dimensional categories which form a preliminary framework for analysis (Patton 2002). In the context of this study, the CPX framework is the preliminary framework for analysis. The framework is structured such that it captures the multiple dimensions associated with a capability and gives structure to what would otherwise be unstructured qualitative data.

Multiple analysis techniques were considered for examining the results of the interviews. Software tools are available to support analysis of interview output. One of the challenges with these tools is that they analyse portions of the interview based on key words, patterns and frequencies. The challenge in this case is that the software focuses more on specific words or phrases and less on the overall meaning of the words and phrases in their context. In addition, many of the software tools make associations based on frequencies of words across interviews. The qualitative stage of this research focused on identifying the universe of capabilities that *may* exist within product-oriented or service-oriented firms. Thus, irrespective of the fact that a capability may have been

referenced once vs. multiple times, it was included in the set of potential capabilities. Moreover, different expressions, words, phrases were used across interviews to reference the same capability. Thus, the decision was made to manually analyse the data resulting from the interviews following an approach referred to as *meaning condensation*.

Kvale (1996, 193) describes meaning condensation as an "abridgment of the meanings express by interviewees into shorter formulations." Meaning condensation provides an approach for analysing qualitative data without transforming the data into quantitative expressions. The approach centres on the concept of taking the subject's answers or the "Natural Units" and summarising them into "Central Themes". While other approaches that focus on coding and quantifying occurrences of key words do not allow the researcher to evaluate the context of a statement or expression, meaning condensation provides this flexibility. The approach was best suited for analysing the resulting interview data because it facilitated filtering of common themes across interviews and provided a summarised form of interview results that developed the survey in the second phase of the research.

Application of the meaning condensation approach involves five steps as outlined by Kvale (1996, 194). The first step involves reviewing the entire interview to understand the interview and its context. The next step involves identifying the natural "meaning units" as expressed by subjects; these are determined by the researcher. The third step involves the identification of the common theme that dominates each natural meaning units. The fourth step focuses on interrogating the meaning units in terms of the specific purposes of the study. The final step involves summarising the overall themes of the interview in a descriptive statement.

In this study, there were two outputs resulting from the interviews. The capabilities that interviewees identified were coded into the CPX framework. The second output was perspectives on transition across orientations. The perspectives resulted from the responses provided when respondents were asked for their opinions on strategies for transition across orientation and factors impeding transition across orientations.

The meaning condensation approach was used to take the interview output and code capabilities into the CPX framework. The results of this coding are in Appendix A. The meaning units were the capabilities identified through the interviews. The theme and

context surrounding each meaning unit (capability) aligned to the competency, process and external fields in the CPX framework. The interrogation process involved review of the evaluation criteria in the CPX framework to validate that the items captured were indeed capabilities. The interrogation process continued with multiple reviews of the candidate list of capabilities coded into the CPX framework to ensure that duplication and overlap of capabilities were addressed. A summarised list of the capabilities elicited is in Table 9, the full version of the capabilities coded into the CPX framework is in Appendix A.

Table 9 – Capabilities Resulting from Interviews

Capability
After Sales Support
Relationship Building
Research and Development
Organisational Learning
Market Anticipation
Cross-functional Communication
Knowledge and IP Management
Resource Management
Recruiting Effectiveness
Customer Relationship Management
New Product/Service Development
Competitive Intelligence
Investment in People
Technically Proficient Management
Contact Negotiation
Market Breadth
Market Depth
Customer Education
Customer Expectation Management
Lead Customer Network
Partner/Vendor Management
Quality Assurance
Firm Brand Management
Demand Forecasting and Management
Solution Design and Architecture
Demand Forecasting and Management
Solution Design and Architecture

The second type of output from the interviews was a list of transition strategies and impediments. Interviewees were asked for their perspectives on the most effective strategies firms can employ for transitioning from one orientation to another. They were also asked for their perspectives on potential impediments to the success of a transition

strategy. While the question of transitioning across orientations is not directly within the scope of this research, the data resulting from the interviews begin to shed light on this subject and serve as a foundation for future research. The transition strategies and impediments were extracted from the interviews using the meaning condensation. The resulting transition strategies and impediments are in Table 10.

Table 10 – Transition Strategies and Impediments

	Description
Transition Strategies	Acquisition of another firm
	Organic growth
	Internal change in structure or processes
Impediments	Skills of people in the firm
	Existing processes within the firm
	Existing perception of the firm

4.3.5 Reliability and Validity

Triangulation is one of the key methodological concepts used in this research. Patton (2002) points out that triangulation can strengthen research by combining methods, data and qualitative and qualitative approaches. Triangulation itself is a strategy for improving the validity and reliability of research. This study applied triangulation in two ways to improve overall reliability and validity. Data triangulation occurred through use of multiple individuals in the interviewing stage. Methodological triangulation occurred as both qualitative and quantitative approaches were used to elicit and validate data.

Researchers have debated the applicability of the concepts of reliability and validity in qualitative research. Stenbacka (2001) contends that the concept of reliability is misunderstood in qualitative research because the purposes of qualitative research and quantitative research are different – quantitative studies focus on reliability in the context of *explaining* while quantitative studies focus on reliability in the context of *generating understanding*. The argument follows that a discussion of reliability in the context of a qualitative study results in the conclusion that the study is 'no good'. However, other researchers (Patton 2002; Lincoln and Guba 1985) contend that a discussion of reliability

is crucial to convincing the audience of the quality of the study and ultimately the findings. A key point is that reliability and validity need to be considered in the context of the research paradigm. For qualitative research approaches, researchers agree that the focus should be on *dependability* with respect to the process and *consistency* with respect to data and results (e.g., Lincoln and Guba 1985; Hoepfl 1997).

Reliability and validity in the context of the first phase of this study can be discussed in terms of the dependability of the interview process and the consistency of the resulting data. Specifically in reference to the first phase of this research, the following tactics employed in the process contributed to overall dependability:

- Interview guide,
- Multiple interviewees,
- Interview taping,
- CPX framework.

The interview guide contributed to establishing a degree of consistency across the interviews and ensured common coverage of subject areas across all interviews. The use of multiple interviewees introduced triangulation and contributed to completeness by ensuring elicitation of all possible capabilities within the first phase of the research. Taping of interviews contributed to overall dependability, preventing the potential loss of data and providing an accurate reference for recalling interview facts. Overall consistency was introduced in the data capture/analysis process through use of the CPX framework. The combination of all of these tactics ensured a sufficient degree of dependability in the interview process and consistency in the resulting data.

In addition to the four tactics related to the procedures and operations of the study, the interviews were conducted in multiple locations with multiple individuals at different times and produced similar responses. In fact, the interview process was terminated because later interviews failed to produce new or different information from previous interviews. Thus, one can be confident that the results of the interviewing process can be reproduced reliably and the resulting data would be consistent with the data produced through this study.

4.3.6 Limitations

As with other forms of qualitative research, there are potential limitations to the use of interviewing. Lack of rigor around the interview process, biases, data completeness and potential for generalisation are all potential limitations to qualitative research approaches and interviewing. This research incorporated measures to mitigate the risks associated with these limitations.

With respect to procedural rigor, as discussed in the section on reliability and validity, a number of tactical considerations were made as part of the interview process to ensure sufficient consistency and dependability. Use of an interview guide, multiple interviewees, interview taping and a standard framework for data capture/analysis all contributed to additional rigor through the interview process.

The issue of both researcher and participant bias is also relevant in research interviews. In this case, a standardised interview guide mitigated the risk of researcher bias. In terms of the specific data obtained in the study, the researcher had prior experience with both product-oriented and service-oriented firms in the software industry. Thus, knowledgeable follow-up questions and conversation were possible from both perspectives in interviews.

Courtesy bias refers to participants behaving in ways they believe correspond to what the researcher wants to hear (Hines 1993). In this study, the risk of courtesy bias was mitigated by using multiple interviewees with varied experiences across product-oriented and service-oriented firms. In all interviews, the researcher had a prior relationship with each interviewee or was referred to the interviewee through someone with a relationship. The nature of the existing relationship mitigated the risk of courtesy bias as interviewees would have felt comfortable enough to provide honest responses. In addition, since the interviews were exploratory in nature, interviewees could not tell what responses or positions the interviewer wanted to hear.

The two final potential limitations to this research are the issues of data completeness and the ability to generalise results. The first phase of the study yielded a complete set of capabilities across product- and service-oriented firms. Within the interviews, a business process aid was used to prompt interviewees and ensure significant

aspects of the business process were not being omitted in the discussion. In addition, no new information was obtained from later stage interviews. The repetition of information across interviewees with varied experiences in the industry indicates that the elicited set of capabilities is exhaustive.

With respect to the ability to generalise results, the first phase of the research focused on the elicitation of capabilities across product-oriented and service-oriented software firms. Within this phase, it is a known limitation that the interview findings cannot reliably be generalised to the entire industry since they were obtained through interviews with 15 individuals. However, this limitation was considered in the design of the research. The second phase of the study focuses on validating and generalising the existing of the elicited capabilities across a broader set of firms.

4.4 Phase Two – Capability Validation

The key outcome of the first phase of the research was a set of capabilities that potentially characterised product orientations or service orientations. The second phase of the study focused on using the data elicited in the first phase to determine if the elicited capabilities are representative of product-oriented or service-oriented firms. The following sections provide details on the mechanics of the survey process.

4.4.1 Survey Instrument Design

The survey instrument was divided into three sections. A copy of survey is available in Appendix B. The first section of the survey instrument asked respondents to indicate the degree to which the capabilities elicited in the first phase of the research exist within their organisations. Capabilities were assessed based on the degree of maturity by applying the Capability Maturity Model (CMM) (Paulk et al. 1991). The CMM describes capabilities in terms of one of five different levels of maturity: Initial, Repeatable, Defined, Managed and Optimising. Respondents were provided a definition for each

capability level so each respondent could evaluate his firm's position against each of the identified capabilities.

The CMM was used as a scale for measuring capabilities because it provided more consistent descriptions for what it means for a capability to be mature vs. immature and likely reduced some of the subjectivity in the evaluation process by creating a consistent point of reference. In addition, since CMM is a widely recognised and understood concept within the software industry, respondents should be familiar with the terminology and different maturity levels. The maturity model was particularly suitable for measuring organisational capabilities since they are developed over time.

The second section of the survey instrument focused on the concept of transition across capabilities. Each question in this section addressed an aspect of firms transitioning from product-oriented to service-oriented and vice versa. The questions in this section focused on understanding how firms are able to transit the two orientations; specifically focusing on the respondent's perspective on the best strategy for making such a transition as well as the perceived impediments to such a transition.

The final section of the survey collected demographic information pertaining the respondent (e.g., tenure within the firm, position/title etc.) and information pertaining to the respondent's firm (e.g., revenue from products, revenue from services, number of employees etc.). This data was useful in understanding the classification of firms in terms of product vs. service orientation and in examining relationships between the existence of capabilities and firm size, firm age etc.

4.4.2 Delivery Medium

The survey used in the second phase of the research study was administered over the Internet. Researchers have found the Internet to be a favourable and effective medium for conducting surveys (Dillman 2007; Dillman and Bowker 2001; Kronsick 1999; Groves 2006).

From a theoretical point of view, researchers have proposed that a web-based approach to surveying yields a higher response rate over a pen-and-paper technique

(Cobanoglu et al. 2001). From a practical perspective, this is not necessarily true in all cases. Many factors influence the response rate of a web-based survey, notably the characteristics of the sample population. An online questionnaire can result in a low response rate if members of the sample population do not have Internet access or a limited number of individuals in the population have access to the Internet (Sax et al. 2003). Similarly, using a traditional pen-and-paper technique to survey populations in which postal mail is not a primary communication channel will result in lower response rates. The sample population for this study was Canadian software firms. In deciding to proceed with an Internet-based survey, the assumption was made that individuals in all software firms have Internet access and that Internet is preferred over postal mail.

Surveying over the Internet also reduces the delay between when the respondent completes the questionnaire and when the researcher receives the data. With an online questionnaire, the time between completion of the questionnaire and when results return is a matter of seconds; the response to a pen and paper survey takes days and possibly weeks to receive. In addition, results to the web-based questionnaire are returned in an electronic format, ready for analysis. With a pen-and-paper based approach, additional data-entry and manipulation are required before analysis can be conducted.

The online questionnaire is also preferred over the traditional pen-and-paper technique because a web-based approach produces a response set with higher data quality (Cobanoglu et al. 2001). Client side validations (on the web-browser) placed on the questionnaire ensure a minimum quality of response. The validations ensure that the data follows a specific format and abides by imposed constraints (e.g., all fields or a set of fields must be complete).

The Internet does have some disadvantages, especially a coverage error as defined by Dillman and Bowker (2001). Most organisations have firewalls to prevent unsolicited email. Thus, an initial email inviting the respondent to complete the survey can be flagged by security software and result in the intended recipient never receiving the email. In this case, the researcher may never know that the email has not reached the recipient, and this will result in the response rate metric indicating a lower than actual response rate. The impact of such a coverage error should not have significantly influenced the overall findings of the second phase of the research study. The assumption is that the instances of

emails blocked by firewalls is randomly distributed and not related to the variables of interest. Thus, if individuals could not respond, their responses would not vary significant from actual respondents.

4.4.3 Contact Strategy

Following from the decision to administer the survey over the Internet is the contact strategy, which defines the medium and approach for communicating with participants. Traditional approaches for contacting participants include phone, fax, mail and face-to-face conversations. The process for contacting participants can vary from having a single instance of contact with a potential study participant to contacting the participant multiple times. In this study, the decision was to use email as the communication medium and employ a single contact strategy for contacting participants.

Using email as the primary contact method integrated well with the decision to administer the actual questionnaire over the Internet. The assumption was that if potential respondents have email, they also have Internet access, and vice versa. Using email also created a simpler user experience for the study participants. The email contained a hyperlink to the survey, and the individual could access the survey with one-click of the link - there was no need to type in a long URL to access the survey.

With respect to the contact process, this study used a single-contact approach, which entailed contacting study participants once. Alternatives to the single-contact strategy include a two-contact strategy consisting of phone calls, faxes, letters or emails. In a two-contact strategy, initial contact establishes the potential participant's interest, obtains a commitment or gains permission for future contact (Kvale 1996). Following the initial contact, follow-up contact provides details on the web-site address (in the case of a web-based questionnaire) or serves as a reminder to complete the survey.

Since email was the primary communication medium, it made sense to include the request for participation and participation details all in one email. The possibility of a follow-up email was considered to increase the overall response rate to the survey. However, given that the initial email was unsolicited the decision was made to avoid

sending another unsolicited email, primarily to avoid frustration and negative feedback from individuals in the study populations. The email sent to potential study participants is available in Appendix B.

4.4.4 Common Method Bias

Common method bias occurs when some portion of the variance in a measure is attributed to the method or procedure (Doty and Glick 1998). Moreover, the variance is systemic error that causes the data to be false. Thus, it is important to address the issue of common method variance to prevent the unintentional introduction of common method bias. Podsakoff et al. (2003) summarised the extant literature pertaining to common method variance and defined four major types of common method variance: from "having a common rater, a common measurement context, a common item context, or from the characteristics of the items themselves." It is important to clarify that common method variance does not necessarily lead to common method bias. Common method bias is only an issue when the effect of the common method variance is significant enough to skew the data beyond a trivial level (Meade et al. 2007). Doty and Glick (1998) also caution from over-focusing on potential common method bias as they indicate the existence of common method variance in most cases does not invalidate research findings.

In the case of the second phase of this research, all data were collected using a questionnaire and thus in a common measurement and item context. In the ideal situation, common method variance can be avoided and assessed by collecting each variable using multiple methods. However, this approach is not practical; as most of the firms in the study population are private institutions and do not publicly disclose data such as revenue and revenue sources. Malhotra et al. (2006, 1866) also point out that "Although researchers generally agree CMV (common method variance) has the potential to affect the results of a single method study, no consensus exists about the seriousness of such biases". To minimise common method variance, a number of procedural considerations were made in the design and execution of the study. The following sections discuss the

procedural considerations taken to mitigate the risk of common method variance from the four major sources.

Procedural Remedies for Common Source or Rater

All of the data obtained in this research were self-reported by individuals in the software industry. In this situation, a source of bias that needs to be considered is a potential bias introduced by the source or rater (survey respondent). Social desirability bias can impact the accuracy of data obtained from an individual. Podsakoff et al. (2003, p. 881) define social desirability bias as "the tendency on the part of individuals to present themselves in a favourable light, regardless of their true feelings about an issue or topic". Social desirability bias results from the need for individuals to feel socially accepted. In the case of this research the concern is that survey respondents may have created a more positive image of the firm than is actually the case. Garbett (1988) argues that companies may select and promote characteristics that align with strategic plans of the firm and not necessarily reflect reality. In an attempt to reduce the cases in which respondents feel the need to create a positive image of the firm, respondents were informed that the responses to the survey are confidential and a set of responses cannot be linked to a specific firm. This anonymity reduced potential common method variance due to social desirability.

Leniency bias is another consideration in the case of data obtained from a common source or rater. Leniency bias occurs when an individual allows personal feelings and knowledge to influence reported data (Farh and Dobbins 2006). Existing knowledge on the construct of interest may cause individuals to respond in a way that they believe they are generating the findings they believe should result from the research. Similarly, knowledge of or feelings towards the researcher may cause individuals to vary responses. In this research, the risk of leniency bias was mitigated by random selection of respondents who were not known to the researchers. While respondents knew the software industry and its characteristics, the details of the study and specific construct of interest were not shared with respondents.

Procedural Remedies for Common Measurement Context

All of the data in the second phase of this research study was obtained in a common measurement context. Measurement context is another potential source of common method variance (Podsakoff et al. 2003). Two key contextual considerations are medium and location. A face-to-face interview approach increases social desirability and leniency biases when compared to computer-based survey approaches (Richman et al. 1999). In the case of this research, the survey was administered over the Internet, thus minimising the risk of social desirability and leniency biases. Survey respondents were contacted through email and were geographically located across Canada. It is also expected that with the wide-spread availability of Internet access, not all survey respondents completed the survey in the same setting (e.g., in an office environment), thus reducing environment-related common method variance.

Procedural Remedies for Common Item Context

Common item context is another one of the four sources of common method variance identified by Podsakoff et al. (2003). The context and order in which the items are presented to the respondent can affect how the respondent completes the survey. For example, longer surveys can fatigue the respondent, which can degrade response quality. Shorter surveys, on the other hand, are less likely to result in fatigue (Hinkin 1995), and they also reduce the possibility that responses are influenced by previous questions and answers (Harrison et al. 1996). Respondents are more likely to recall answers provided to earlier questions and factor these answers into responses to subsequent questions. The order of presentation of items can also affect the perceived level of importance by the respondent. This is of particular concern in larger surveys, as questions towards the end may seem less important.

In the case of this research, the survey was divided into multiple sections where the respondent was presented with three different types of scales. While the survey was not short, measures were taken to reduce common method variance resulting from

common item context. Specifically, the questions that related to capabilities were presented to users in a random order. It was not possible to randomise all items in the survey due to design and technology limitations. However, given that the most critical questions in the survey related to the capabilities, it is believed that the issue of common item context was addressed sufficiently through randomisation of the capability questions.

Procedural Remedies for Characteristics of Items

The final source of common method variance identified by Podsakoff et al. (2003) is related to the characteristics of items. Specific items in the survey, their wording or subject matter can influence how the respondent addresses the specific item. For example, just as social desirability bias can influence overall responses from an individual; it is also possible that specific items in the survey can trigger social desirability biases (Nederhof 1985). Respondents may interpret the subject matter or wording of particular question in such a manner that it triggers the desire to respond in a manner that is deemed more socially desirable than their true position.

To reduce the impact of biases resulting from the characteristics of items the wording and language associated with each item was reviewed carefully to ensure sensitivities and interpretation was taken into consideration. The survey was reviewed in detail with three individuals in the software industry who matched the characteristics of potential respondents to validate readability and address ambiguities in interpretation. The survey was also reviewed with individuals outside of the industry to identify use of industry-specific jargon or buzz words. Use of jargon can lead respondents to interpret intended meanings which can generate additional unintended variance across responses (Podsakoff et al. 2003).

In addition to the wording of specific questions, the labels used in the anchors of the scales can also systematically influence responses (Tourangeau et al. 2000). To prevent misinterpretation with the scale labels, the industry standard capability maturity model (CMM) was used to measure capability maturity. For those respondents not

familiar with the model and its framework measuring capability maturity, a description of the maturity levels was presented at the beginning of the survey. Outside of the capability maturity questions, the other Likert scale questions were also anchored with clear unambiguous labels such as “strongly agree” and “significant”.

4.4.5 Study Population and Sampling Procedure

The study population for the survey was Canadian software organisations listed in Industry Canada’s Canadian Capabilities database. Industry Canada maintains the Canadian Company Capabilities (CCC) database; it is available online at http://strategis.ic.gc.ca. The database contains over 60,000 company profiles. Not all of these firms are technology firms or specifically focus on the software industry, 6,469 of these firms can be classified as technology firms (NACIS Code = 5415). Of the firms classified as technology firms, 3143 included email addresses in the CCC directory. Initial solicitation emails were sent out to the 3143 firms and 346 of these emails were returned as undeliverable due to invalid or inactive email addresses. Thus, the total number of firms contacted as part of the study was 2797. The total number of firms that responded to the questionnaire was 163 resulting in an overall response rate of 5.8%. The demographic details of the responding firms are discussed in section 4.4.5.

