Service Combinative Capabilities and Service Operations Strategy: Formulation, Process and Antecedents

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Abstract

Service companies face even greater challenges due to the direct involvement of customers and the dynamics of customer demand. In order to survive or stay ahead, service companies need appropriate operations strategies that are effective in driving their performance, as well as being in line with their resource profiles. Therefore, two fundamental areas become particularly important: (1) decisions on the strategy content to develop operations strategies that provide the right kinds of capabilities to be competitive, and (2) the means by which capabilities can be built up into a service operations strategy.

The literature on both manufacturing and service operations strategy has long recognized the generic capabilities of quality, delivery, cost and flexibility as the most important operational objectives. This dissertation follows this capability-based operations strategy view, and attempts to address the above two questions through three empirical studies. The first study focuses on the first research question by examining the impact of various service operations strategies with different combinative capabilities on business performance. It also investigates the influence of environmental factors on various strategic choices. Following the "sand cone" model, the second study explores the process of establishing a service operations strategy with multiple capabilities. Specifically, it examines the impact of acquiring flexibility, which is situated at the top of the pyramid suggested by the "sand cone" model, on companies' existing capabilities. The third study focuses on an important strategic decision area, organizational mechanisms, and tries to find

out how service companies can make use of their structural and contextual organizational mechanisms to improve their service agility.

Survey data and panel data are used for this dissertation. Structural equation models, regressions, and data envelopment analysis (DEA) methods are applied in the studies. In general, the findings indicate that service companies can have strategic choices other than being "focused" or "all-round". However, the most effective service operations strategies tend to be rooted in excellence in quality and delivery, which is aligned with the "sand cone" progressive route. In terms of strategy establishment, building additional capability is likely to affect existing capabilities negatively. The magnitude of the impact, however, reduces along the pyramid route. Furthermore, organizational mechanisms, including metaroutines, job enrichment, incentives and trust, can be used to help service companies achieve and improve service agility.

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CHAPTER 1 – INTRODUCTION

1.1 Introduction

The discipline of operations management has evolved from its core areas in factory management, production engineering and industrial engineering into the combination of both a strong core and interfaces with other disciplines such as behavioural science, information management and strategy (Meredith 2001; Voss 1995). It has also evolved from this core to embrace operations in services. Operations strategy, in particular, has been a major area of research in operations management since the early work by Skinner (1969):

> A company's competitive strategy at a given time places particular demands on its manufacturing function, and, conversely, that the company's manufacturing posture and operations should be specifically designed to fulfill the task demanded by strategic plans. [Unfortunately,] too often top management overlooks manufacturing's potential to strengthen or weaken a company's competitive ability.

This suggestion of the strong tie between operations strategy and overall corporate strategy, as well as the identification of the absence of operations in the corporate strategic planning process, has influenced the development of operations management. Following the seminal work of Skinner (1969; 1974) and subsequently Hayes and Wheelwright (1984) and Hill (1985; 1989), a significant body of studies related to the theories and practice of operations strategy has emerged in the past decades (Corbett and van Wassenhove 1993; Fine and Hax 1985; Noble 1995; Swamidass and Newell 1987; Swink and Way 1995; Ward et al. 1995; Williams et al. 1995). The majority of operations strategy research has been in a manufacturing context. There has been, however, an increasing effort devoted to the study of service operations strategy in recent years (Roth and Menor 2003; Spring and Araujo 2009).

Operations strategy can help companies in multiple ways. It can serve as a functional strategy to shape the competitive advantage in supporting the business in this function. Taking a broader view, it can also appear at the corporate level to influence the overall business directions (Hofer and Schendel 1978). More specifically, Hayes and Wheelwright (1984) described the strategic roles of operations in four stages:

> (1) Internally neutral: the objective is to minimize the negative impact of the manufacturing function; (2) Externally neutral: the objective is to maintain parity with competitors, usually by following industry practice; (3) Internally supportive: manufacturing exists to support business strategy. Manufacturing investments are checked for consistency at the business level and the implications of business strategy changes for manufacturing are considered; (4) Externally supportive: manufacturing capabilities shape business strategy in terms of the types of products developed and the ways in which markets are addressed. Manufacturing leads rather than follows and long range programmes are implemented to acquire capabilities in advance of needs. (Mills et al. 1995)

The four-stages view suggests that the essence of operations strategy lies in the selection and establishment of capabilities which influence companies' business performance and competitive advantage (Boyer and Lewis 2002; Leonard-Barton 1992; Neely and Wilson 1992; Noble 1995; Platts and Gregory 1990; Prahalad and Hamel 1990; Stalk et al. 1990).

Two perspectives are central to operations strategy (Miller and Roth 1994). The first perspective is the pattern of operations choices that a company makes (Hayes and Wheelwright 1984; Hayes et al. 1988; Hill 1989; Wheelwright 1984). There are two types of operations choices; structural and infrastructural (Hayes and Wheelwright 1984). Choices in structure refer to the decisions about facilities, capacity, location, and operational process, which have been the focus in earlier operations strategy research (Hayes and Schmenner 1978; Hayes and Wheelwright 1979; Schmenner 1976; Skinner 1969). A holistic perspective has been adopted in

some studies to pay attention to the infrastructural choices, such as organization, performance measurement and management style (Berry and Hill 1992; Kinnie and Staughton 1991; Platts and Gregory 1990). This perspective of operations strategy has been brought into service context with the addition of integration to structure and infrastructure (Roth and Menor 2003). The choices in structure, infrastructure and integration serve as a major component of service delivery system.