The response rate achieved in the second phase of the research is relatively low. Researchers indicate that one of the challenges with the survey approach is low response rate and growing trends in non-response (e.g., Baruch and Holtom 2008; Rogelberg and Stanton 2007). Moreover the phenomenon is not unique to Internet-based surveys, research indicates phone and mail survey approaches are also resulting in lower than expected response rates (Cook et al. 2000). Groves (2006) indicates that the trend in declining response rates across survey approaches can be attributed to over-surveying in certain populations. The primary challenge with a low response rate is the risk of a non-response bias influencing the findings of the survey. Various procedures exist to evaluate

the existence and impact of non-response bias. A detail discussion and analysis of potential non-response bias follows in section 4.4.8.

In contrast to the sampling approach used in phase one of the research study, the second phase used a probability sampling strategy. Probability sampling, unlike the purposeful sampling strategy that was used to identify interview candidates involves the selection of a random and representative sample of participants from the population. Probability sampling is appropriate when the goal of the research is to generalise the research findings to the population (Patton 2002). The goal of the second phase of the study was to generalise the elicited capabilities to the broader study population, thus the probability sampling approach was deemed most suitable.

Resulting Sample

This section summarises the descriptive characteristics of the resulting sample. The sample is described in terms of the firms' attributes and respondents' attributes collected in the demographic profile section of the survey. The final sample resulted in 163 respondents. Table 11 summarises the demographics of the resulting sample.

Given that this research focuses on understanding the differences between product-oriented and service-oriented firms, it is important to explore the orientation of firms in the resulting sample. As previously discussed, this research uses the firm's revenue sources as the primary indicator of orientation. Firms obtaining revenue primarily from products are product-oriented, and firms obtaining revenue primarily from services are service-oriented. Table 12 summarises the revenue sources for firms that participated in the study. The data indicates that of the 163 firms participating in the survey the mean revenue from products was 44% and 55% for services, respectively.

The frequency data indicates that 43 firms in the sample do not earn any revenue from products and 16 firms in the sample do not earn any revenue from services. With respect to "Other" revenue sources, 152 firms indicated they earn no revenue from other sources. Firms that reported other revenue cited sources such as hardware and research grants. Overall, because this research focuses on understanding the differences between

product-oriented and service-oriented firms, the mix of firms in the sample is optimal to support the analysis.

Table 11 – Firm Demographics

Characteristic	Response Categories	Frequency	%	Cumulative%
Firm Size	1-200	153	93.9	93.9
	201-500	5	3.1	96.9
	501-1000	5	3.1	100.0
Annual Revenue	$1 - $99,999	17	10.4	10.4
	$100,000 - $199,999	15	9.2	19.6
	$200,000 - $499,999	28	17.2	36.8
	$500,000 - $999,999	20	12.3	49.1
	$1,000,000 - $4,999,999	52	31.9	81.0
	$5,000,000 - $9,999,999	13	8.0	89.0
	$10,000,000 - $24,999,999	12	7.4	96.3
	$25,000,000 - $49,999,999	5	3.1	99.4
	$50,000,000+	1	.6	100.0
Ownership Structure	Private	154	94.5	94.5
	Public	8	4.9	99.4
	Other	1	.6	100.0
Geographic Revenue Sources	Only Canada	75	46.0	46.0
	Both Canada and USA	58	35.6	81.6
	Other Countries	30	18.4	100.0

Table 12 – % Revenue by Source

	% Revenue from Products	% Revenue from Services	% Revenue from Other
Valid	163	163	163
Mean	44.02	54.56	1.42
Median	45.00	50.00	.00
Std. Deviation	37.113	37.413	7.629

The questionnaire also captured characteristics about the respondents. One of the critical success factors to the use of the survey approach was gaining access to individuals within the firms who are knowledgeable about the industry and firm and have enough visibility across the organisation to knowledgably answer the questions in the survey. Three key questions were asked of respondents to understand if this condition was met: the respondent's role within the firm, the number of years experience and the respondent's tenure with the firm.

Table 13 summarises the respondent's response when asked to best categorise his role within the organisation. In the resulting sample, more than 50% of the respondents indicated that they hold a position at the CxO (e.g., CEO, CIO, CMO etc.) level and more than 85% of respondents held a position of senior manager or higher. Given this distribution, one can be satisfied that in general, respondents in the resulting sample were senior enough to have sufficient knowledge and visibility across the firm.

Table 13 summarises the frequency of responses when respondents were asked to indicate the number of years of experience in the software industry. In line with the responses to the question with respect to role, more than 50% of the respondents indicated they had more than 16 years of experience in the industry. On the lower end of the scale, less than 2% (three respondents) said they have been in the software industry for two years or less. Thus, based on the data respondents in the resulting sample should have had sufficient understanding of the software industry to answer the questions in the survey. A final question asked respondents to indicate the number of years of experience they have with their current firm. This was asked to understand the degree of firm specific knowledge the respondents had (in addition to industry experience). The data indicates that the majority of respondents were with their current firm for between 3-10 years. The number of individuals that have been with their firm for less than 2 years is smaller than any of the other ranges and significantly higher than the number of individuals with less than two years of experience in the software industry, this likely reflects the turnover between firms that exists within the industry. Across the sample, given that more than 85% of the individuals in the sample have been with their firms for three years or more, respondents had sufficient knowledge of their firms to complete the survey.

Table 13 – Respondent Demographics

Characteristic	Response Categories	Frequency	%	Cumulative%
Role	CxO	89	54.6	54.6
	Vice-President	22	13.5	68.1
	Director	13	8.0	76.1
	Senior Manager	17	10.4	86.5
	Manager	10	6.1	92.6
	Other	12	7.4	100.0
Industry Experience	0-2 years	3	1.8	1.8
	3-5 years	12	7.4	9.2
	6-10 years	31	19.0	28.2
	11-15 years	34	20.9	49.1
	16+ years	83	50.9	100.0
Tenure with the Firm	0-2 years	24	14.7	14.7
	3-5 years	41	25.2	39.9
	6-10 years	37	22.7	62.6
	11-15 years	30	18.4	81.0
	16+ years	31	19.0	100.0

Non Response Bias

Given the relatively low response rate, it is imperative to assess the data for possible non-response bias, the effect of non-responses on the overall findings of the survey (Creswell 1998). The concern in this case is that had the non-responders actually responded, their responses may vary significantly from those that did respond. Wave analysis can be used to evaluate the potential impact of non-response bias. The premise is that non-respondents are similar to those who responded later to the survey (Creswell 1998). Based on this assumption, wave analysis involves comparing earlier responders with late responders to determine if there is a significant difference in responses (Armstrong and Overton 1977).

Early responders were compared with late responders to determine the existence of a non-response bias. The responses were sorted by the timestamp and the top quartile of responses compared with the bottom quartile of responses (late responders). Between the two quartiles, the analysis compared the mean values for demographics and responses

to the three sections of the questionnaire. The detailed analysis (in Appendix C) indicates that there is no statistically significant difference between the means and variances of the two quartiles; this indicates that non-response bias does not influence the sample.

A consideration when determining the existence of non-response bias is whether the variable being measured is connected to non-response (Rogelberg and Stanton 2007). For example, a study that measures the frequency by which people check email may suffer from non-response bias, since individuals that do not check email as frequently may not complete the survey. In this research, there is no known link between the variables of interest and non-responders.

A final check of non-response bias can be completed through a comparison of demographics between the study population and respondents. Table 14 shows the distribution of firm annual revenue across the two populations. Note that the annual revenue data for the entire population was not available for all firms in the population. The assumption is that the missing values follow a random distribution. The frequencies in Table 14 represent data for the available firms. The results of a Kolmogorov-Smirnov test indicate that there is no evidence to suggest that the two samples are significantly different with a K-S test statistic of 0.889 and $p < 0.001$. Thus, both the wave analysis and the examination of demographics across the two samples do not show evidence of response bias.

Table 14 – Annual Revenue by Population

Annual Revenue	CCC Directory Population		Respondents	
	Frequency	%	Frequency	%
$1 - $99,999	234	14.1	17	10.4
$100,000 - $199,999	177	10.7	15	9.2
$200,000 - $499,999	241	14.5	28	17.2
$500,000 - $999,999	220	13.2	20	12.3
$1,000,000 - $4,999,999	466	28.1	52	31.9
$5,000,000 - $9,999,999	132	8.0	13	8.0
$10,000,000 - $24,999,999	86	5.2	12	7.4
$25,000,000 - $49,999,999	35	2.1	5	3.1
$50,000,000+	69	4.2	1	.6

4.4.6 Dependent Variable

The primary objective of this research is to understand how product-oriented and service-oriented firms differ in organisational capabilities. The initial step in the analysis of the data obtained from the 163 respondents focuses on identifying product-oriented vs. service-oriented firms. Two options existed in categorising firms as product-oriented or service-oriented. In the questionnaire, respondents were asked to indicate the degree to which they believe their firm is product-oriented vs. service-oriented. The two ways to classify firms are to use the response to this question or to use the revenue source percentage reported by the respondents.

For the purposes of this analysis, the reported revenue source data are used as the primary determinant of orientation. While the use of the already established product-oriented vs. service-oriented variable from the questionnaire is quicker and easier, it is not consistent across the sample. Respondents did not have structured guidance on how to evaluate their orientation. Respondents were informed that source of revenue is the primary determinant of orientation, but they were not provided a scale mapping percentage of revenue from product vs. services to a rating on the scale. Thus, one respondent may have reported a 60-40 split in percentage of revenue from products and services as moderately product-oriented while another respondent may have reported this as roughly equal. As a result, the preferred option was to analyse the reported sources of revenue and use this information as the primary determinant of orientation.

The decision to use reported revenue as the measure for orientation, led to subsequent analysis and decision-making to determine if the orientation measure should be used as a continuous variable or a categorical variable. The use of a categorical vs. continuous dependent variable is critical for consideration as it influences the type of analysis that can be conducted and the specific statistical procedures that can be used. The decision was made to create a categorical dependent variable to represent orientation instead of using a continuous variable. There were two key factors influencing this decision.

Firstly, the goal of the research is to determine the distinguishing capabilities between product-oriented and service-oriented software firms. The use of a continuous

variable treats two firms with relatively closely reported revenue percentages (e.g., 80 and 85) differently. In reality, two firms reporting relatively close revenue percentages from a strategic orientation perspective would not be considered significantly different from one another. Modelling the variable as a categorical variable allows firms with relatively small differences in reported revenue to be treated similarly in analysis.

Secondly, the characteristics of the data lend themselves to treatment as categorical variables. Figures 3, 4 and 5 depict the distributions of the three variables that capture revenue sources. Examination of the histograms for the variables for revenue from products, revenue from services and revenue from other sources indicates that these variables are more groupings of cases instead of following a continuous close-to-normal distribution. Thus, because of the characteristics of the data and the practical application the decision was made to create a new categorical variable to represent the orientation of a firm.

The creation of the new dependent variable and associated categorisation of orientation involves thoroughly examining the distribution of revenue by source. Given that the reported revenues range from zero to 100% for both products and services, initial analysis requires establishing ranges for the classification of firms. The first step in performing this analysis was to examine the histograms for reported percentage revenue from products, services and "other". The number of firms reporting revenue from other sources was relatively small (11 firms, 9 of which reported less than 30% of total revenue from other sources). For this reason, the analysis initially focused on considering the data for product and service revenue and then factored in the firms reporting other revenue sources to determine if they fit into an existing category or if they needed to be omitted from the analysis. The histograms helped identify natural breakpoints in the distribution of revenue. Given the nature of firms in the study, prior to examining the data, it was expected that there would be at least three categories of firms with respect to orientation: product-oriented, service-oriented and a hybrid-orientation category for the firms that have a significant mix of revenue from multiple sources.

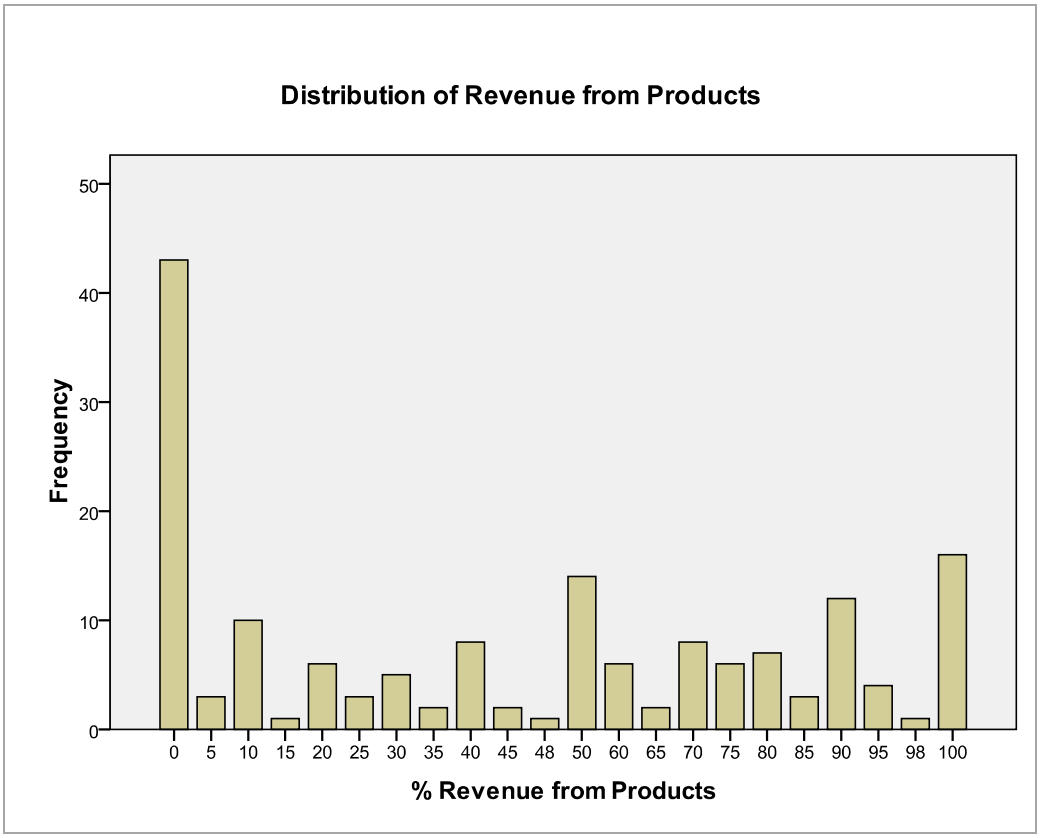

Figure 3 – Distribution of Reported Revenue from Products

Figure 3 summarises the distribution of reported revenue from products across the sample. The frequency column indicates, as expected, that there are concentrations of firms at both extremes (0% and 100%), a concentration of firms around the 50% range and a small number of firms in between these concentration points. Specifically, there are five key points where the distribution spikes, at 0%, 10%, 50%, 90% and 100%. At each of these points, there is a spike in the frequency of firms reporting revenue from products. Given that the goal of this exercise is to categorise firms into a smaller number of groups based on their reported revenue, these key points serve as a logical starting point for establishing these groupings.

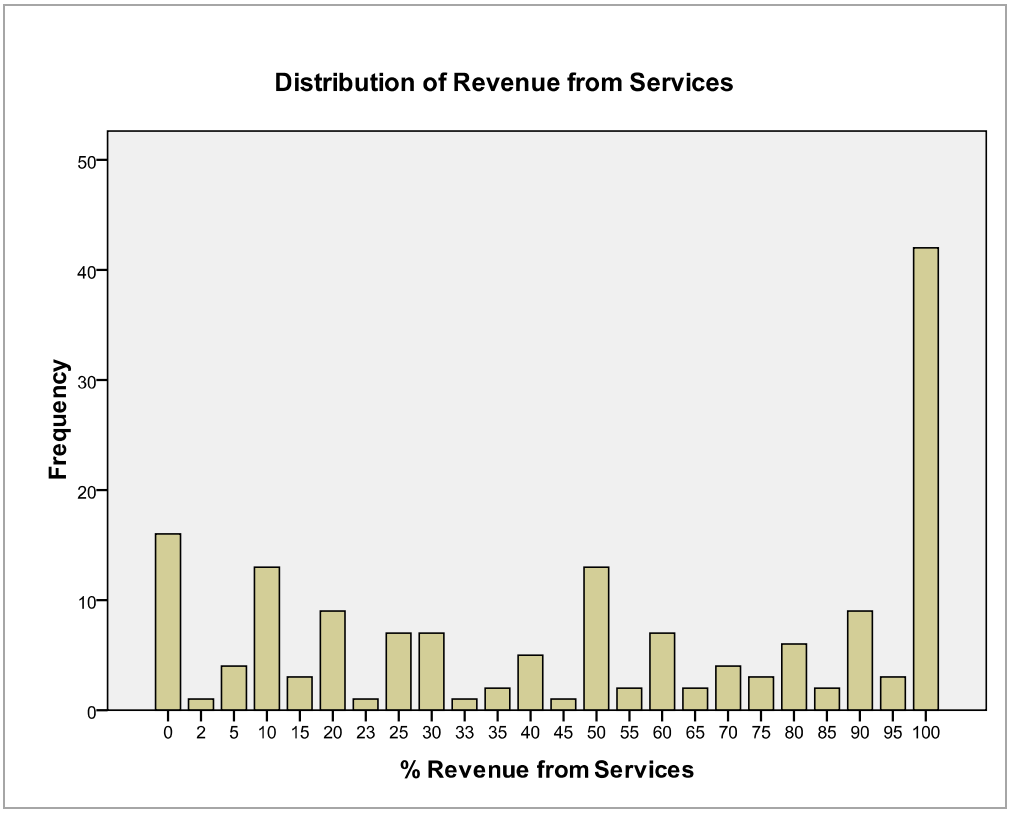

Figure 4 – Distribution of Reported Revenue from Services

Similarly, to the product scenario, Figure 4 summarises the distribution of firms reporting revenue from services. The data in this table indicates a similar situation in that there are logical groupings that appear based on the frequency of firms indicating specific percentages of revenue from services. As is the case with the product scenario, there are concentrations of firms at the extremes (10% or less and 100%). Similar to the product scenario, there is also a concentration of firms at the 50% mark and a smaller number of firms spread between these concentration points.

One of the key differences between the distribution of revenue sources across products and services within the sample is the number of purely product-oriented vs. purely service-oriented firms. Based on the two tables summarising revenue sources, the data indicates that there are significantly more service-oriented firms with all of their revenue from services firms in the sample than there are product-oriented firms with all of their revenue from products.

One of the considerations in determining the appropriate ranges for the groups is to ensure that the groupings capture the contrasts in the data. This needs to be balanced with the need to manage fragmentation across the sample – creating too many groups with too few data points per group will not support the quantitative analysis. For example, to capture the contrast across categories, these ranges are optimal:

- 0% - 9%
- 10% - 49%
- 50%
- 51% - 89%
- 90% - 100%

The challenge is that these categories fragment the sample with too few data points in each category and lead to significant differences in the number of firms each category (e.g., 13 vs. 46). Thus, a smaller number of categories are required to manage the fragmentation and create categories of relatively equal size. An alternate set of ranges is:

- 0% - 39%
- 40% - 60%
- 61% - 100%

Using these ranges will result in three categories of relatively equal sizes. However, the challenge in this case is that firms with a potential 90/10 split are treated the same as firms with a 39/61 split. Also, in the case of the product revenue sources, approximately one third of the firms are under the 10% mark, thus losing some of contrast in the original data.

After analysing the distribution of revenue sources across the sample and testing a number of candidate ranges for contrast and fragmentation, the following ranges appear to best balance across the completing demands for contrast and preventing fragmentation:

- 0% - 10%
- 11% - 65%
- 66% - 100%

These ranges result in categories of relatively similar size and provide significant enough contrast to conduct meaningful quantitative analysis.

The final step in completing the grouping of firms by orientation is to address the firms that reported revenue from other sources. A summary of the distribution of firms reporting revenue from other sources is in Figure 5. Generally, across the sample, not many firms reported revenue from other sources with 152 firms indicating none and over 96.9% of firms indicating 10% or less of total revenue from areas other than products or services. Firms that reported revenue from other sources had the opportunity to provide a description of the revenue source. The majority of the firms that indicated revenue from other sources indicated "Hardware" as the source for other revenue. Other sources of revenue outside of products and services were grants and web-site advertising.

Given the relatively small number of firms that reported revenue from other sources, the main objective of analysing this dimension of revenue is to determine if each of these firms can be classified as product-oriented, service-oriented, hybrid or if given the type of revenue reported, they need to be omitted from further analysis. The decision on classification or omission can be made by examining the revenue source variables to determine if the firm can be fit into each of the three categories. The outcome of this review indicates that all of the firms reporting revenue from sources other than products or services can be classified into three categories defined by the chosen revenue ranges. While the firms have a portion of their revenue from other sources, they also have revenue from products or services. In all cases, review of the product vs. service split and the source of other revenue resulted in a clear position with respect to whether these firms belong in the product, service or hybrid category.

Table 15 shows the final distribution of firms by orientation once applying the groupings defined by the revenue source ranges. The categorisation results in three groups of similar size (approximately one third of the sample per category). This represents a new dependent variable that is used in further analysis.

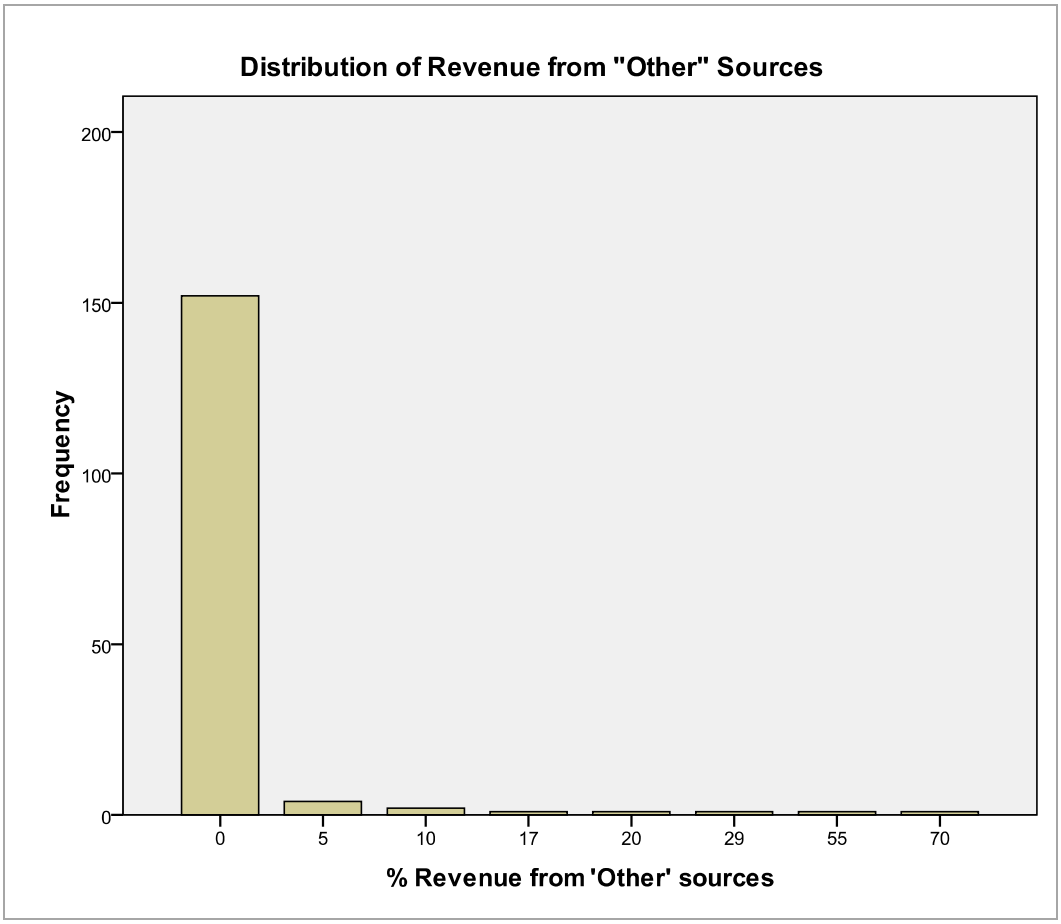

Figure 5 – Distribution of Reported Revenue from "Other" Sources

Table 15 – Orientation of Firms Based on Revenue

Orientation	Frequency	%	Cumulative%
Service	56	34.4	34.4
Product	58	35.6	69.9
Hybrid	49	30.1	100.0
Total	163	100.0	

4.4.7 Independent Variables

The previous section discussed the descriptive statistics of the dependent variable. This section presents the measurements obtained from the respondents with respect to the independent variables. Descriptive statistics are reported for each of the major types of measurements taken in the survey instrument.

Descriptive Statistics

The questionnaire contained two sections of questions related to the firm's orientation, capability maturity and transitioning between orientations. Table 16 summarises the measurements obtained from the capability maturity questions in section two of the survey. Respondents were asked how their firms rated with respect to capability maturity against the capabilities elicited in the first phase of the research. Analysis of a correlation matrix created from the 25 items indicates that there is common variance across the capabilities; thus, a data reduction technique can be employed to group capabilities together with common variance. The reduced set of capabilities provides a linearly independent representation of the capabilities that are used subsequent analysis. Details of the data reduction are in Chapter 5.

The second section of the questionnaire focused on trying to understand the respondent's perspective to transition across orientations. Specifically, the respondents were asked their perspectives on the effectiveness of different strategies for transitioning across orientations and their perspectives on the significance of select impediments in making such a transition. Respondents were asked to evaluate transition strategies through acquisition of other firm, through organic growth and through internal change. Respondents were asked to evaluate a strategy's effectiveness on a seven-point scale (1 = least effective, 7 = most effective). The respondent's perspectives on the impediments were captured in a similar manner. Respondents were asked to rate the extent to which skills of people with the firm, processes imbedded within the firm and the perception held by customers affect transitioning across orientations (1 = insignificant, 7 = significant).

Table 16 – Capability Maturity Descriptive Statistics

Capabilities	Mean	Std. Deviation
Technically Proficient Management	3.19	1.308
Solution Design and Architecture	3.01	1.365
Relationship Building	2.79	1.355
After Sales Support	2.74	1.369
New Product/Service Development	2.74	1.309
Resource Management	2.71	1.202
Quality Assurance	2.60	1.573
Market Depth	2.55	1.366
Cross-Functional Communication	2.52	1.321
Market Anticipation	2.48	1.269
Customer Relationship Management	2.46	1.362
Research and Development	2.34	1.442
Knowledge and IP Management	2.34	1.376
Customer Expectation Management	2.34	1.278
Organisational Learning	2.33	1.295
Partner Vendor Management	2.27	1.478
Firm Brand Management	2.27	1.379
Customer Education	2.25	1.450
Contract Negotiation	2.21	1.372
Investment in People	2.20	1.400
Market Breadth	2.20	1.393
Competitive Intelligence	2.17	1.368
Recruiting Effectiveness	2.06	1.492
Lead Customer Network	2.04	1.507
Demand Forecasting and Management	1.92	1.383

Table 17 summarises the measurements obtained from the questions pertaining to the transition from a service orientation to a product orientation and the measurements obtained from the questions pertaining to the transition from product orientation to service orientation.

Table 17 – Transition from Service to Product Descriptive Statistics

		Mean	Std. Deviation
Service to Product Descriptive Statistics	Impeded by Skills of People	5.80	1.580
	Impeded by Processes	5.23	1.702
	Impeded by Perception	5.01	1.696
	Transition via Acquisition	4.61	1.980
	Transition via Organic Growth	4.02	1.721
	Transition via Internal Change	3.77	1.797
Product to Service Descriptive Statistics	Impeded by Skills of People	5.96	1.424
	Impeded by Processes	5.50	1.455
	Impeded by Perception	5.06	1.679
	Transition via Acquisition	4.15	1.958
	Transition via Organic Growth	4.10	1.664
	Transition via Internal Change	3.56	1.656

4.4.8 Control Variables

There are two control variables that are of interest in this study in addition to the dependent and independent variables. The size of the firm is measured in terms of revenue, and the age of the firm measured in years. Firm age sheds light on the issue of how product orientations and service orientations relate to the maturity of the organisation; it aids in understanding if an orientation is more or less likely early in the firm's existence or later. The distribution of firms by age is shown in Figure 6.

Firm size addresses the question of whether larger or smaller firms are more likely to possess a given orientation. In the case of this study, firm size is measured in terms of revenue. Number of employees is the other option for characterising firm size however given the nature of contracting relationships and outsourcing particularly in service-oriented firms, annual revenue allows for a more accurate comparison between orientations. The distribution of firms by revenue is available in Table 14.

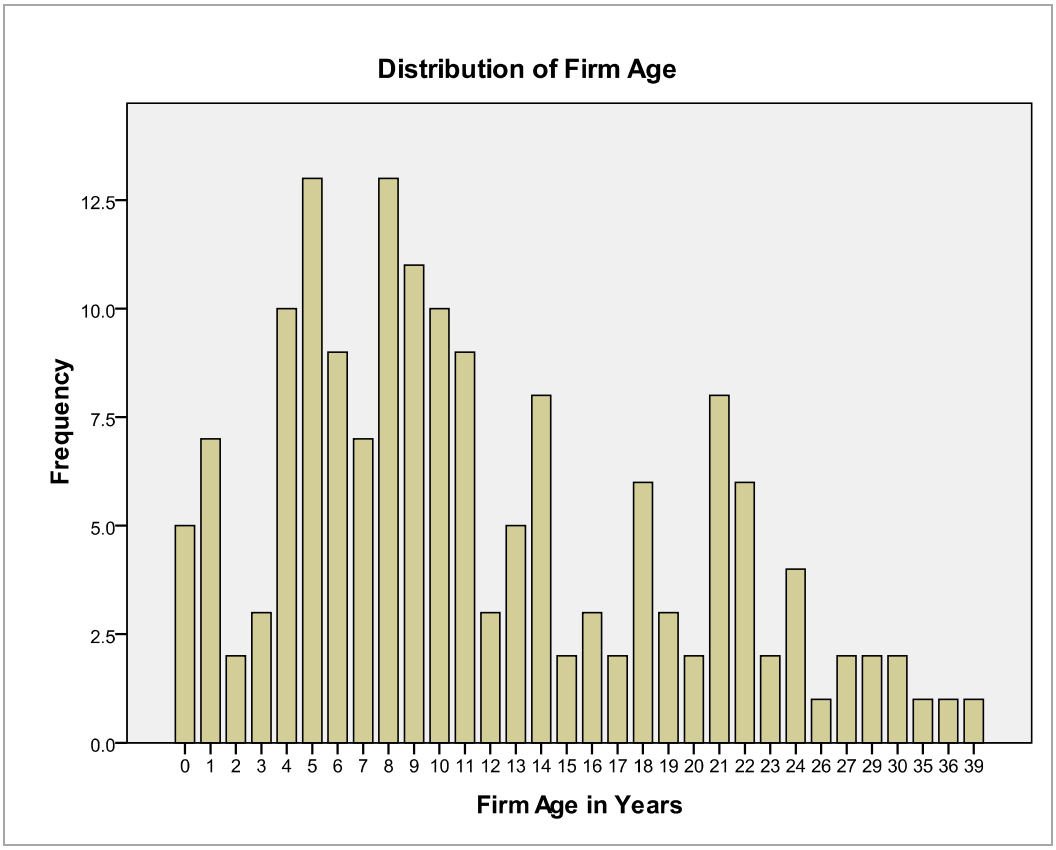

Figure 6 – Distribution of Firm Age

4.4.9 Summary

This chapter provided a detail description of the methods associated with the execution of the research study. The chapter began with a discussion of the design of the research study and discussed the details of the interview approach and execution. Following this, the second phase of the research method was discussed in detail, including the design of the survey instrument, the administration process and the resulting data. Descriptive statistics on the resulting sample and measured data was also presented, followed by a discussion of possible bias sources and implications.

The following chapter analyses in detail the data obtained from the second phase of the research study. Specifically, the objective of the analysis is to understand the relationship between a firm's orientation (product, service, and hybrid) and the capabilities identified in the first phase of the research.

5.0 Findings

5.1 Introduction

The structure of this research is defined by the phases of data collection and analysis. The first phase focused on interviewing industry experts to elicit the capabilities representative of product-oriented and service-oriented firms; the results of this phase were reported in Section 4.3.4. The data obtained in the first phase of the research served as input to the second phase of the study. With the goal of validating the capabilities obtained in the first phase, the second phase employed a survey-based approach to reach 163 firms and gain perspective on the existence of these capabilities within their organisations. The first phase of the research used a qualitative approach, while the second phase followed a quantitative approach. This chapter discusses the quantitative analysis on the data resulting from the second phase of the research.

5.2 Descriptive Differences in Firm Orientation

The second section of the questionnaire focused on the capabilities that were elicited as part of the first phase of the research. Respondents were asked to evaluate their firms with respect to its maturity level across each of the capabilities. The scale used in these questions took the form of a 5-point Likert scale, with each of the points on the scale representing one of the five capability maturity levels in the Capability Maturity Model. These data are also continuous in nature and thus can be subjected to the ANOVA test. However, a test of the ANOVA assumptions for normality and homogeneity of variances indicates there is an issue with the data not satisfying the assumptions. Thus, additional caution must be taken in interpreting the results of the ANOVA procedure. The Welch and Brown-Forsythe statistics can be used to determine reliably if there is a significant difference in means between the capabilities. The results of the Welch and

Brown-Forsythe tests, in Table 18, indicate that there are indeed significant differences in means by orientation across a subset of the identified capabilities.

Table 18 – Robust Tests for Equality of Means for Capabilities

Capability	Mean			Welch		Brown-Forsythe	
	Product	Service	Hybrid	Statistic[a]	Sig.[b]	Statistic[a]	Sig.[b]
After Sales Support	3.29	1.96	2.96	15.474	.000	17.252	.000
Relationship Building	2.19	3.32	2.88	10.415	.000	11.571	.000
Research and Development	2.91	1.73	2.37	10.288	.000	10.796	.000
Organisational Learning	2.02	2.73	2.22	4.836	.010	4.711	.010
Market Anticipation	2.69	2.23	2.51	1.838	.164	1.896	.154
Cross-Functional Communication	2.79	2.11	2.65	3.935	.022	4.428	.013
Knowledge and IP Management	2.03	2.64	2.37	3.151	.047	2.812	.063
Resource Management	2.64	2.77	2.71	.179	.836	.165	.848
Recruiting Effectiveness	2.10	1.93	2.14	.280	.757	.315	.730
Customer Relationship Management	2.10	2.64	2.67	3.393	.037	3.159	.045
New Product/Service Development	3.22	2.29	2.67	8.504	.000	7.964	.001
Competitive Intelligence	2.31	2.11	2.08	.530	.590	.466	.628
Investment in People	1.86	2.52	2.22	3.089	.050	3.251	.041
Technically Proficient Management	3.62	2.73	3.20	7.599	.001	6.957	.001
Contract Negotiation	2.22	2.20	2.20	.006	.994	.006	.994
Market Breadth	2.14	2.18	2.31	.199	.820	.202	.817
Market Depth	2.78	2.13	2.76	4.261	.017	4.182	.017
Customer Education	1.98	2.38	2.43	1.596	.208	1.597	.206
Customer Expectation Management	2.38	2.14	2.51	1.093	.339	1.143	.322
Lead Customer Network	2.59	1.25	2.29	15.946	.000	13.815	.000
Partner Vendor Management	2.43	2.13	2.24	.620	.540	.616	.541
Quality Assurance	3.14	2.09	2.55	7.868	.001	6.659	.002
Firm Brand Management	2.60	1.71	2.51	7.707	.001	7.394	.001
Demand Forecasting and Management	2.10	1.66	2.00	1.588	.209	1.583	.209
Solution Design and Architecture	3.40	2.70	2.92	4.732	.011	3.995	.021

a. Asymptotically F distributed

b. Shaded cells indicate non-significant test results

The ANOVA procedure and the Welch and Brown-Forsythe tests do not provide insight into the specific orientations that result in significant differences of means. The Games-Howell test can be used to gain this additional insight. The test is appropriate for

use on these data given the inequality of variances and unequal number of cases in each group (Cohen 2001). Severely unequal variances can result in increased Type I error and with smaller sample size, more moderate differences in group variance can lead to increase in Type I error (Cohen 2001). The Games-Howell test has been regarded as more robust than Tukey's HSD when variances are unequal (Cohen 2001). Games-Howell is considered to be robust when sample sizes and variances are not equal across compared groups (Field 2009). The results of the Games-Howell tests are in Table 19. The results of the tests indicate that there are significant differences in means across a subset of the capabilities by orientation ($p < 0.05$). The data in Table 19 makes it visually clear that most of differences in capabilities are between product orientation and service orientation with fewer indicating statistically different maturity levels of hybrid orientation.

In the third section of the survey, respondents were asked to indicate their perspectives on success strategies and impediments towards transitioning across product orientation and service orientation. These questions were included in the survey to begin to understand how firms perceive transition relative to their current orientation. On the one end, the scale was labelled with 1 = very ineffective in the case of a transition strategy and 1 = very insignificant in the case of an impediment. Similarly, on the other end, 7 = very effective in the case of a transition strategy and 7 = very significant in the case of an impediment. Similar to the previous two sets of data obtained from the survey, the ANOVA procedure can be applied to examine the difference in means across the orientation groups. However, similar to the data pertaining to the capabilities, Levene's test for equality of variances indicates that not all of the variances are equal for all of the scale items across the three orientations. Thus, in this case the data are subjected to the Welch and Brown-Forsythe tests as they have no assumptions related to equality of variances (Cohen 2001). The results of the Welch and Brown-Forsythe tests, in Table 20, indicate that there are significant differences in how firms by orientation view the issue of transitioning from one orientation to another. The results, however, do not indicate that there are any significant differences in how firms by orientation view the impediments to achieving a transition across orientations.

Table 19 – Games-Howell Test for Capabilities

Capability	Service Mean Difference[a]		Product Mean Difference[a]		Hybrid Mean Difference[a]	
	Product	Hybrid	Service	Hybrid	Service	Product
After Sales Support	-1.329*	-.995*	1.329*	.334	.995*	-.334
Relationship Building	1.132*	.444	-1.132*	-.688*	-.444	.688*
Research and Development	-1.182*	-.635*	1.182*	.546	.635*	-.546
Organisational Learning	.715*	.508	-.715*	-.207	-.508	.207
Market Anticipation	-.458	-.278	.458	.179	.278	-.179
Cross-Functional Communication	-.686*	-.546	.686*	.140	.546	-.140
Knowledge and IP Management	.608*	.276	-.608*	-.333	-.276	.333
Resource Management	.130	.054	-.130	-.076	-.054	.076
Recruiting Effectiveness	-.175	-.214	.175	-.039	.214	.039
Customer Relationship Management	.539	-.031	-.539	-.570	.031	.570
New Product/Service Development	-.938*	-.388	.938*	.551	388	-.551
Competitive Intelligence	-.203	.026	.203	.229	-.026	-.229
Investment in People	.656*	.293	-.656*	-.362	-.293	.362
Technically Proficient Management	-.889*	-.472	.889*	.417	.472	-.417
Contract Negotiation	-.028	-.008	.028	.020	.008	-.020
Market Breadth	.041	-.128	-.041	-.168	.128	.168
Market Depth	-.651*	-.630	.651*	.021	.630	-.021
Customer Education	.392	-.054	-.392	-.446	.054	.446
Customer Expectation Management	-.236	-.367	.236	-.131	.367	.131
Lead Customer Network	-1.336*	1.036*	1.336*	.300	1.036*	-.300
Partner Vendor Management	-.306	-.120	.306	.186	.120	-.186
Quality Assurance	-1.049*	-.462	1.049*	.587	.462	-.587
Firm Brand Management	-.889*	-.796*	.889*	.093	.796*	-.093
Demand Forecasting and Management	-.443	-.339	.443	.103	.339	-.103
Solution Design and Architecture	-.700*	-.222	.700*	.478	.222	-.478

* the mean difference is significant at $p < 0.05$

a. Shaded cells indicate non-significant test results

Table 20 – Robust Tests for Equality of Means for Transition Questions

	Strategy or Impediment	Mean			Welch		Brown-Forsythe	
		Product	Service	Hybrid	Statistic[a]	Sig.[b]	Statistic[a]	Sig.[b]
Service to Product	Transition via Acquisition	5.17	3.86	4.80	6.341	.003	7.171	.001
	Transition via Organic Growth	4.28	3.50	4.33	3.740	.027	4.132	.018
	Transition via Internal Change	3.62	3.41	4.35	4.196	.018	4.019	.020
	Impeded by Skills of People	5.91	5.86	5.59	.641	.529	.609	.545
	Impeded by Processes	5.26	5.20	5.24	.017	.983	.021	.979
	Impeded by Perception	4.79	5.05	5.22	.969	.383	.896	.410
Product to Service	Transition via Acquisition	4.81	3.61	4.00	6.294	.003	5.889	.003
	Transition via Organic Growth	4.45	3.55	4.31	4.438	.014	4.944	.008
	Transition via Internal Change	3.43	3.00	4.35	10.376	.000	9.990	.000
	Impeded by Skills of People	6.02	6.04	5.80	.532	.589	.455	.635
	Impeded by Processes	5.29	5.79	5.41	1.643	.198	1.794	.170
	Impeded by Perception	5.10	4.93	5.14	.224	.800	.248	.780

a. Asymptotically F distributed

b. Shaded cells indicate non-significant test results

Given the unequal number of cases in each group and the inequality of variances, the Games-Howell test is appropriate for better understanding what orientations result in significant differences of perspectives in transition strategies and impediments. The results of the Games-Howell tests are in Table 21.

Table 21 – Games-Howell Test for Transition Strategies and Impediments

	Strategy or Impediment	Service Mean Difference[a]		Product Mean Difference[a]		Hybrid Mean Difference[a]	
		Product	Hybrid	Service	Hybrid	Service	Product
Service to Product	Transition via Acquisition	-1.315*	-.939*	1.315*	.376	.939*	-.376
	Transition via Organic Growth	-.776*	-.827*	.776*	-.051	.827*	.051
	Transition via Internal Change	-.210	-.936*	.210	-.726	.936*	.726
	Impeded by Skills of People	-.057	.265	.057	.322	-.265	-.322
	Impeded by Processes	-.062	-.048	.062	.014	.048	-.014
	Impeded by Perception	.260	-.171	-.260	-.431	.171	.431
Product to Service	Transition via Acquisition	-1.203*	-.393	1.203*	.810	.393	-.810
	Transition via Organic Growth	-.895*	-.753	.895*	.142	.753	-.142
	Transition via Internal Change	-.431	-1.347*	.431	-.916*	1.347*	.916*
	Impeded by Skills of People	.018	.240	-.018	.221	-.240	-.221
	Impeded by Processes	.493	.378	-.493	-.115	-.378	.115
	Impeded by Perception	-.175	-.214	.175	-.039	.214	.039

* the mean difference is significant at $p < 0.05$

a. Shaded cells indicate non-significant test results

In addition to measurement items included in the survey, specific demographic data was also included in the final section. Table 22 contains the summarised results of the comparison of means procedure run against firm age and annual revenue. The original annual revenue captured in the questionnaire was captured as a categorical variable. A new continuous annual revenue variable was created for subsequent analysis. The variable was created by taking the mid-points associated with each of the categories. The original variable followed a highly positively skewed distribution and as a result the mid-points were transformed using a logarithmic function approximating a normal distribution.

Table 22 – Differences in Demographics

Demographics	Mean			F	Sig.[b]
	Product	Service	Hybrid		
Firm Age	12.43	9.59	13.31	3.210	.043
Annual Revenue	14.33	13.54	14.03	2.829	.062

a. Shaded cells indicate non-significant test results

Table 22 reports the results of the ANOVA procedure. In the case of the two demographic variables, Levene's test for homogeneity of variances indicates there are equal variances across the orientations groups. However, the firm age variable does not satisfy the assumption of normality. Thus, caution must be taken in interpreting the results of the ANOVA procedure. While the results indicate there is a significant difference in means across orientation types for both of these demographic variables. Similar to previous analyses, the Welch and Brown-Forsythe tests can be used to assess equality of means without assuming equal variances or normality (Cohen 2001).

The results of the Welch and Brown-Forsythe tests, in Table 23, are consistent with the results of the ANOVA indicating that there is a significant difference in means for firm age across the orientations and no significant difference in means between annual revenue and orientation. The Games-Howell tests can be used to determine specifically for which orientations the means are statistically different. The Games-Howell tests, in Table 24, indicate that there is statistical difference in firm age between service-oriented and hybrid-firms but no significant difference between firm age and service-oriented firms and product-oriented firms or hybrid-oriented and product-oriented firms.

Table 23 – Robust Tests for Equality of Means for Demographics

Demographics	Welch		Brown-Forsythe	
	Statistic[a]	Sig.[b]	Statistic[a]	Sig.[b]
Firm Age	3.562	.032	3.171	045
Annual Revenue	2.761	.068	2.854	.061

a. Asymptotically F distributed

b. Shaded cells indicate non-significant test results

The analysis presented in this section begins to identify some of the differences between product-oriented, service-oriented and hybrid firms. The results of the analysis indicate that there are significant differences in the capabilities across firms by orientation type, differences in their perspectives on transitioning across orientations and their demographics. The following section of this chapter analyses the relationship between orientation and capabilities.

Table 24 – Games-Howell Test for Demographics

Characteristic	Service Mean Difference[a]		Product Mean Difference[a]		Hybrid Mean Difference[a]	
	Product	Hybrid	Service	Hybrid	Service	Product
Firm Age	-2.842	-3.717*	2.842	-.875	3.717*	.875
Annual Revenue	-.79164	-.48729	.79164	.30435	.48729	-.30435

a. Shaded cells indicate non-significant test results

5.3 Capabilities that Characterise Software Firm Orientations

The primary objective of this research is to understand the capabilities that characterise product-oriented and service-oriented firms in the software industry. In doing so, the capabilities elicited in the first phase of the research were included in the second phase of the research and survey respondents were asked to indicate the degree to which their firm possesses each capability. Of specific interest is the relationship between the capabilities and the orientation of the firm.

To examine this relationship, it is necessary to express the 25 scale items in terms of linearly independent components. Examination of the correlation matrix indicated there is a proportion of common variance between some of the capabilities. This suggests that there is some overlap in capabilities or that they are similar in nature. Reduction of the data dimensions will achieve parsimony and reduce shared variance across the capabilities, allowing them to be included in a regression model.

One of the crucial considerations in the choice of a data reduction technique is determination of whether the scale should be treated as reflective or formative in nature. Formative indicators are observed variables that cause the latent variable, which affect the reflective indicators (Bollen 1989). In the case of this research the scale is formative in its characteristics. The scale and model are designed on the principle that orientation is a combination of the observed capabilities. Moreover, Jarvis et al. (2003) indicate that formative models differ from reflective models in the interchangeability of scale items. Reflective models typically have interchangeable scale items and share a common theme, and individual items can be dropped without altering the conceptual domain of the construct. Formative models are not interchangeable, and individual items cannot be

inserted without altering the conceptual domain of the construct, as is the case with the orientation of the capabilities. Diamantopoulos and Winklhofer (2001) argue that the choice in design and treatment between formative and reflective models should be driven by theoretical considerations related to the causal priority between indicators and the latent variable. Researchers also encourage consideration on the formative vs. reflective nature of constructs, particularly in business research (Diamantopoulos and Papadopoulos 2010; Coltman et al. 2008). In the case of capabilities and the orientation of the firm, it is clear that the capabilities are not interchangeable, and they are believed to have a causal relationship with the orientation of the firm. Thus, based on the theoretical structure of the model and its associated characteristics, the formative specification is most appropriate in this case.

The formative specification influences the choice of data reduction technique. Principal Component Analysis is a data reduction technique that statistically identifies independent components removing any shared variance with the original set components (Rao 1964). PCA was originally introduced by Pearson (1901) and further developed by Hotelling (1933). Shlens (2009) refers to PCA as one of the most valuable results from applied linear algebra. PCA "… linearly transforms an original set of variables into a substantially smaller set of uncorrelated variables that represent most of the information in the original set" (Dunteman 1989, 7). The technique is widely used in data analysis and social applied research (Rao 1964; Moore 1981; Jolliffe 2002). It has been applied in the analysis of genetic data (Reich et al. 2006; Price et al. 2006) and Ibrahim et al. (2009) apply the technique to identify the characteristics that represent organisational innovativeness.

PCA is often confused with factor analysis because of the similarities between the two techniques. Both are data reduction techniques, but factor analysis assumes that the co-variation in the observed variables is due to the presence of one or more of the factors (Jolliffe 2002, 158). Factor analysis assumes the factors have causal influence on the observed variables. PCA, meanwhile, makes no assumptions regarding causality; it is a variable reduction procedure for reducing a large number of variables into a smaller number of variables that account for the majority of variance in the larger set of variables. For the purposes of this analysis, PCA is the appropriate technique to reduce the 25

capability items to a smaller number of variables that can be used in subsequent analysis. PCA is also appropriate following the decision to proceed with the formative specification because PCA produces components that are orthogonal and a linear combination of the original items; there is no shared variance between components.

Prior to engaging in the PCA, the data is examined for suitability. Bartlett's Test of Sphericity and the KMO measure for sampling adequacy test the suitability of the data. A summary of the results is in Table 25. Note that since KMO is > .80, the variables are interrelated and share some common variance (Hair et al. 1995). Also note that Bartlett's test results in a significant chi-square statistic ($p < .001$), indicating that the data is suitable for PCA (Hair et al. 1995).

Table 25 – Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.890
Bartlett's Test of Sphericity	Approx. Chi-Square	2221.406
	Df	300.000
	Sig.	.000

The PCA was preformed with the varimax rotation. Originally developed by Kaiser (1958), the varimax rotation is by far the most popular rotation method (Dunteman 1989, 49; Abdi 2003). Varimax is the appropriate rotation in this case because of the formative specification of the scale, and it produces uncorrelated components. Of the available orthogonal rotations, the varimax rotation also maximises the variance of a column of the component matrix (instead of the rows) (Jolliffe 2002, 270). Each component will have either large or small loadings of any particular variable. The rotation results in a solution that makes it relatively easy to associate each variable with a single factor (Jolliffe 2002, 270; Abdi 2003). The rotated component matrix resulting from applying the principal component analysis in SPSS with varimax rotation is in Table 26.

Table 26 – Rotated Component Matrix

Capability	Component			
	1	2	3	4
Solution Design and Architecture	.792			
After Sales Support	.743			
Technically Proficient Management	.736			
New Product/Service Development	.703			
Quality Assurance	.703			
Research and Development	.692			
Cross-Functional Communication	.655			
Lead Customer Network	.569		.519	
Market Depth	.465			
Customer Education		.845		
Relationship Building		.761		
Customer Relationship Management		.669		
Knowledge and IP Management		.623		
Customer Expectation Management		.596		
Resource Management		.502		
Competitive Intelligence			.701	
Market Breadth			.659	
Contract Negotiation			.625	
Firm Brand Management			.577	
Market Anticipation			.564	
Demand Forecasting and Management	.465		.525	
Partner Vendor Management			.496	
Recruiting Effectiveness				.776
Investment in People				.740
Organisational Learning				.636

* items loading below .4 not shown

One of the critical decisions associated with PCA is choosing the number of components to retain. A number of different criteria need to be considered in making this decision. The rotated component matrix suggests the existence of four factors. Kaiser (1958) and Cattell (1966) suggest that eigenvalues determine what components are retained or dropped from the solution. Kaiser (1958) contends that components with eignevalues less than 1.0 are unstable and should be removed from the solution (known as Kaiser's rule). Costello and Osborne (2005) more recently point out that Kaiser's rule is one of the least accurate methods for determining the number of components to retain. They point out that the scree test is the best method for determining the number of components to retain. Cattell (1966) defined the scree test for determining the number of components to retain in solution. The test involves the examination for the scree plot to identify dominant components.

In the case of this solution, using eigenvalues greater than 1.0 as an initial criterion, the solution contains four unique factors. In addition to applying Kaiser's rule visual examination of the scree plot also confirms the existence of four dominant factors. Table 27 indicates that there is indeed shared variance across the capabilities. The scores for each of the four components are retained and used in subsequent analysis.

Table 27 – Total Variance Explained

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	8.951	35.803	35.803
2	3.549	14.197	50.000
3	1.472	5.889	55.889
4	1.178	4.712	60.601

The objective of completing the PCA was to reduce the 25 linearly dependent capability items into a smaller set of orthogonal variables. The PCA resulted in four orthogonal variables. Researchers indicate that the process of assigning meaning to the results of the PCA is based on the researchers' understanding of the study context and the original measurement variables (Rao 1964; Jolliffe 2002, 67). In this case, it is possible to examine the 25 capability items and the components they loaded onto respectively. The objective is to find some degree of commonality or relationship between the individual variables and the components on which they are loaded.

By examining the specific capabilities that load on each of the factors, it is clear that there are common themes related to each of the components. Table 28 summarises how the capabilities align to each of the components resulting from the PCA. Notice that the capabilities that load on the first component all relate to technology and associated processes within the firm. Similarly, there is a common theme across the capabilities that load on the second factor; they all relate to the customer and knowledge management aspects of the organisation. The capabilities loading on the third component all relate to functions of marketing and external partnerships. In addition, all the capabilities loading on the fourth factor relate to people.

Table 28 – Component Definition

Component	Dimension	Abbreviation	Capabilities
1	Technology and Process	TP	• Solution Design and Architecture • Cross-Functional Communication • New Product and Service Development • Technically Proficient Management • Lead Customer Network • Quality Assurance
2	Customer and Knowledge Management	CKM	• Relationship Building • Knowledge and IP Management • Resource Management • Customer Relationship Management • Customer Education • Customer Expectation Management
3	Marketing and Partnerships	MP	• Brand Management • Demand Forecasting and Management • Partner Vendor Management • Lead Customer Network • Market Breadth • Contract Negotiation • Competitive Intelligence • Market Anticipation
4	People	PPL	• Investment in People • Recruiting Effectiveness • Organisational Learning

The four components identified through the PCA are used in the following section of this chapter. They will be included in a model to examine the relationship between these sets of capabilities and their relationship to product orientation, service orientation and the hybrid orientation.

5.4 Capability Analysis

This section examines the relationship between the elicited capabilities and the firm's orientation. In this case, the dependent variable of interest is categorical in nature, with three possible unordered values (product, service, and hybrid). A multinomial logit model (MNL model) can be used to model the relationship between orientation and the elicited capabilities. The MNL model is chosen because it does not make assumptions

about normality, linearity and homogeneity of variances for the independent variables. It also supports an unordered categorical dependent variable (Press and Wilson 1978; Borooah 2002, 47; Hosmer and Lemeshow 2000, 31). The MNL model has been applied in a number of research domains. Dow and Endersby (2004) use the model to predict outcomes in voting research, and Bussiere and Fratzscher (2006) apply it to predict financial crises.

The multinomial logit (MNL) model is a generalisation of the binary logit model, which is a specialised case of the MNL where the dependent variable has only two outcomes. In the MNL model, the dependent variable can have multiple discrete outcomes. The estimation technique used in the MNL is similar to the binary logit model. In the binary logit model, the estimation is a prediction of one outcome vs. the other (0,1) with probabilities p and p-1 respectively. In the case of the MNL model, the estimation is a prediction of one of multiple outcomes with more than two possible choices (e.g., 0, 1, 2). The MNL model predicts the odds of the different outcomes compared to a baseline or reference outcome. In the case of three possible outcomes, Hosmer and Lemeshow (2000) describe the general expression for conditional probability as:

$$P(Y = j|x) = \frac{e^{g_j(x)}}{\sum_{k=0}^{2} e^{g_k(x)}}$$

where:

- x' is the covariate vector ($x_0, x_1, x_2, \ldots x_p$) of length p+1 with $x_0 = 1$ where p is the number of covariates in the model.
- $g_k(x)$ is the logit function where $g_k(x) = x'(\beta_{k0} + \beta_{k1} + \beta_{k2} \ldots + \beta_k)$ for k possible outcomes and the vectors $\beta_0 = 0$ and $g_0(x) = 0$

The multinomial regression model allows for examination of the influence of a number of variables at the same time. The impact of a variable can be assessed while controlling for the effectiveness of other variables in the model. One of the considerations for applying the MNL model is sample size. Hosmer and Lemeshow (2000, 340) provide

the guidance that the minimum number of cases per independent variable is 10. In this research the constructed MNL model exceeds the minimum recommended cases per independent variable. Press and Wilson (1978) also indicate that the MNL model is relatively robust when compared to other techniques with respect to violations in assumptions of normality and equality of variances.

The MNL model is similar to the Ordinary Least Squares (OLS) regression model, but there are significant differences. The OLS model calculates changes in the dependent variable. The MNL model however calculates changes in the log odds of the dependent variable, not changes in the variable itself. That is, MNL estimates the odds of an event occurring. In addition, instead of using a least-squared deviations criterion for best fit, the MNL model uses a maximum likelihood approach for determining best fit. This difference maximises the probability to correctly predict the observed results. Because of this difference, the indicators of fit such as the R^2 statistic referenced in the case of OLS are not applicable in the case of MNL.

In the case of the MNL model, goodness of fit tests includes the Pearson and deviance tests (Hosmer and Lemeshow 2000, 145). In both of these tests adequate fit corresponds to a finding of non-significance. Both of these tests are chi-square methods, with the Pearson statistic based on traditional chi-square and the deviance statistic based on likelihood chi-square. Menard (2002, 47) indicates that the deviance test is preferred over the Pearson test. In addition, the likelihood ratio indicates the probability that the observed values of the dependent variable can be predicted from the observed values. The likelihood ratio chi-square with $p < 0.05$ will indicate that the model fits significant better than the model will no predictors. Further to the likelihood ratio, the likelihood ratio test examines the significance of individual MNL regression coefficients for each independent variable. The likelihood ratio test is often preferred for the Wald statistic. Both aim to serve the same purpose, but recent research indicates that the Wald statistic is more susceptible to false negatives for large regression coefficients (Menard 2002, 39).

In the case of OLS regression, the R^2 value reflects the proportion of variance in the dependent variable associated with the independent variable. Larger R^2 values indicate that more variance is explained by the model and generally indicates a better fitting model. While in the case of the MNL model the R^2 statistic does not apply,

alternative pseudo R^2 statistics exist. McFadden (1974), Cox and Snell (1989) and Nagelkerke (1991) all have defined variations of a pseudo R^2 statistic that can be used to evaluate the MNL model. While these tests offer a supplement to the R^2 statistic in OLS, they do not measure the same property. The pseudo R^2 tests do not measure goodness of fit but more reflect a measurement of strength of association (Hosmer and Lemeshow 2000, 164; Borooah 2002, 62; Heinzl et al. 2005). As a result, researchers are divided on the appropriate interpretation pseudo R^2 values, with many cautioning or recommending against use in general (Aldrich and Nelson 1984, 58; Borooah 2002, 62)

One of the assumptions and inherent limitations of the multinomial logit model is that of Independence of Irrelevant Alternatives (IIA). IIA predicates that the odds of an outcome do not depend on alternatives that are not relevant (Borooah 2002, 72). The classic example that is used to illustrate IIA is in the case of commuters choosing between transportation models, assuming the options are car, bus and train. A multinomial model will estimate odds of one of the three outcomes. The model assumes that there is no difference in outcome based on irrelevant factors such as bus colour, train length etc. The IIA property implies that the variables omitted from the model are independent random variables (Hausman and McFadden 1984). This assumption is particularly relevant in the application of multinomial logit models in studies of consumer choice (e.g., Guadagni and Little 1983; Louviere and Woodworth 1983). Researchers have proposed tests to validate the IIA assumption (e.g., Hausman-McFadden). However, more recent research indicates that these tests of the IIA assumption are unsatisfactory for applied work (Cheng and Long 2007). Cheng and Long (2007) suggest that the MNL model should only be used in situations in which the outcome categories are plausibly distinct, can be weighed independently and are generally dissimilar. In the case of this research, the three classifications for orientation (product, service and hybrid) are distinct and dissimilar.

In examining the relationships between orientation and the firm's capabilities, the objective is to determine if a firm's capabilities are a statistically significant predictor of a firm's orientation (product, service, and hybrid). Tables 29, 30 and 31 summarise the results of the multinomial regression. The orientation variable is the dependent variable in the regression, and the firm's capabilities represent the independent variables. The

MNL model was constructed with product-oriented firms as the reference category. The selection of the reference category does not impact the outcome of the solution, but it is common practice to use the largest category (most cases) as the reference category (Borooah 2002, 49). Both Pearson and deviance tests for goodness of fit indicated a strong fit between the model and data with chi-Square = 317.008 and p = .411 for the Pearson test and chi-Square = 285.545 p = .856 for the deviance test.

The model fitting information in Table 29 indicates the existence of a relationship between the dependent variable (orientation) and some combination of the independent variables. With $p < 0.05$, the null hypothesis that there is no significant difference between the inclusion and exclusion of independent variables can be rejected.

Table 29 – Orientation Model Fitting Information

Model	**Model Fitting Criteria**	**Likelihood Ratio Tests**		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	357.313			
Final	285.545	71.768	12	.000

Table 30 provides additional insight on the relationships between orientation and the capabilities and three other variables that were included in the MNL model. Three of the capabilities indicate they are significant with $p < 0.05$; the regression likelihood ratio tests indicate that there is a statistically significant relationship between orientation and each of the sets of capabilities. The other two variables, firm age and firm size, are not significant. The predictive accuracy of the MNL model can be assessed by looking at the classification values in Table 31. The table shows correct and incorrect classifications of the dependent variable. The overall hit-rate of the model can be evaluated by comparing the chance hit-rate to the hit-rate achieved by the model. The commonly accepted benchmark to characterise MNL model usefulness is a 25% improvement over the rate of accuracy achievable by chance alone (Naderi 2009; Costea 2003). The proportional chance accuracy rate is defined by the proportional by chance hit-rate as the sum of squared percentages for each category plus 25% (Naderi 2009; Costea 2003). Thus, the proportional chance accuracy rate plus 25% is represented by:

$$[(.344)^2 + (.356)^2 + (.301)^2] * 1.25 \sim .42$$

Notice that the proportional chance accuracy rate plus 25% is 42%, the model predicts overall with an accuracy of 57.1%. Hence, the overall model is useful as it offers a substantial improvement over random assignment.

Table 30 – Orientation and Capabilities Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.[a]
Intercept	289.942	4.397	2	.111
Technology and Process	315.641	30.095	2	.000
Customer and Knowledge Management	309.986	24.441	2	.000
Marketing and Partnerships	290.708	5.163	2	.076
People	296.461	10.916	2	.004
Firm Age	287.894	2.349	2	.309
Firm Size	288.698	3.153	2	.207

a. Shaded cells indicate non-significant test results

Table 31 – Classification of Observed vs. Predicted Orientations

Observed	Predicted			
	Service	**Product**	**Hybrid**	**Percent Correct**
Service	37	11	8	66.1%
Product	9	41	8	70.7%
Hybrid	15	19	15	30.6%
Overall Percentage	37.4%	43.6%	19.0%	57.1%

The parameter estimates in Table 32 provide additional details with respect to each of the relationships. The estimated coefficients and the Wald statistic provide insight into the relationship between orientation and each of the independent variables. The model indicates relationships exist between the capabilities and firm orientation. The highlighted cells indicate where there is no significant relationship between a variable and orientation. Specifically there is no significant relationship between firm age, firm size and orientation. In addition, there is no significant relationship between hybrid firms

and marketing and partnership capabilities. The other capabilities indicate a significant relationship between the capabilities and orientation ($p < 0.05$).

Table 32 – Orientation and Capabilities Parameter Estimates

Orientation Grouping[a]		B	Std. Error	Wald	Sig.[b]	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Service	Intercept	3.984	1.944	4.201	.040			
	Technology and Process	-1.564	.340	21.137	.000	.209	.107	.408
	Customer and Knowledge Management	1.277	.296	18.601	.000	3.587	2.007	6.409
	Marketing and Partnerships	-.498	.240	4.306	.038	.607	.379	.973
	People	.944	.308	9.370	.002	2.570	1.404	4.703
	Firm Age	-.035	.032	1.161	.281	.966	.906	1.029
	Firm Size	-.251	.143	3.056	.080	.778	.588	1.031
Hybrid	Intercept	1.898	1.772	1.148	.284			
	Technology and Process	-.951	.309	9.447	.002	.386	.211	.708
	Customer and Knowledge Management	.726	.251	8.377	.004	2.067	1.264	3.379
	Marketing and Partnerships	-.104	.216	.232	.630	.901	.590	1.376
	People	.665	.293	5.161	.023	1.944	1.096	3.450
	Firm Age	.009	.028	.095	.758	1.009	.955	1.065
	Firm Size	-.123	.128	.915	.339	.884	.687	1.138

a. The reference category is: Product.
b. Shaded cells indicate non-significant test results

In the MNL model, the Parameter Estimates provide additional detail on the degree to which an independent variable differentiates the reference category from the other values of the dependent variable. In Table 32, B is the amount that the log odds of the dependent variable (orientation) changes when the independent variable changes one unit (Hosmer and Lemeshow 2000, 266). Exp(b) is generally used to interpret the

relationship in terms of effect size, the closer the odds ratio is to 1.0, the closer the predictor variable comes to being independent of the dependent variable. Values of Exp(b) that are above 1.0 indicate a positive influence and values below 1.0 indicate a negative influence.

The parameter estimates indicate that there is a negative relationship between the Technology and Process capability with respect to service-oriented firms relative to product-oriented firms ($p < 0.05$). There is a positive relationship between the Customer and Knowledge Management and People capabilities with respect to service-oriented firms relative to product-oriented firms ($p < 0.05$). There is significant negative relationship between the Marketing and Partnerships capabilities and a firm's service orientation when compared to a product orientation ($p < 0.05$). In service-oriented firms, the immaturity of the capabilities related to Technology and Process distinguish product-oriented firms from service-oriented firms. In service-oriented firms, the maturity of capabilities related to Customer and Knowledge Management as well as People distinguish between service-oriented firms and product-oriented firms. The other two variables are not significant ($p < 0.05$); firm age and annual revenue do not distinguish service-oriented firms from product-oriented firms.

Examining the hybrid category, the results are similar in direction of relationship to services when compared to products. With respect to the capabilities, three capabilities tested significant for hybrid orientation ($p < 0.05$). There is a negative relationship between Technology and Process and hybrid orientation relative to product orientation. There is positive relationship between hybrid orientation and Customer and Knowledge Management capabilities relative to product orientation. There is also a positive relationship between People capabilities and hybrid orientation relative to product orientation. Both of these capabilities also tested significant in the case of service-oriented firms relative to product-oriented firms, and notice that in the case of service-oriented firms the strength of the relationship is greater than is the case with hybrid firms. As is the case with service-oriented firms, there is no significant relationship between firm age, firm size and a hybrid orientation. Table 33 summarises the direction of relationships between capabilities and orientations.

Table 33 – MNL Model Findings Summary

		Product	Service	Hybrid
Capabilities	Technology and Process	+	-	-
	Customer and Knowledge Management	-	+	+
	Marketing and Partnerships	+	-	n/a
	People	-	+	+
Other	Firm Size	n/a	n/a	n/a
	Firm Age	n/a	n/a	n/a

\+ indicates a positive relationship exists ($p < 0.05$)
\- indicates a negative relationship exists ($p < 0.05$)
n/a indicates no relationships exists ($p < 0.05$)

In terms of magnitude, the following statements summarise the degree to which capability maturity contributes to the likelihood of a firm having a given orientation:

- For each unit increase in Customer and Knowledge Management capabilities, the likelihood of a firm having a service orientation increases by a factor of 3.6 and the likelihood of having a hybrid orientation increase by a factor of 2.1.
- For each unit increase in People-related capabilities, the likelihood of a firm having a service orientation increases by a factor of 2.6 and the likelihood of a firm having a hybrid orientation increases by a factor of 1.94.
- For each unit increase in Technology and Process capabilities, the likelihood of a firm having a service orientation decreases by a factor of .791 and the likelihood of having a hybrid orientation decreases by a factor of .614.
- For each unit increase in Marketing and Partnership capabilities, the likelihood of a firm having service orientation decreases by a factor of .393.

5.5 Summary

This chapter focused on the quantitative analysis associated with the data obtained from the second phase of the research. The data resulting from the administration of the survey was analysed using statistical techniques. Specifically:

- The Welch and Brown-Forsythe and Games-Howell procedures were used to test for significant differences in firm capabilities and demographics.
- PCA was used to reduce the 25 capability items to four linearly independent components.
- A MNL model was constructed to understand relationships between orientation and the capabilities as well as two control variables.

The findings of the analysis indicate that there are indeed statistically significant differences in characteristics between product-oriented and service-oriented firms. Moreover, there are statistically significant differences in how the elicited capabilities contribute to product, service and hybrid orientations. The following chapter discusses the theoretical and managerial implications of these findings in detail.

6.0 Summary and Conclusions

6.1 Introduction

The goal of this research was to characterise the capabilities that enable product orientation and service orientation in Canadian software firms. Chapter 1 provided an overview of the research questions of interest and the design of the study. Chapters 2 and 3 discussed three key bodies of literature in order to provide background with respect to the strategic orientations of firms, organisational capabilities, organisational evolution and the software industry. The review of the literature and data in these chapters led to the development of five hypotheses with respect to the capabilities that characterise product-oriented and service-oriented software firms. Chapter 4 discussed the process executed to perform phases one and two of the study. Chapter 5 presented a detailed analysis to examine the relationship between orientation and capabilities. This chapter discusses the overall findings of the research, implications and proposes future research opportunities.

6.2 Discussion of Results

This study was designed to understand the capabilities that characterise product-oriented and service-oriented software firms. A review of the literature led to the development of five hypotheses related to the capabilities the enable firms in the software industry with different orientations. These hypotheses and results testing are summarised in Table 34. With respect to the first hypothesis (H1), Table 32 supports these hypotheses as there are statistically significant differences in the maturity of capabilities across product-oriented, service-oriented and hybrid-oriented firms. Hypotheses H2, H3, H4 and H5 are supported based on the results of the MNL model (Table 32).

Table 34 – Summary of Hypothesis Findings

	Hypothesis	Finding
H1	There are a distinct set of capabilities that enable distinct orientations	Supported
H2	Service-oriented software firms are characterised by people intensive capabilities	Supported
H3	Service-oriented software firms are characterised by customer intensive capabilities	Supported
H4	Product-oriented software firms are characterised by technology intensive capabilities	Supported
H5	Product-oriented software firms are characterised by marketing intensive capabilities	Supported

In addition to testing for the specific hypotheses, the data collected in the first and second phases of the research study allowed for additional analysis and result in other relevant findings. The analysis also indicates the following:

- There are significant differences in how the firms of different orientations perceive the effectiveness of transition strategies from being product-oriented to service-oriented as well as from being service-oriented to being product-oriented.
- There is no evidence to indicate that orientation is related to firm revenue or firm age (Table 32).

This study also identified a hybrid orientation that lies between product orientation and service orientation. Hybrid-oriented firms distinguish themselves in terms of characteristics from both product-oriented and service-oriented firms by their control of delivery, customer/technology focus and solution customisation. The hybrid orientation differs more from product orientation than service orientation.

This research was focused on identifying the capabilities that distinguish between product orientation and service orientation in software firms. With respect to service-oriented firms, the findings of the research indicate that service-oriented firms are distinguished from product-oriented firms by their capabilities related to people, customers and knowledge management. This finding is consistent with the extant literature. Sink (2006, 116) highlights the importance of people and the dynamic between people in the firm and customers, employee focus on customers is critical to the success

of a services business. Hoch et al. (2000) point out that service-oriented software firms rely on a trust relationship between employees in the firm and customers. The extant literature pertaining to service orientation does not address the notion of knowledge management. Hybrid firms in comparison do not distinguish themselves from the other two orientations through people-related capabilities, but the existence of customer and knowledge management capabilities contributes positively to the probability that a firm has a hybrid orientation (similar to service-oriented firms, although the relationship is not as strong). There is little discussion in the literature pertaining to hybrid orientations and their representations.

The findings of this research indicate that technology and process capabilities characterise product orientations relative to service-oriented and hybrid-oriented firms. This finding is consistent with the views presented in the literature. Research indicates that these firms focus on production efficiencies, cost minimisation and new product development (Kaufman et al. 2002; Voss and Voss 2000). In the software industry, production efficiencies, cost minimisation and new product development are a function of technology capabilities and software development processes. Staying ahead of the technology curve is critical in the success of the product-oriented firms in the software industry (Nies 2005; Cook 2005; Lippman 2005). With respect to technology and process capabilities, they contribute negatively to the likelihood that a firm has a service orientation or hybrid orientation. The MNL model indicates that the negative relationship is stronger in the case of service-oriented firms than hybrid-oriented firms; this is explained by the fact that hybrid firms by definition are part product-oriented and part service-oriented.

Marketing and partnership capabilities also distinguish between the product orientations and service orientations. This finding agrees with the perspectives in the extant literature. Researchers are consistent in their view that marketing is crucial to the success of product-oriented software firms (Sink 2006; Hoch et al. 2000; Nies 2005; Cook 2005). In addition to consensus on the positive relationship between these capabilities and product-oriented firms, the literature also consistently recognises that marketing and partnership capabilities contribute negatively to the likelihood that firms

have a service orientation. Hoch et al. (2000) point out that service-oriented firms in the software industry often dedicate fewer, if any, resources to marketing.

This study also examined the relationship between two control variables and orientation specifically, firm size and firm age. The two control variables included in the study were age and firm size. The results of the study do not indicate a significant relationship between either of these variables and the probability that a firm has a product, service or hybrid orientation. Thus, it theoretically possible for firms to possess any orientation at any age or size. This finding differs from the views presented in the extant literature. Roberts (1990) postulates that technology firms begin as service-oriented and evolve towards product orientation. Roberts (1990) also found that as the age of the firm increases the likelihood of transition from product to service orientation decreases. From a growth and size perspective, Alajoutsijiirvi et al. (1999) presented that a shift from service intensive customer products towards standardised products is a key growth strategy for small software firms. Neither of these findings is supported by this research. One of the reasons for the discrepancy between Roberts (1990) and the findings of this study could be the timing of the studies. There is a 20-year gap between the study conducted by Roberts and this research, and the industry has changed significantly over that time. As Cusumano (2008) points out, a number of large prominent product-oriented firms are moving into the services business (e.g., HP).

Although not directly addressed by this research, the issue of transition across orientations is of great interest. The strategies and impediments to transition identified in this research only begin to address the issue of how firms transition across orientations. The findings of this research indicate that there are no significant differences in how firms view the impediments towards transitioning across orientations. However, there are significant differences in how firms by orientation view the transition strategies. Specifically, service-oriented firms rated transition through acquisition and organic growth as a less effective transition strategy relative to product and hybrid firms. Hybrid firms also rated transition through internal change as a more effective transition strategy than did product-oriented and service-oriented firms. It is interesting to note that on the issue of transition both product-oriented and service-oriented firms noted that shifting to the opposite orientation is most effectively achieved through acquisition. Hybrid firms

that already have aspects of the target orientation in the firm cite internal change as the most effective strategy. This could reflect the confidence these firms have in expanding their capabilities towards the target orientation and could also reflect the lack of confidence product-oriented and service-oriented firms have in their ability to change the organisation and move towards the opposing orientation. The extant literature pertaining to strategic orientations does not specifically address the strategies and impediments associated with transition across orientations, although there is acknowledgement that it does occur (e.g., Roberts 1990; Alajoutsijiirvi et al. 1999; Cusumano 2004). While not in the focus or scope for this research, the findings research to the issue of transition across orientations provide a foundation for future research.

6.3 Theoretical Implications

From a theoretical perspective, this study contributes to the literature pertaining to strategic orientations, capabilities and the software industry. This research adopted the comparative approach to organisational strategy introduced by Venkatraman (1989). Researchers have since used the comparative approach to understand the key dimension of an organisation's strategy as it pertains to different orientations (e.g., Lumpkin and Dess 1996; Jaworski and Kohli 1993). From a construct perspective, this is one of the few research studies to operationalise the strategic orientation of firms in terms of capabilities. This approach provides a basis for the operationalisation of other orientations in terms of capabilities and provides a mechanism for researchers to define at a more tactical level what it means for a firm to have a specific orientation. The bodies of literature related to strategic orientations (e.g., Morgan and Strong 2003; Prahalad and Hamel 1994; Jaworski and Kohli 1993; Covin and Slevin 1991) will benefit from the approach defined in this research study as it provides a basis for expressing other orientations in terms of a set of organisational capabilities.

Specifically in terms of product orientation and service orientation, the extant literature addresses these constructs at a fairly abstract level (e.g., Voss and Voss 2000; Lynn et al. 2000). The literature does not provide insight into what it tactically means for a firm to be service-oriented or product-oriented. This research operationalises the

product and service orientation constructs by defining the orientations in terms of the capabilities and characteristics that distinguish them. From a measurement perspective, the survey instrument designed in this study serves as the foundation for the development of a tool for measuring the product orientation or service orientation of a firm. The extant literature pertaining to strategic orientations contains measurement techniques for other orientations such as Entrepreneurial Orientation (e.g., Covin and Slevin 1991; Lumpkin and Dess 1996), but there is no research that focuses on measurement associated with product orientation and service orientation.

From a design and approach point of view, this study employs a novel technique to elicit capabilities at the organisational level. Other studies within the literature have elicited capabilities at the role-level (Hogan et al. 1984; Cran 1994; Herley 1998). Use of the CPX framework supported a novel, structured approach for capturing capabilities at the organisational level. Thus, the approach demonstrated in this study for eliciting organisational capabilities is a unique contribution to the body of literature pertaining to capabilities. Future research studies can leverage and refine the approach demonstrated in this study to elicit organisational capabilities. Research that focuses on understanding the operationalisation of organisational strategy can use the approach demonstrated in this study for elicitation of organisational perspective.

6.4 Managerial Implications

From a practical perspective, executives, managers, entrepreneurs and those with influence in software organisations can benefit from the findings of this research study. Managers and individuals in leadership positions within firms can use the findings of this research to evaluate the firm from an internal perspective and external perspective. In addition to evaluation, the knowledge resulting from this research related to specific relationships between the maturity of capabilities and orientations can aid managers and leaders in attaining their desired strategic positions.

The understanding of the characteristics that distinguish product-oriented, service-oriented and hybrid-oriented provides individuals in the software industry with a method

for identifying the strategic position of a firm. Having an understanding of these characteristics can be useful when evaluating the firm's own position in the market relative to competitors and other firms in the industry. Within the firm, this can help gauge the firm's orientation and serve as an indicator for intentional or unintentional deviation. With respect to competitors, a noticeable change in any of these characteristics may signal an intentional change in strategy or an unintentional deviation with respect to the firm's orientation.

From a capabilities perspective, an understanding of the capabilities that contribute positively and negatively to the likelihood that a firm has a product, service or hybrid orientation can help managers as they make decisions within the organisations. In the case in which a leader is interested in building or strengthening a product or service orientation, the results of this study can provide guidance on what the capabilities to focus to achieve the desired outcome. The capabilities help the firm understand where to focus to influence orientation. This focus then drives investment decisions, project portfolio prioritisation and resource allocation. This knowledge is crucial as business environments are continually facing challenges related to transformation and strategic renewal under the constraints of finite and scarce resources. The findings of this study provide leaders with grounded input to support decisions pertaining to achieving desired strategic orientations.

From a competitive standpoint, an understanding of the capabilities and relationships that exist between them and a firm's orientation can help with understanding or defending a competitive position. Firms scanning the competitive environment can use the findings of this research to identify competitors who may be seeking to move from one orientation to another or strengthen their position with an existing orientation. This knowledge and understanding may position the firm to defend its own position or prevent movement by competitors through counter-strategies.

Lastly, this research has taken two constructs that have been previously treated as relatively abstract in the literature "demystified" them such that they can be understood and applied by those outside of the immediate research community. Managers and leaders in the business community recognise, face and attempt to overcome the challenges associated with product and service orientations on a daily basis (e.g.,

Gerstner 2002; Nies 2005). Demystifying product orientation and service orientation using the organisational capabilities constructs potential opens up the research literature to the business community.

6.5 Limitations and Future Research

While the results of this research indicate that there are capabilities that distinguish between software firms with product, service and hybrid orientations, there are limitations associated with the findings of this research. In terms of being able to reproduce the results of this study, while maybe possible reproduce the results of this study outside of the Canadian software industry, it is likely not possible to do anywhere in the world. The software industry in the United States is similar to Canada, and execution of a similar study focusing on U.S. firms will likely result in similar findings; the nature of the software business in other countries is very different.

India, China and some eastern European countries have very different models across a number of dimensions. The economics of the industry vary in these countries in terms of chargeable rates. The distance from customers varies in these countries as, in many cases, there is significant geographic separation from customers. In addition, legalities surrounding patents and enforcement vary in these countries. All of these factors may contribute to variation in the capabilities that embody product and service orientations. However, the similarity between the Canada and the United States along these same dimensions may result in reproducible findings in the U.S. software industry. Examination of these orientations in different geographic regions represents an opportunity for future research. In addition to replication of this study in different geographies, other opportunities for future research exist that build on the findings of this study.

The software industry continues to evolve and grow at a faster pace than other industries. From a product orientation perspective, concepts such as open-source software are changing the business model under which the traditional product-oriented software firms operate. Operationally, this change will show up in the capabilities these firms

possess. Future research possibilities exist outside the context of this research study to understand the implications of these technologies and their impact on the capabilities that are representative of product-oriented firms.

Similarly from a service-orientation perspective, the continuing success of off-shore consultancies and service providers will change the way in which Canadian firms that provide services will compete. With off-shore firms charging lower rates and an increase of off-shore consultancies, there will be fewer and fewer opportunities to compete on cost, and it is likely the focus will have to shift towards a differentiation strategy. Cusumano (2008) points out that off-shore firms are already looking very similar in that they all for the most part compete on price. With rising labour rates, differentiation on price cannot continue, and these firms will be forced to innovate and shift focus on other strategies to achieve competitive advantage. Future research that examines the differences in capabilities between Canadian-based software services firms and off-shore software services firms may stand to benefit all firms seeking to strengthen or build a strong service orientation.

In addition to the trends that pertain to service-oriented and product-oriented firms, perhaps one of the more interesting opportunities for future research is in further understanding the capabilities of firms with hybrid orientations. Recently Oracle has announced that it will begin to move into the business of hardware (supported with its acquisition of Sun Microsystems). In addition, HP with its acquisition of Mercury and EDS is moving more towards a hybrid orientation, with a focus on both products and services. Cusumano (2008) also points out that, within the industry, product-oriented firms tend to be shifting focus on services to grow revenue streams. With firms traditionally focusing on one orientation moving towards other strategic orientations, there are opportunities for future research that focuses on understanding specific how these transitions are made, the extent to which short-term transitional capabilities are required to make these transitions and the capabilities that are required in the target state to sustain such a transition.

6.6 Conclusion

The purpose of this study was to identify the capabilities that characterise product-oriented and service-oriented firms in Canada's software industry. The research also examined the relationships between capabilities and orientations. The study was executed in two phases. The first phase focused on eliciting candidate capabilities through a set of expert interviews. The second phase adopted a survey approach to test for the existence of these capabilities in terms of their maturity within Canadian software firms.

The analysis of the data resulting from the second phase of the research study was analysed using multiple statistical analysis techniques. A comparison of means across a set of characteristics indicates that there are indeed significant differences in product, service and hybrid orientations. A multinomial logistic regression (MNL) model was constructed to examine the relationship between the elicited capabilities and the three orientations. The results of the MNL model indicate that there are indeed unique types of capabilities that distinguish between the orientations.

Both the research approach and the findings of this research study make significant contributions to the literature in the areas of strategic orientations and organisational capabilities. Researchers will benefit from the approach outlined in this study for eliciting and validating the existence of organisational capabilities, and the results of this research study will contribute to advancement in the development of the strategic orientation construct associated product, service and hybrid orientations. Practitioners in the software industry stand to benefit from the findings of this research, as they will be able to apply the findings to influence the progression of firm's strategic position towards a desired orientation.

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Appendices

Appendix A

Interviewee Recruitment

Subject: Software Industry Research Study – University of Waterloo

Participant Name,

My name is Rakinder Sembhi and I am a PhD student at the University of Waterloo in the Management Science department. I am currently working on fulfilling the dissertation requirement for my PhD. My thesis is focused on studying product and service orientations in the Canadian software industry. Specifically, the study focuses on identifying the capabilities that enable product and service orientations.

I am seeking your participation in the form of an interview. I am targeting participants such as yourself who are experienced professionals in the software industry with a solid understand of the dynamics of the software industry. Your responses to specific questions will be used to identify the capabilities that enable the product and service orientations of Canadian software firms.

Your participation in this study is entirely voluntary. Should you wish to participate, we can arrange a time to meet at a convenient location. The interview is expected to last an hour and will take the form of an informal discussion at a convenient meeting location.

This project has been reviewed and has received ethics clearance through the Office of Research Ethics at the University of Waterloo. Should you have any questions about the study, please contact either Rakinder Sembhi at rakinder@alumni.uwaterloo.ca or Dr. Rod McNaughton (519) 888-4567 ext. 32713, rmcnaughton@uwaterloo.ca.

Thank you for your time,

Rakinder Sembhi

University of Waterloo
Management Science

rakinder@alumni.uwaterloo.ca

Figure A3- Interviewee Solicitation Email

Interview Guide

Study Introduction

I would like to thank-you again for agreeing to participate in this discussion - I appreciate you taking time out of your schedule to assist in this research effort.

Before we begin with the actual interview, I would like to give you an overview of this research study and the goals of this interview specifically.

Study Overview

This research study focuses on building an understanding of the capabilities that characterise the strategic orientations of Canadian software firms. Specifically, the strategic orientations of interest are *product orientation* - a strategic position that supports the firm's ability to generate revenue from the sale of products and *service orientation* - a strategic position that supports the firm's ability to generate revenue from services. The research study that I have designed to build this understanding is composed of two phases.

The first phase of the study is the interview phase (in which we are currently participating). The goal of this first phase is to elicit the capabilities that characterise service orientations and product orientations in software firms. These capabilities will be elicited through interviewing industry subject matter experts such as yourself.

Following the first phase of the research, a second phase will focus on validating the results of the first phase using a survey approach. A broader group of individuals in the software industry will be asked to validate the identified capabilities.

Do you have any questions on the overall research study or approach?

Interview Format

The format of the interview will be focused and somewhat structured. I will start by asking a question and you can take your time to collect your thoughts and respond. I may ask follow-up or clarifying questions based on your response. The overall interview will consist of approximately ten questions and as much discussion as you would like. You will also have the opportunity to provide general comments, thoughts and feedback both throughout the interview and at the end.

- Consent to participate
    - Participant will be provided with a paper copy of the consent form to read, sign and return.
    - In some cases the consent form maybe emailed out ahead of time and may have been returned prior to the interview, in this case a copy of the form will be available for the participant's review.

Personal Introductions

- Personal Introduction
    - Academic
    - Professional
    - Personal

- Interviewee Introduction
    - Years of experience
    - Types of firms
    - Positions held

The Software Industry

- Do you see the software business as being unique from other types of businesses in other industries?

    - What do you believe causes these differences?
    - Are these differences more prevalent at the industry level or do they vary by organisation?
    - How do these differences impact an organisation's strategy?
    - How do these differences impact an organisation's operations?

Product-Oriented and Service-Oriented Firms

- Based on your experience, do you believe there are differences between organisation's that develop software products vs. those that focus on software services?

    - What do you believe are the unique properties of software product firms? Software services firms?

- Based on the IndustryPrint model, what processes/functional areas do you believe are most critical to the success of product-oriented firms / service-oriented firms? Note: the participant will be shown a copy of the IndustryPrint model (separate attachment).

    - Are these areas critical/important for all types of organisations or more so for software firms?
    - Are these areas specifically important for software firms that are product-oriented and

- Within critical functional areas/processes these areas, what do you believe the organisational capabilities are that are crucial to supporting success of the firm's orientation?

    - Product orientation?
    - Service orientation?

    Note that for the purposes of this research study a capability is being defined as "complex bundles of skills and collective learning, exercised through organisational processes that ensure superior coordination of functional activities". Capabilities have the following components:

    - Skill, technology or knowledge
    - Processes by which they are deployed, coordinated in the organisation
    - Differentiate the organisation from its competitors
    - Contribute to some type of competitive advantage in the target market

- For each capability:

    - *Probe:* Why does the interviewee believe this capability is crucial to supporting the orientation?
    - *Probe:* How do you believe organisations go about building these capabilities? Is there a process? Does it vary by capability? Type of organisation? Other factors?

- Are there functional areas that you believe are critical to both software product firms and software services firms?

- Are there capabilities within these common functional areas that apply to both product and service-oriented firms?

- Based on your experience, do these capabilities need to be built in a specific order? Are there certain capabilities that you have noticed emerged prior to others? Do you believe this is a requirement?

- Have you seen capabilities change over time with respect to the maturity of the firm's orientation? Do some capabilities mature at a faster/slower rate than others?

- Of the functional areas and capabilities identified for product-oriented firms, do you believe this varies based on:

    - The type of software product (e.g., enterprise server software vs. client side software?)
    - The geography of the software firm (GTA, USA, etc.)?
    - The size of the firm?
    - Structure (private equity vs. corporation)

- How do you see the application service provider's business model fitting into the framework of product-oriented firms and service-oriented firms?

    - More product-oriented? Service-oriented?
    - Do the capabilities still hold true?

- Assume you are the CEO of a large product-oriented (or service-oriented if more applicable) and you have been told by the board of directors that your firm needs to begin focusing more on products/services. What strategies do you employ to achieve this objective? What are the most significant impediments?

    - *Probe:* What organisational capabilities do you seek to build? Abandon? Focus on retaining?
    - *Probe:* In which areas of the firm do you focus investment? Where do you see opportunities to cutback?

Conclusions and Feedback

- Playback of key points discussed and confirmation.

- Do you have additional questions or anything you would like to add or discuss?

Interview Results

Table A1 – Capabilities Coded in CPX Framework

Capability	Competencies *Key Skills, Knowledge or Technology*	Processes *How competencies are deployed, organised, coordinated and embodied in the business*	External *How this capability connects with customers and/or suppliers*
After Sales Support	Providing customers with support after the sale of the product or delivery of the service such that their expectations are exceeded.	• Established after sale support organisation • Established SLAs with customers and internal communication/monitoring of SLAs • Training individuals to provide support with awareness of product/service and the specific customer	• Maintains contact with customers after the initial sale and influences customers' propensity to consume future products/services.
Relationship Building	Ability to build a relationship with a customer or key individuals in the customer's organisation. Requires an aptitude for reading people, political navigation and interpersonal skills.	• Providing formal opportunities to build and maintain networks • Development of networking skills at the individual level • Development of subject matter expertise in specific areas at that individual level	• These relationships are what generate sales opportunities for the organisation.
Research and Development	Maintaining the appropriate amount of R&D investment and directing investment to research areas that can lead to commercialisation. This capability also involves staffing the R&D function with individuals who have the intellectual skills and procedural discipline required to carry out research.	• Recruiting processes that attract researchers • Defined investment portfolio for R&D research funds • Tracking and reporting of portfolio performance and progress • Process of submitting, reviewing and approving new investments • Engineering planning function to support transition from ideation, R&D to product/service development	• Cornerstone for new innovations that will be included in future products/services. • Influences the firm's ability to deliver new and innovative products/services to customers. • Influences the firm's ability to 'disrupt" markets and create new ones.
Organisational Learning	Resources within the organisation are able to adapt and rapidly develop new skills based on role requirements and customer needs.	• Access to courses or training opportunities to allow employees to develop new skills • Dedicated budget for training of employees • Defined learning plans/paths for employees • Individuals with a desire to learn and acquire knowledge	• Required to respond to changing market demands.
Market Anticipation	Ability predict current and future customer needs/demands based on market scanning and research.	• Established relationships with existing customers to understand current unsatisfied needs • Ability to forecast beyond the demands of existing customers and identify future customer segments.	• Positions the firm to grow in the market, improve service to existing customers and attract new customers.
Cross-functional Communication	Effective communication between the different groups and functions within the firm (e.g., R&D, Product Development, Service Delivery, Sales etc.)	• Incentives for communication between R&D portfolio management and product/service development • Establishment of formal networking opportunities • Established processes for managing and identifying dependencies in current product/service offering portfolio or matrix-organisation structures that cross product/service offering boundaries (e.g., organisation by market segment)	• Influences the products/services that customers are offered, has an impact on the firm's ability to effectively meet the needs of individual customers and the market as a whole.

Table A1 (cont.) – Capabilities Coded in CPX Framework

Capability	Competencies *Key Skills, Knowledge or Technology*	Processes *How competencies are deployed, organised, coordinated and embodied in the business*	External *How this capability connects with customers and/or suppliers*
Knowledge and IP Management	Internal focus on managing knowledge and IP such that IP is protected and knowledge is disseminated throughout the organisation.	• Knowledge management systems that are used to retain IP • Training for individuals focusing on how to access knowledge within the organisation • Dedicated knowledge manager role for different products/services; these individuals are responsible for ensuring systems are maintain, updated and accurate	• Allows the firm to reduce delivery time through leveraging existing knowledge and work towards incremental improvements by building on existing knowledge.
Resource Management	Alignment of individual resources to the most appropriate roles based on their skills, interest and role requirements. This includes assignment of the right types of resources (e.g., contractors, FTEs) for each role.	• Defined staffing process considering enterprise wide demand and skills • Realignment process for un-aligned resources • Communication process for resources to indicate skills/preferences • Management knowledge of 'suitability' of role and resource type (e.g., FTEs vs. contractors)	• Influences the products/services that are developed. • From a customer perspective, individuals in key roles influence the quality of products/services that are delivered to end-customers.
Recruiting Effectiveness	Establishing a performing recruiting engine that recruits the right 'fit' of individual for the organisation, provides access to the appropriate volume of recruits (based on demand) and operates in a cost effective manner.	• HR understanding of roles and responsibilities within the firm Interview processes involving 'doers' (beyond HR) • Feedback from interviewers to recruiting (what went wrong/well) • Established relationships with recruiting firms and other partner organisations	• Influences the longer-term future of the firm and its ability to develop products and deliver products or services.
Customer Relationship Management	Maintaining and investing in relationships with customers.. Capturing information about current customers and using this information to offer new products/services; innovating based on this information.	• Individual-level skills in building and maintaining relationships • Organisation-level support and commitment of resources to enable individual relationship management • Recruiting efforts focused on recruiting individuals who have existing relationships. • Ability to identify current customers across the enterprise • Systems to support capturing of customer data, collection of metrics, analysis and reporting	• Influences the firm's ability to deliver the correct products and services to clients at the most appropriate time. • Provides the firm with a basis for serving current customer needs and developing future products/services for customers.
New Product/Service Development	Ability to develop/create new products and services and deploy these into the market place. Making the right decisions on what a product/service will be structured like (what will be included, what will be excluded).	• Alignment of product/service planning, management and development groups • Establishment of product/service planning organisation/group • Research to understand customer needs/preferences • Defined and communicated internal vision/plan for product and service offerings • Continuous planning and road mapping of the firms product/service offerings; includes having a multi-year forward looking plan towards future products/service offerings.	• Influences the future products/services that are delivered to customers
Competitive Intelligence	Understanding what competing firms are doing and where the firm stands with respect to its competition.	• Continual benchmarking of the organisation against competitors • Communication of organisation's position against competitors • Strategy for improving/maintaining competitive position	• Provides the firm with an understanding of where it is positioned in the market; allowing it to better satisfy customers needs through addressing gaps and elevating performance

Table A1 (cont.) – Capabilities Coded in CPX Framework

Capability	Competencies *Key Skills, Knowledge or Technology*	Processes *How competencies are deployed, organised, coordinated and embodied in the business*	External *How this capability connects with customers and/or suppliers*
Investment in People	Internal focus on investing, building and growing employees.	• Leadership support/recognition on the value of individuals • Defined recognition programs (support the how and when to provide recognition) • Training opportunities (opportunities for individuals to grow themselves) • Establishment of a mentoring culture within the firm • Training for mentors/coaches • Evaluation of coaches/mentors	• Builds employee commitment to serving customers in line with the organisation's goals and values
Technically Proficient Management	Technical skills within the management and executive ranks of the organisations.	• Managers who have technical skills and experience (have 'walked the line'). • Training and knowledge investment at 'upper' levels focused on refresh and training on new technologies	• Contributes to the overall quality and timeliness of the delivered product/service
Contact Negotiation	Legal knowledge and skills within the organisation to protect the firm from legal risks and litigation.	• Processes for legal contract review • Defined points within business processes indicating when legal function needs to be engaged • Risk management culture at all levels of the organisation	• Directly impacts the effectiveness of relationships with suppliers and customers by establishing the terms of engagement
Market Breadth	Focus and success in serving customers broadly across markets and organisations.	• Strategy to deliver cross-product/cross-service offerings to customers • Internal coordination of customer interactions, communications, messaging etc. • Internal ability to manage customer metrics (e.g., revenue / (product or service) etc.) e.g., not just considering technology but HR, training etc. • Have top performers in the market; have them understanding what is happening and where the market is going	• Connects with customers across different industry verticals
Market Depth	Focus and success in niche markets or parts of the organisation, focusing on deep subject matter expertise within the niche.	• Knowledge acquisition and growth within niche market • Building alliances/partnerships with firms in niche market	• Connects with customers deep within industry verticals and niches
Customer Education	Ability to make customers self-sufficient to the point where they can maintain a product/service themselves or have educated themselves enough to perform the service on their own.	• Individual desire to transfer knowledge and diffuse information • Executive/management support for knowledge sharing • Collaborative processes of engagement with customers (vs. proprietary)	• Adds to the firm's brand equity by aiding customer to build capability and create their own success.
Customer Expectation Management	Positioning the product/service early on such that the customer knows what to expect upon delivery.	• Individual based awareness of "what could go wrong" • Understanding of situation and desired outcomes and likely outcomes • Customer communications function (or marketing communications) that focused on delivering consistent and accurate messaging	• Impacts the firm's ability to meet and or exceed customer expectations which influence customer satisfaction and future growth potential

Table A1 (cont.) – Capabilities Coded in CPX Framework

Capability	Competencies *Key Skills, Knowledge or Technology*	Processes *How competencies are deployed, organised, coordinated and embodied in the business*	External *How this capability connects with customers and/or suppliers*
Lead Customer Network	Ability to build and maintain a network of lead customers that will be 'first-to-market' with new products/services, allowing them to test and provide feedback into early versions of the product/service.	• Pipeline/source for identify lead customers • Definition of programs for lead customers (processes for engagement and support) • Tracking of progress/performance of lead customers against tested products/service Incorporation of feedback from lead customers back into the organisation	• Influences the firm's ability to test products and services with 'trusted' clients
Partner/Vendor Management	Developing and maintaining a network of partner firms to complement or support creation/delivery of products or services.	• Established relationships with vendors/suppliers • Developed programs for managing relationships with vendors/suppliers • Leveraging of scale, size and strategy to obtain best possible pricing • Tracking and management of vendor/supplier performance	• Directly impacts the effectiveness supplier relationships by establishing the terms of engagement
Quality Assurance	Dedicated function within the firm that is focused on performing quality assurance on products/services.	• Defined processes to solicit review or testing • Benchmarked or defined process for evaluating quality (e.g., acceptable, not acceptable etc) • Recording, tracking and reporting feedback for action	• Impacts the perception of the firm's ability to deliver and establishes/maintains credibility
Firm Brand Management	Establishing and maintaining of the firm's brand within the market.	• Establishing and executing a branding strategy • Policies and procedures to identify non-compliance and risks to public perception • Training of employees to build awareness of brand positioning and protection	• Serves as the "external face" of the firm
Demand Forecasting and Management	Ability to predict future demand \for the firm's current product/service offerings	• Management of the firm's internal pipeline • Consistent contact with current customers to understand demand	• Influences the firm's ability to deliver products and services to customers and adequately address SLAs with suppliers
Solution Design and Architecture	Quality of the overall design of the software solution being delivered, in this case quality is measured by the degree to which the architecture functions, scales, performs and serves as a foundation for future development/extension.	• Established SDLC process (requirements, design, etc.) • Appropriate governance and gating at each phase of development or service delivery	• Differentiates the firm from its competitors through a superior product/service that is more viable in the long term

Appendix B

Survey Recruitment

Subject: Software Industry Research Study – University of Waterloo

My name is Rakinder Sembhi and I am a PhD student at the University of Waterloo in the Management Science department. I am currently working on fulfilling the dissertation requirement for my PhD. My research is focused on studying product and service orientations in the Canadian software industry. Specifically, the study focuses on identifying the capabilities that enable product and service orientations.

I am seeking your participation in a research study. I am targeting participants such as yourself who are experienced professionals in the software industry with a solid understand of the dynamics of the software industry. Participation in the study involves completion of an online survey which should take no more than 15-20 minutes to complete. Your responses to specific questions will be used to identify the capabilities that enable the product and service orientations of software firms.

Your participation in this study is entirely voluntary and anonymous. If you prefer not to participate and not be contacted regarding this research study in the future, reply to this email with the text "remove" at the beginning of your response.

This project has been reviewed and has received ethics clearance through the Office of Research Ethics at the University of Waterloo. Should you have any questions about the study, please contact either Rakinder Sembhi at rakinder@alumni.uwaterloo.ca or Dr. Rod McNaughton 1 (519) 888-4567 ext. 32713, rmcnaughton@uwaterloo.ca.

Thank you in advance for your time,

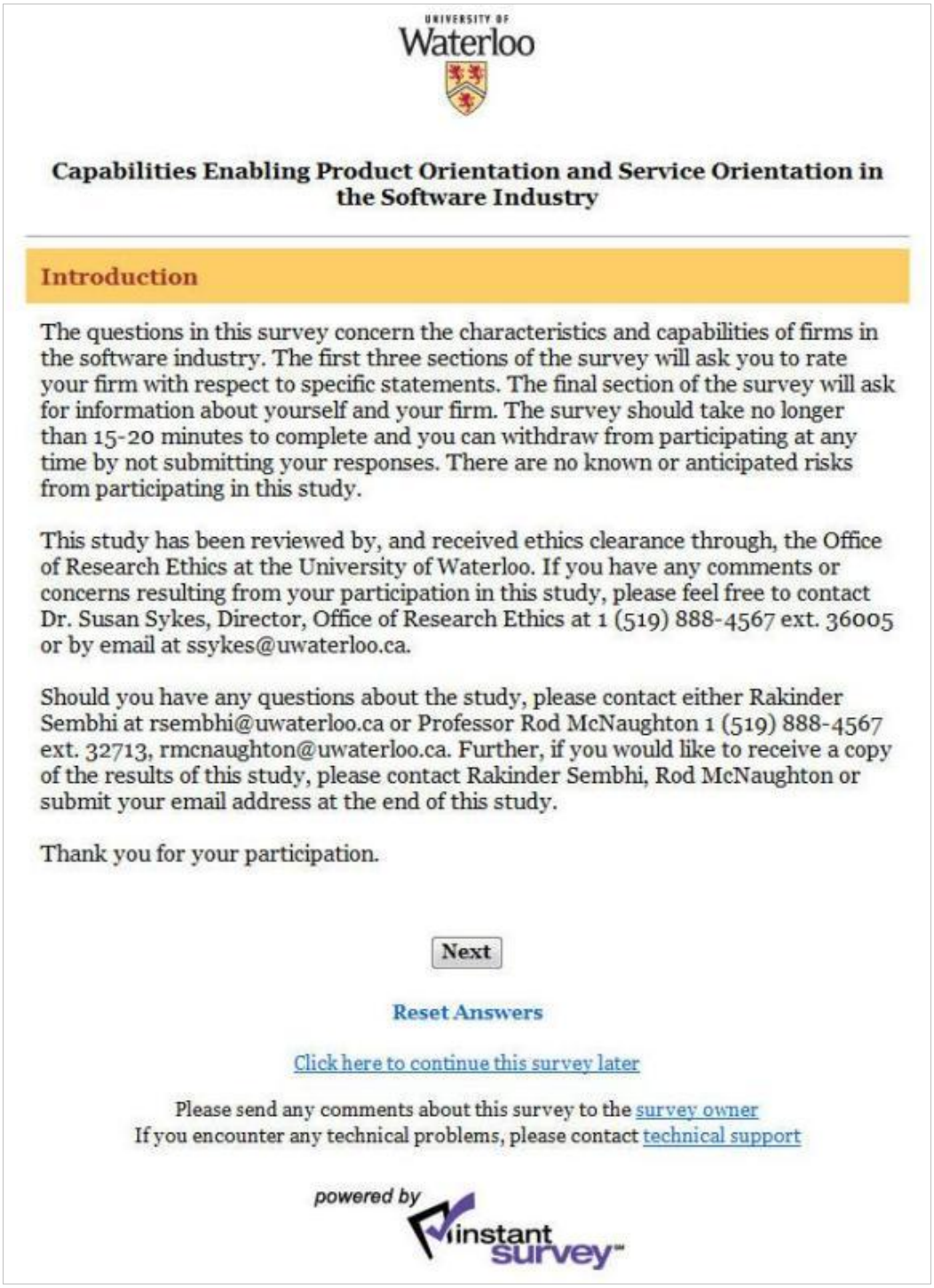
Rakinder Sembhi

University of Waterloo
Management Science

rakinder@alumni.uwaterloo.ca

Figure B1- Survey Respondent Solicitation Email

Survey Instrument



UNIVERSITY OF Waterloo

Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Introduction

The questions in this survey concern the characteristics and capabilities of firms in the software industry. The first three sections of the survey will ask you to rate your firm with respect to specific statements. The final section of the survey will ask for information about yourself and your firm. The survey should take no longer than 15-20 minutes to complete and you can withdraw from participating at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

This study has been reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. If you have any comments or concerns resulting from your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics at 1 (519) 888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

Should you have any questions about the study, please contact either Rakinder Sembhi at rsembhi@uwaterloo.ca or Professor Rod McNaughton 1 (519) 888-4567 ext. 32713, rmcnaughton@uwaterloo.ca. Further, if you would like to receive a copy of the results of this study, please contact Rakinder Sembhi, Rod McNaughton or submit your email address at the end of this study.

Thank you for your participation.

Next

Reset Answers

Click here to continue this survey later

Please send any comments about this survey to the survey owner
If you encounter any technical problems, please contact technical support

powered by instant survey

Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Security and Privacy Information

It is important for you to know that any information that you provide will be confidential. You do not need to identify yourself by name on any materials. All of the data will be summarized and no individual can be identified from the summarized results. Furthermore, the survey web-site is programmed to collect responses on the survey items alone. That is, the site will not collect any information that could potentially identify you (such as machine identifiers). Additionally, if you begin entering responses to the survey on the Web and then choose not to complete the survey, the information that you have already entered will not be transmitted to us.

The data collected from this study will be accessed only by the two researchers named above and will be maintained on a password-protected computer database in a restricted access area of the university. As well, the data will be electronically archived after completion of the study and maintained for two years after the research study has been completed and any submissions to journals have been completed.

If you have any questions regarding the security and privacy of your responses, please contact Rakinder Sembhi by email, rsembhi@uwaterloo.ca.

Next

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Please send any comments about this survey to the survey owner
If you encounter any technical problems, please contact technical support

Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Definitions

The following are definitions for a set of terms that are used in the following questions. Please review each of these to ensure a common understanding of the terminology used in the questions to follow:

Service-Oriented *(firm with a Service Orientation)*

In the context of this study, a service-oriented software firm is one that earns 50 percent or more of its revenue from the sale of services related software (e.g. consulting, or custom software development services). Note that software firms that develop products but deliver them or charge for them in a service-based model are not considered service-oriented for the purposes of this study (e.g. salesforce.com). These firms are considered product-oriented.

Product-Oriented *(firm with a Product Orientation)*

In the context of this study, a product-oriented software firm is one that earns 50 percent or more of its revenue from the sale of software products. Products maybe sold either in the consumer market or to enterprise customers. Software that provides base functionality but requires customization or provides the option of additional customization is also considered to be a product (e.g. SAP, Oracle etc.).

Firm

In the context of this study, when responding to questions regarding your firm, please consider the organization across all business units and geographies.

CxO

Acronym that generally refers to the Chief Officer roles within an organization, commonly used to categorize Chief Executive Officer (CEO), Chief Information Officer (CIO), etc.

Next

Reset Answers

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Please send any comments about this survey to the survey owner
If you encounter any technical problems, please contact technical support

Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Section 2 – Capabilities of Software Firms

For each of the following statements, please indicate the degree to which you believe your firm possesses the capability described and the level of maturity for each capability that is present. The following is a description of the maturity levels:

Level 0 – Non-Existent

The capability does not exist within the firm.

Level 1 – Initial

The capability is characterized as ad-hoc and occasionally even chaotic. Successful execution/use of the capability is dependent on individual efforts and heroics.

Level 2 – Repeatable

Basic management surrounds the execution of the capability (tracking cost, time, and quality). The necessary discipline is in place to repeat earlier successful use/execution of the capability.

Level 3 – Defined

The capabilities are documented, standardized, and integrated into a standard processes for the firm.

Level 4 – Managed

Detailed measures for capabilities and quality are collected. Both capabilities and outputs are quantitatively understood and controlled.

Level 5 – Optimized

Continuous capability improvement is facilitated by quantitative feedback and from piloting innovative ideas and technologies.

Next

Reset Answers

Click here to continue this survey later

Please send any comments about this survey to the survey owner
If you encounter any technical problems, please contact technical support

Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *After Sales Support*

Competencies

Providing customers with support after the sale of the product or delivery of the service such that their expectations are exceeded.

Processes

- Established after sale support organization
- Established service level agreements with customers and internal communication/monitoring of service level agreements
- Training individuals to provide support with awareness of product/service and the specific customer

External Influence

Maintains contact with customers after the initial sale and influences customers' propensity to consume future products/services.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

Reset Answers

Click here to continue this survey later

Please send any comments about this survey to the survey owner
If you encounter any technical problems, please contact technical support

Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: ***Relationship Building***

Competencies

Ability to build a relationship with a customer or key individuals in the customer's organization. Requires an aptitude for reading people, political navigation and interpersonal skills

Processes

Providing formal opportunities to build and maintain networks

- Development of networking skills at the individual level
- Development of subject matter expertise in specific areas at that individual level

External Influence

These relationships are what generate sales opportunities for the organization.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

Reset Answers

Click here to continue this survey later

Please send any comments about this survey to the survey owner
If you encounter any technical problems, please contact technical support

Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Research and Development*

Competencies

Maintaining the appropriate amount of R&D investment and directing investment to research areas that can lead to commercialization. This capability also involves staffing the R&D function with individuals who have the intellectual skills and procedural discipline required to carry out research.

Processes

- Recruiting processes that attract researchers
- Defined investment portfolio for R&D research funds
- Tracking and reporting of portfolio performance and progress
- Process of submitting, reviewing and approving new investments
- Engineering planning function to support transition from ideation, R&D to product/service development

External Influence

- Cornerstone for new innovations that will be included in future products/services.
- Influences the firm's ability to deliver new and innovative products/services to customers.
- Influences the firm's ability to 'disrupt" markets and create new ones.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

Reset Answers

Click here to continue this survey later

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Organizational Learning*

Competencies

Resources within the organization are able to adapt and rapidly develop new skills based on role requirements and customer needs.

Processes

- Access to courses or training opportunities to allow employees to develop new skills
- Dedicated budget for training of employees
- Defined learning plans/paths for employees
- Individuals with a desire to learn and acquire knowledge

External Influence

Required to respond to changing market demands.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	◉	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Market Anticipation*

Competencies

Ability predict current and future customer needs/demands based on market scanning and research.

Processes

- Established relationships with existing customers to understand current unsatisfied needs
- Ability to forecast beyond the demands of existing customers and identify future customer segments.

External Influence

Positions the firm to grow in the market, improve service to existing customers and attract new customers.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Cross-functional Communication*

Competencies

Effective communication between the different groups and functions within the firm (e.g. R&D, Product Development, Service Delivery, Sales etc.)

Processes

- Incentives for communication between R&D portfolio management and product/service development
- Establishment of formal networking opportunities
- Established processes for managing and identifying dependencies in current product/service offering portfolio or matrix-organization structures that cross product/service offering boundaries (e.g. organization by market segment)

External Influence

Influences the products/services that customers are offered, has an impact on the firm's ability to effectively meet the needs of individual customers and the market as a whole.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

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Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Knowledge and IP Management*

Competencies

Internal focus on managing knowledge and IP such that IP is protected and knowledge is disseminated throughout the organization.

Processes

- Knowledge management systems that are used to retain IP
- Training for individuals focusing on how to access knowledge within the organization
- Dedicated knowledge manager role for different products/services; these individuals are responsible for ensuring systems are maintain, updated and accurate

External Influence

Allows the firm to reduce delivery time through leveraging existing knowledge and work towards incremental improvements by building on existing knowledge.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	◉	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

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Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Resource Management*

Competencies

Alignment of individual resources to the most appropriate roles based on their skills, interest and role requirements. This includes assignment of the right types of resources (e.g. contractors, FTEs) for each role.

Processes

- Defined staffing process considering enterprise wide demand and skills
- Realignment process for un-aligned resources
- Communication process for resources to indicate skills/preferences
- Management knowledge of 'suitability' of role and resource type (e.g. FTEs vs. contractors)

External Influence

Influences the products/services that are developed. From a customer perspective, individuals in key roles influence the quality of products/services that are delivered to end-customers.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Recruiting Effectiveness*

Competencies

Establishing a performing recruiting engine that recruits the right 'fit' of individual for the organization, provides access to the appropriate volume of recruits (based on demand) and operates in a cost effective manner.

Processes

- HR understanding of roles and responsibilities within the firm
- Interview processes involving 'doers' (beyond HR)
  Feedback from interviewers to recruiting (what went wrong/well)
- Established relationships with recruiting firms and other partner organizations

External Influence

Influences the longer-term future of the firm and its ability to develop products and deliver products or services.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: ***Customer Relationship Management***

Competencies

Maintaining and investing in relationships with customers, Capturing information on current customers and using this information to offer new products/services; innovating based on this information.

Processes

- Individual-level skills in building and maintaining relationships
- Organization-level support and commitment of resources to enable individual relationship management
- Recruiting efforts focused on recruiting individuals who have existing relationships.
- Ability to identify current customers across the enterprise
- Systems to support capturing of customer data, collection of metrics, analysis and reporting

External Influence

- Influences the firm's ability to deliver the correct products and services to clients at the most appropriate time.
- Provides the firm with a basis for serving current customer needs and developing future products/services for customers.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: ***New Product/Service Development***

Competencies

Ability to develop/create new products and services and deploy these into the market place. Making the right decisions on what a product/service will be structured like (what will be included, what will be excluded).

Processes

- Alignment of product/service planning, management and development groups
- Establishment of product/service planning organization/group
- Research to understand customer needs/preferences
- Defined and communicated Internal vision/plan for product and service offerings
- Continuous planning and road mapping of the firms product/service offerings; includes having a multi-year forward looking plan towards future products/service offerings.

External Influence

Influences the future products/services that are delivered to customers

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Competitive Intelligence*

Competencies

Understanding what competing firms are doing and where the firm stands with respect to its competition.

Processes

- Continual benchmarking of the organization against competitors.
- Communication of organization's position against competitors.
- Strategy for improving/maintaining competitive position

External Influence

Provides the firm with an understanding of where it is positioned in the market; allowing it to better satisfy customers needs through addressing gaps and elevating performance.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: ***Investment in People***

Competencies

Internal focus on investing, building and growing employees.

Processes

- Leadership support/recognition on the value of individuals
- Defined recognition programs (support the how and when to provide recognition)
- Training opportunities (opportunities for individuals to grow themselves)
- Establishment of a mentoring culture within the firm
- Training for mentors/coaches.
- Evaluation of coaches/mentors.

External Influence

Builds employee commitment to serving customers inline with the organization's goals and values.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: ***Technically Proficient Management***

Competencies

Technical skills within the management and executive ranks of the organizations.

Processes

- Managers who have technical skills and experience (have 'walked the line').
- Training and knowledge investment at 'upper' levels focused on refresh and training on new technologies

External Influence

Contributes to the overall quality and timeliness of the delivered product/service.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Contract Negotiation*

Competencies

Legal knowledge and skills within the organization to protect the firm from legal risks and litigation.

Processes

- Processes for legal contract review.
- Defined points within business processes indicating when legal function needs to be engaged.
- Risk management culture at all levels of the organization.

External Influence

Directly impacts the effectiveness of relationships with suppliers and customers by establishing the terms of engagement.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Market Breadth*

Competencies

Focus and success in serving customers broadly across markets and organizations.

Processes

- Strategy to deliver cross-product/cross-service offerings to customers.
- Internal coordination of customer interactions, communications, messaging etc.
- Internal ability to manage customer metrics (e.g. revenue / (product or service) etc.)
  e.g. not just considering technology but HR, training etc.
- Have top performers in the market; have them understanding what is happening and where the market is going.

External Influence

Connects with customers across different industry verticals.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Market Depth*

Competencies

Focus and success in niche markets or parts of the organization, focusing on deep subject matter expertise within the niche.

Processes

- Knowledge acquisition and growth within niche market.
- Building alliances/partnerships with firms in niche market.

External Influence

Connects with customers deep within industry verticals and niches.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Customer Education*

Competencies

Ability to make customers self-sufficient to the point where they can maintain a product/service themselves or have educated themselves enough to perform the service on their own.

Processes

- Individual desire to transfer knowledge and diffuse information.
- Executive/management support for knowledge sharing.
- Collaborative processes of engagement with customers (vs. proprietary)

External Influence

Adds to the firm's brand equity by aiding customer to build capability and create their own success.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: ***Customer Expectation Management***

Competencies

Positioning the product/service early on such that the customer knows what to expect upon delivery.

Processes

- Individual based awareness of "what could go wrong"
- Understanding of situation and desired outcomes and likely outcomes.
- Customer communications function (or marketing communications) that focused on delivering consistent and accurate messaging.

External Influence

Impacts the firm's ability to meet and or exceed customer expectations which influence customer satisfaction and future growth potential.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Lead Customer Network*

Competencies

Ability to build and maintain a network of lead customers that will be 'first-to-market' with new products/services, allowing them to test and provide feedback into early versions of the product/service.

Processes

- Pipeline/source for identify lead customers.
- Definition of programs for lead customers (processes for engagement and support)
- Tracking of progress/performance of lead customers against tested products/service .
- Incorporation of feedback from lead customers back into the organization.

External Influence

Influences the firm's ability to test products and services with 'trusted' clients.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Partner/Vendor Management*

Competencies

Developing and maintaining a network of partner firms to complement or support creation/delivery of products or services.

Processes

- Established relationships with vendors/suppliers
- Developed programs for managing relationships with vendors/suppliers.
- Leveraging of scale, size and strategy to obtain best possible pricing.
- Tracking and management of vendor/supplier performance.

External Influence

Directly impacts the effectiveness supplier relationships by establishing the terms of engagement.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Quality Assurance*

Competencies

Dedicated function within the firm that is focused on performing quality assurance on products/services.

Processes

- Defined processes to solicit review or testing.
- Benchmarked or defined process for evaluating quality (e.g. acceptable, not acceptable etc)
- Recording, tracking and reporting feedback for action.

External Influence

Impacts the perception of the firm's ability to deliver and establishes/maintains credibility.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

Next

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Firm Brand Management*

Competencies

Establishing and maintaining of the firm's brand within the market.

Processes

- Establishing and executing a branding strategy.
- Policies and procedures to identify non-compliance and risks to public perception.
- Training of employees to build awareness of brand positioning and protection.

External Influence

Serves as the "external face" of the firm.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: ***Demand Forecasting and Management***

Competencies

Ability to predict future demand \for the firm's current product/service offerings.

Processes

- Management of the firm's internal pipeline.
- Consistent contact with current customers to understand demand.

External Influence

Influences the firm's ability to deliver products and services to customers and adequately address service level agreements with suppliers.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

---

Please indicate the degree to which you believe your firm possesses the following capability:

Capability: *Solution Design and Architecture*

Competencies

Quality of the overall design of the software solution being delivered, in this case quality is measured by the degree to which the architecture functions, scales, performs and serves as a foundation for future development/extension.

Processes

- Established software development lifecycle process (requirements, design, etc.)
- Appropriate governance and gating at each phase of development or service delivery.

External Influence

Differentiates the firm from its competitors through a superior product/service that is more viable in the long term.

Not Present	Initial	Repeatable	Defined	Managed	Optimized
0	1	2	3	4	5
○	○	○	○	○	○

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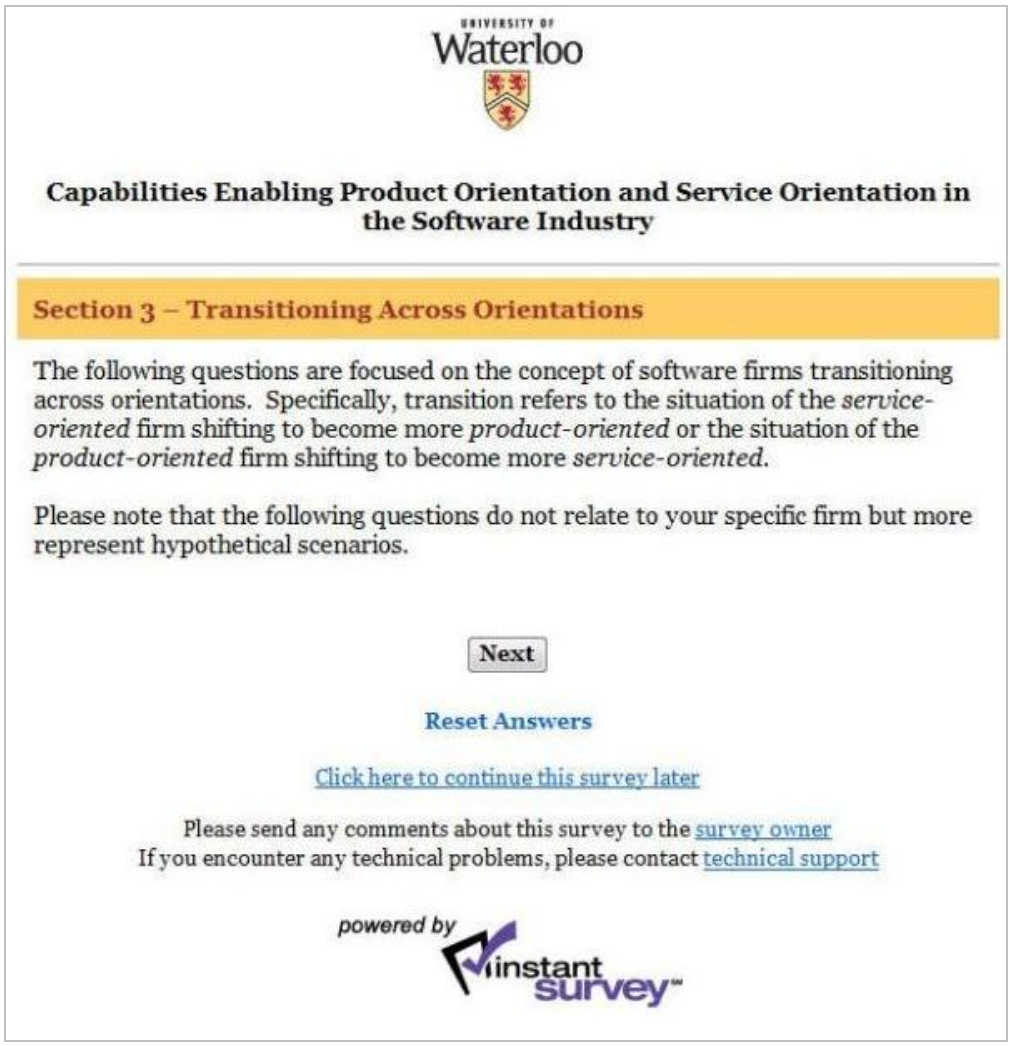

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Section 3 – Transitioning Across Orientations

The following questions are focused on the concept of software firms transitioning across orientations. Specifically, transition refers to the situation of the *service-oriented* firm shifting to become more *product-oriented* or the situation of the *product-oriented* firm shifting to become more *service-oriented*.

Please note that the following questions do not relate to your specific firm but more represent hypothetical scenarios.

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Consider the situation in which a software firm wishes to transition from a *product-orientation to a service-orientation*. All else being the same, rate the effectiveness of each general strategy for performing this transition:

	Not Effective 1	2	3	4	5	6	Very Effective 7
Acquisition of a service-oriented software firm	○	○	○	○	○	○	○
Organic growth (refers to the firm's ability to create a new division/department within the existing organization)	○	○	○	○	○	○	○
Internal change (refers to the firm's ability to change the focus and activities of existing parts of the organization)	○	○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

In the situation of the firm attempting to transition from a *product-orientation to a service-orientation* consider the following impediments to making such a transition. For each impediment, rate the degree to which you believe it contributes to the firm's overall ability to successful achieve the transition.

	Insignificant 1	2	3	4	5	6	Significant 7
Skills of people in the firm	○	○	○	○	○	○	○
Changing imbedded processes within the firm	○	○	○	○	○	○	○
Changing the perception of customers	○	○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Consider the situation in which a software firm wishes to transition from a *service-orientation to a product-orientation* (opposite of the previous two questions). All else being the same, rate the effectiveness of each general strategy for performing this transition:

	Least Effective 1	2	3	4	5	6	Most Effective 7
Acquisition of a product-oriented software firm	○	○	○	○	○	○	○
Organic growth (refers to the firm's ability to create a new division/department within the existing organization)	○	○	○	○	○	○	○
Internal change (refers to the firm's ability to change the focus and activities of existing parts of the organization)	○	○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

In the situation of the firm attempting to transition from a *service-orientation to a product-orientation* consider the following impediments to making such a transition. For each impediment, rate the degree to which you believe it contributes to the firm's overall ability to successfully achieve the transition.

	Insignificant 1	2	3	4	5	6	Significant 7
Skills of people in the firm	○	○	○	○	○	○	○
Changing imbedded processes within the firm	○	○	○	○	○	○	○
Changing the perception of customers	○	○	○	○	○	○	○

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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

Section 4 – Profile Information

Note that none of the information collected in this section will or can be used to identify you directly. This information will be used to categorize responses and will only be reported in aggregate.

About Your Firm

When answering the following questions about your firm, please consider the global organization across all business units and functions.

The firm's approximate total revenue (across all lines of business) is:

- $ 1 - $99,999
- $ 100,000 - $199,999
- $ 200,000 – $499,999
- $ 500,000 - $999,999
- $ 1,000,000 – $4,999,999
- $ 5,000,000 - $9,999,999
- $ 10,000,000 – 24,999,999
- $ 25,000,000 - $49,999,999
- $ 50,000,000 +

The firm was founded in:

Year of founding (e.g. 2001):

Please provide a breakdown of the proportion of total firm revenue that comes from the sale of products, service or other. When considering total revenue, consider global revenue across all business units (product/service lines):

% product	0
% service	0
% other	0
Remaining value	100

please describe the nature of 'other' revenue

Next

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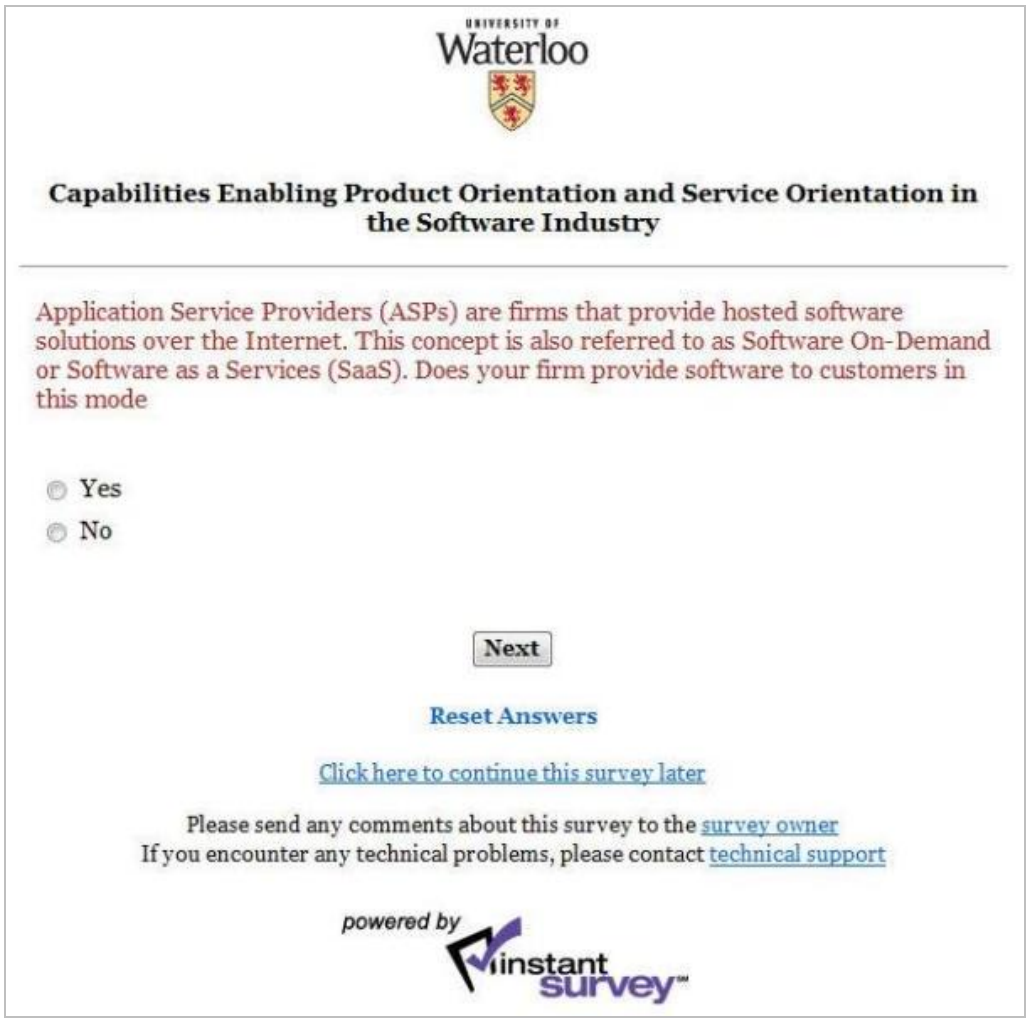
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Application Service Providers (ASPs) are firms that provide hosted software solutions over the Internet. This concept is also referred to as Software On-Demand or Software as a Services (SaaS). Does your firm provide software to customers in this mode
Yes
No
Next
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Capabilities Enabling Product Orientation and Service Orientation in the Software Industry

The total number of employees that work for the firm is (in all locations):

- 0 - 200
- 201 - 500
- 501 – 1000
- >1000

The ownership structure of your firm is:

- Private
- Public
- Other (Please describe):

The firm's revenue is distributed in the following proportions across markets:

% Revenue from Canada	0
% Revenue from United States of America	0
% Revenue from Mexico	0
% Revenue from South America	0
% Revenue from Europe	0
% Revenue from Asia	0
% Revenue from Australia	0
% Revenue from Africa	0
Remaining value	100

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What is your current role within your firm:

- (•) CxO
- ( ) Vice-President
- ( ) Director
- ( ) Senior Manger
- ( ) Manager
- ( ) Other

How many years of experience do you have within the software industry?

- ( ) 0 – 2 years
- ( ) 3 – 5 years
- ( ) 6 – 10 years
- (•) 11 – 15 years
- ( ) 16 + years

How many years of experience do you have with your current firm?

- ( ) 0 – 2 years
- ( ) 3 – 5 years
- (•) 6 – 10 years
- ( ) 11 – 15 years
- ( ) 16 + years

Email Address:
Only provide an email address if you wish to be informed of the study findings.

Finish

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Appendix C

Non-Response Bias

Table C1 – Means for Dependent Variables By Respondent Group

Variable	Respondent Group	N	Mean	Std. Deviation	Std. Error Mean
Revenue Group	Early	46	1.67	.701	.103
	Late	46	1.59	.717	.106
Firm Age Group	Early	46	2.39	.714	.105
	Late	46	2.13	.806	.119
Revenue from Products	Early	46	41.74	35.656	5.257
	Late	46	37.39	36.587	5.394
Revenue from Services	Early	46	58.04	35.847	5.285
	Late	46	62.61	36.587	5.394
Number of Employees	Early	46	1.09	.412	.061
	Late	46	1.09	.412	.061

Table C2 – Levene's Test for Equality of Variances for Dependent Variables

Variable	Group	F	Sig.
Revenue Group	Equal variances assumed	.117	.733
	Equal variances not assumed		
Firm Age Group	Equal variances assumed	.346	.558
	Equal variances not assumed		
Revenue from Products	Equal variances assumed	.154	.696
	Equal variances not assumed		
Revenue from Services	Equal variances assumed	.105	.746
	Equal variances not assumed		
Number of Employees	Equal variances assumed	.000	1.000
	Equal variances not assumed		

Table C3 – t-test for Equality of Means for Dependent Variables

Variable	Group	t	df	Sig. (2-tailed)
Revenue Group	Equal variances assumed	.588	90	
	Equal variances not assumed	.588	89.952	.558
Firm Age Group	Equal variances assumed	1.643	90	.104
	Equal variances not assumed	1.643	88.722	.104
Revenue from Products	Equal variances assumed	.577	90	.565
	Equal variances not assumed	.577	89.940	.565
Revenue from Services	Equal variances assumed	-.604	90	.547
	Equal variances not assumed	-.604	89.962	.547
Number of Employees	Equal variances assumed	.000	90	1.000
	Equal variances not assumed	.000	90.000	1.000

Table C4 –Means for Capability Responses by Respondent Group

Capability	Respondent Group	N	Mean	Std. Deviation	Std. Error Mean
After Sales Support	Early	46	3.07	1.143	.169
	Late	46	2.76	1.320	.195
Relationship Building	Early	46	2.83	1.371	.202
	Late	46	2.61	1.406	.207
Research and Development	Early	46	2.41	1.309	.193
	Late	46	2.20	1.376	.203
Organisational Learning	Early	46	2.37	1.271	.187
	Late	46	2.20	1.408	.208
Market Anticipation	Early	46	2.35	1.303	.192
	Late	46	2.13	1.327	.196
Cross-Functional Communication	Early	46	2.61	1.273	.188
	Late	46	2.43	1.344	.198
Knowledge and IP Management	Early	46	2.35	1.402	.207
	Late	46	2.09	1.347	.199
Resource Management	Early	46	2.76	1.268	.187
	Late	46	2.59	1.257	.185
Recruiting Effectiveness	Early	46	2.07	1.526	.225
	Late	46	2.02	1.570	.232
Customer Relationship Management	Early	46	2.43	1.377	.203
	Late	46	2.22	1.315	.194

Table C4 (cont) –Means for Capability Responses by Respondent Group

Capability	Respondent Group	N	Mean	Std. Deviation	Std. Error Mean
New Product/Service Development	Early	46	2.59	1.359	.200
	Late	46	2.63	1.289	.190
Competitive Intelligence	Early	46	2.22	1.534	.226
	Late	46	1.96	1.549	.228
Investment in People	Early	46	2.15	1.520	.224
	Late	46	2.11	1.509	.222
Technically Proficient Management	Early	46	3.72	1.004	.148
	Late	46	3.41	1.257	.185
Contract Negotiation	Early	46	2.02	1.325	.195
	Late	46	1.93	1.323	.195
Market Breadth	Early	46	1.87	1.392	.205
	Late	46	1.78	1.281	.189
Market Depth	Early	46	2.57	1.601	.236
	Late	46	2.57	1.455	.215
Customer Education	Early	46	2.28	1.486	.219
	Late	46	2.11	1.479	.218
Customer Expectation Management	Early	46	2.37	1.323	.195
	Late	46	2.15	1.414	.208
Lead Customer Network	Early	46	2.28	1.615	.238
	Late	46	1.98	1.598	.236
Partner Vendor Management	Early	46	2.30	1.443	.213
	Late	46	2.00	1.430	.211
Quality Assurance	Early	46	2.89	1.538	.227
	Late	46	2.63	1.583	.233
Firm Brand Management	Early	46	2.39	1.527	.225
	Late	46	2.17	1.465	.216
Demand Forecasting and Management	Early	46	2.15	1.475	.218
	Late	46	2.15	1.475	.218
Solution Design and Architecture	Early	46	3.26	1.373	.202
	Late	46	3.13	1.470	.217

Table C5 – Levene's Test for Equality of Variances for Capability Responses

Capability	Group	F	Sig.
After Sales Support	Equal variances assumed	1.897	.172
	Equal variances not assumed		
Relationship Building	Equal variances assumed	.079	.780
	Equal variances not assumed		
Research and Development	Equal variances assumed	.225	.636
	Equal variances not assumed		
Organisational Learning	Equal variances assumed	.477	.491
	Equal variances not assumed		
Market Anticipation	Equal variances assumed	.022	.882
	Equal variances not assumed		
Cross-Functional Communication	Equal variances assumed	.593	.443
	Equal variances not assumed		
Knowledge and IP Management	Equal variances assumed	.396	.531
	Equal variances not assumed		
Resource Management	Equal variances assumed	.002	.968
	Equal variances not assumed		
Recruiting Effectiveness	Equal variances assumed	.051	.822
	Equal variances not assumed		
Customer Relationship Management	Equal variances assumed	.502	.480
	Equal variances not assumed		
New Product/Service Development	Equal variances assumed	.558	.457
	Equal variances not assumed		
Competitive Intelligence	Equal variances assumed	.006	.941
	Equal variances not assumed		
Investment in People	Equal variances assumed	.060	.807
	Equal variances not assumed		
Technically Proficient Management	Equal variances assumed	3.425	.068
	Equal variances not assumed		
Contract Negotiation	Equal variances assumed	.001	.978
	Equal variances not assumed		
Market Breadth	Equal variances assumed	.494	.484
	Equal variances not assumed		
Market Depth	Equal variances assumed	.638	.427
	Equal variances not assumed		

Table C5 (cont.) – Levene's Test for Equality of Variances for Capability Responses

Capability	Group	F	Sig.
Customer Education	Equal variances assumed	.000	.991
	Equal variances not assumed		
Customer Expectation Management	Equal variances assumed	.165	.685
	Equal variances not assumed		
Lead Customer Network	Equal variances assumed	.064	.802
	Equal variances not assumed		
Partner Vendor Management	Equal variances assumed	.155	.695
	Equal variances not assumed		
Quality Assurance	Equal variances assumed	.458	.500
	Equal variances not assumed		
Firm Brand Management	Equal variances assumed	.573	.451
	Equal variances not assumed		
Demand Forecasting and Management	Equal variances assumed	.000	1.000
	Equal variances not assumed		
Solution Design and Architecture	Equal variances assumed	.632	.429
	Equal variances not assumed		

Table C6 – t-test for Equality of Means for Capability Responses

Capability	Group	t	df	Sig. (2-tailed)
After Sales Support	Equal variances assumed	1.182	90	.240
	Equal variances not assumed	1.182	88.206	.240
Relationship Building	Equal variances assumed	.751	90	.455
	Equal variances not assumed	.751	89.944	.455
Research and Development	Equal variances assumed	.776	90	.440
	Equal variances not assumed	.776	89.777	.440
Organisational Learning	Equal variances assumed	.622	90	.536
	Equal variances not assumed	.622	89.073	.536
Market Anticipation	Equal variances assumed	.793	90	.430
	Equal variances not assumed	.793	89.971	.430
Cross-Functional Communication	Equal variances assumed	.637	90	.526
	Equal variances not assumed	.637	89.737	.526
Knowledge and IP Management	Equal variances assumed	.910	90	.365
	Equal variances not assumed	.910	89.857	.365
Resource Management	Equal variances assumed	.660	90	.511
	Equal variances not assumed	.660	89.994	.511
Recruiting Effectiveness	Equal variances assumed	.135	90	.893
	Equal variances not assumed	.135	89.926	.893
Customer Relationship Management	Equal variances assumed	.774	90	.441
	Equal variances not assumed	.774	89.811	.441
New Product/Service Development	Equal variances assumed	-.157	90	.875
	Equal variances not assumed	-.157	89.744	.875
Competitive Intelligence	Equal variances assumed	.812	90	.419
	Equal variances not assumed	.812	89.991	.419
Investment in People	Equal variances assumed	.138	90	.891
	Equal variances not assumed	.138	89.995	.891
Technically Proficient Management	Equal variances assumed	1.283	90	.203
	Equal variances not assumed	1.283	85.783	.203
Contract Negotiation	Equal variances assumed	.315	90	.754
	Equal variances not assumed	.315	90.000	.754
Market Breadth	Equal variances assumed	.312	90	.756
	Equal variances not assumed	.312	89.382	.756
Market Depth	Equal variances assumed	.000	90	1.000
	Equal variances not assumed	.000	89.196	1.000

Table C6 (cont.) – t-test for Equality of Means for Capability Responses

Capability	Group	t	df	Sig. (2-tailed)
Customer Education	Equal variances assumed	.563	90	.575
	Equal variances not assumed	.563	89.998	.575
Customer Expectation Management	Equal variances assumed	.762	90	.448
	Equal variances not assumed	.762	89.604	.448
Lead Customer Network	Equal variances assumed	.909	90	.366
	Equal variances not assumed	.909	89.991	.366
Partner Vendor Management	Equal variances assumed	1.016	90	.312
	Equal variances not assumed	1.016	89.992	.312
Quality Assurance	Equal variances assumed	.802	90	.425
	Equal variances not assumed	.802	89.927	.425
Firm Brand Management	Equal variances assumed	.697	90	.488
	Equal variances not assumed	.697	89.846	.488
Demand Forecasting and Management	Equal variances assumed	.000	90	1.000
	Equal variances not assumed	.000	90.000	1.000
Solution Design and Architecture	Equal variances assumed	.440	90	.661
	Equal variances not assumed	.440	89.588	.661

Table C7 – Means for Transition Responses by Respondent Group

Transition Question	Respondent Group	N	Mean	Std. Deviation	Std. Error Mean
Transition from Product to Service via Acquisition	Early	46	4.04	1.885	.278
	Late	46	4.04	1.837	.271
Transition from Product to Service via Organic Growth	Early	46	4.39	1.468	.216
	Late	46	4.26	1.570	.231
Transition from Product to Service via Internal Change	Early	46	3.65	1.567	.231
	Late	46	3.43	1.601	.236
Transition from Product to Service impeded by Skills of People	Early	46	5.98	1.527	.225
	Late	46	5.80	1.857	.274
Transition from Product to Service impeded by Processes	Early	46	5.54	1.456	.215
	Late	46	5.28	1.797	.265
Transition from Product to Service impeded by Perception	Early	46	5.09	1.697	.250
	Late	46	4.65	2.024	.298
Transition from Service to Product via Acquisition	Early	46	4.78	1.837	.271
	Late	46	4.52	1.952	.288
Transition from Service to Product via Organic Growth	Early	46	4.28	1.882	.277
	Late	46	4.15	1.909	.281
Transition from Service to Product via Internal Change	Early	46	3.89	1.935	.285
	Late	46	3.76	1.957	.289
Transition from Service to Product impeded by Skills of People	Early	46	5.72	1.501	.221
	Late	46	5.63	1.830	.270
Transition from Service to Product impeded by Processes	Early	46	5.33	1.647	.243
	Late	46	5.24	1.911	.282
Transition from Service to Product impeded by Perception	Early	46	4.74	1.718	.253
	Late	46	4.39	1.972	.291

Table C8 – Levene's Test for Equality of Variances for Transition Responses

Transition Question	Group	F	Sig.
Transition from Product to Service via Acquisition	Equal variances assumed	.144	.706
	Equal variances not assumed		
Transition from Product to Service via Organic Growth	Equal variances assumed	.195	.660
	Equal variances not assumed		
Transition from Product to Service via Internal Change	Equal variances assumed	.241	.625
	Equal variances not assumed		
Transition from Product to Service impeded by Skills of People	Equal variances assumed	2.063	.154
	Equal variances not assumed		
Transition from Product to Service impeded by Processes	Equal variances assumed	2.321	.131
	Equal variances not assumed		
Transition from Product to Service impeded by Perception	Equal variances assumed	2.502	.117
	Equal variances not assumed		
Transition from Service to Product via Acquisition	Equal variances assumed	.292	.590
	Equal variances not assumed		
Transition from Service to Product via Organic Growth	Equal variances assumed	.035	.853
	Equal variances not assumed		
Transition from Service to Product via Internal Change	Equal variances assumed	.063	.802
	Equal variances not assumed		
Transition from Service to Product impeded by Skills of People	Equal variances assumed	2.145	.147
	Equal variances not assumed		
Transition from Service to Product impeded by Processes	Equal variances assumed	1.280	.261
	Equal variances not assumed		
Transition from Service to Product impeded by Perception	Equal variances assumed	1.411	.238
	Equal variances not assumed		

Table C9 – t-test for Equality of Means for Transition Responses

Transition Question	Group	t	df	Sig. (2-tailed)
Transition from Product to Service via Acquisition	Equal variances assumed	.000	90	1.000
	Equal variances not assumed	.000	89.941	1.000
Transition from Product to Service via Organic Growth	Equal variances assumed	.412	90	.682
	Equal variances not assumed	.412	89.598	.682
Transition from Product to Service via Internal Change	Equal variances assumed	.658	90	.512
	Equal variances not assumed	.658	89.958	.512
Transition from Product to Service impeded by Skills of People	Equal variances assumed	.491	90	.625
	Equal variances not assumed	.491	86.763	.625
Transition from Product to Service impeded by Processes	Equal variances assumed	.765	90	.446
	Equal variances not assumed	.765	86.291	.446
Transition from Product to Service impeded by Perception	Equal variances assumed	1.116	90	.267
	Equal variances not assumed	1.116	87.343	.267
Transition from Service to Product via Acquisition	Equal variances assumed	.660	90	.511
	Equal variances not assumed	.660	89.669	.511
Transition from Service to Product via Organic Growth	Equal variances assumed	.330	90	.742
	Equal variances not assumed	.330	89.982	.742
Transition from Service to Product via Internal Change	Equal variances assumed	.321	90	.749
	Equal variances not assumed	.321	89.988	.749
Transition from Service to Product impeded by Skills of People	Equal variances assumed	.249	90	.804
	Equal variances not assumed	.249	86.672	.804
Transition from Service to Product impeded by Processes	Equal variances assumed	.234	90	.816
	Equal variances not assumed	.234	88.083	.816
Transition from Service to Product impeded by Perception	Equal variances assumed	.902	90	.369
	Equal variances not assumed	.902	88.348	.370