The second perspective refers to the operations task – the outcome of operations in terms of performance on a number of dimensions. This perspective has been seen as choosing the capabilities to contribute to a company's competitiveness or competitive positioning. Competitive capabilities typically include; quality, delivery, cost and flexibility (Boyer and Lewis 2002; Ferdows and De Meyer 1990; Menor et al. 2001; Neely and Wilson 1992; Noble 1995; Platts and Gregory 1990; Roth 1996; Wheelwright 1984; Youndt et al. 1996). These capabilities are considered as customer order winners and qualifiers (Hill 1989). A company's operations strategy, according to the second perspective, can be described in terms of which of the four competitive capabilities the company chooses to develop a competitive edge.

The literature has examined the second perspective of operations strategy from a number of aspects. The first aspect originated from Boston University's International Manufacturing Future Research Project (Ferdows and De Meyer 1990; Miller and Roth 1988; Nakane 1986). Based on their observations on Japanese manufacturing companies, they found that companies can excel in more than one capability, especially if these capabilities are built in a cumulative way with a certain sequence. The sequential process of establishing capability was described as the "sand cone" model, which suggests that companies are able to acquire multiple capabilities by building them in the order of quality, delivery, cost and flexibility (Ferdows and De

Meyer 1990; Noble 1995). This model has been explained by the competitive progression theory (Roth 1996; Rosenzweig and Roth 2004). Competitive progression theory suggests that the process of acquiring combinative capabilities is associated with organizational learning over an innovation cycle. Companies learn new knowledge every time they acquire additional capability. They evaluate and utilize new knowledge to improve process coordination and reduce process variation so as to influence business performance. However, the capability-based improvement may not be a simply linear process of strategy formulation and implementation but an iterative process (Rytter et al. 2007). In the process of capability accumulation, companies need not only to know the sequence of capability acquisition, but also to be aware that it is risky to focus exclusively on the development of additional capabilities, since the emergence of new capabilities may divert critical resources from the established capabilities and undermine their effectiveness. Hence, a comprehensive knowledge of the acquisition interactions of multiple capabilities is important to ensure the competitive advantage is sustainable.

The second aspect investigates companies' operations strategy from their choices of capabilities and the impact of the choices on business performance (D'Aveni and Gunther 1994; Kathuria 2000; Menor et al. 2001; Miller and Roth 1994; Zhao et al. 2006). Previous studies have primarily used taxonomy analysis to classify strategy groups with similar capability choices. These strategy groups indicate the capability sets companies have chosen and implemented. The linkage between the capability choices and business performance is useful in revealing insights on underlying structures of operational competition (Frohlich and Dixon 2001). However, taxonomy analysis only provides understanding on the capability choices that have been chosen by sampled companies. A systematic approach may be required to

examine all potential capability choices and their impact on business performance to offer companies a richer guidance on the strategic configuration options.

The debate between "focused" operations strategy and "agile" operations strategy has drawn much attention in the literature. Early studies have suggested that companies should focus on one capability to be competitive due to the trade-off effect (Skinner 1974). Trade-off theory argues that the establishment of one capability must be at the price of weakening another (Porter 1980; Sasser et al. 1978; Skinner 1978). The agility strategy, in contrast, suggests that companies should excel simultaneously in the four competitive capabilities of quality, delivery, cost and flexibility in order to develop a competitive edge (Burgess 1994; Fliedner and Vokurka 1997; Menor et al. 2001; Yusuf et al. 1999). Agile operations strategy is seen to be viable under a rapidly changing environment. It is aligned with the competitive progression theory in that companies can follow accumulative path to build multiple capabilities in the sequence suggested by the "sand cone" model. The final aspect connects operations strategy with the resource-based view theory. Resource-based view theory has suggested that each company is different in the physical and intangible assets so that the "appropriate" resource arrangement has to vary from one company to another (Paiva et al. 2008). Therefore, when companies utilize their resources to build operational capabilities, the competitive edge is more likely to come from the alignment between companies' resource profiles and capability choices. The resource-based view indicates that companies are likely to achieve competitive advantage through effective and flexible assembly and deployment of the most appropriate internal resources (Collis and Montgomery 1995). The choices of capabilities, accordingly, may vary for different companies due to their different resource profiles.

The two perspectives of operations strategy have been considered to be linked in the way that the first perspective, the pattern of choices in structure and infrastructure, must be congruent with the second perspective, the operations task (Anderson et al. 1989; Fine and Hax 1985; Miller and Roth 1994). Competitive advantage and effective operations strategy are considered to be derived through the key operational capabilities associated with the important pattern of choices.

> The portfolio of core competencies would be linked to various operating decisions which are normally dictated by a market-based strategy…Along with decisions regarding the organizational infrastructure, such as human resource and management information system, these critical operating decisions would come to represent the structural expression of core competencies within both the resource-based view and operations strategy. (Gagnon 1999)

With the increasingly important role service industries play in the economy, more and more researchers have stressed the need to extend the operations strategy into the service field (Davidow and Uttal 1989; Johnston 2005; Nie and Kellogg 1999). Many studies have used typology or classification to understand the design and delivery of services and gain insights into strategic service management. The frameworks or the perspectives of these classifications evolve from the product/process link and customer contact (Chase 1981; Hayes and Wheelwright 1979), to the service process and the service process/service package (SP/SP) matrix (Kellogg and Nie 1995; Schmenner 1986), and to system designs and operations (Schmenner 2004; Wemmerlov 1990). However, Roth and Menor have pointed out that:

> Much of the descriptive and explanatory work behind existing service classifications requires rigorous testing…Focusing specifically on service operations strategy, a number of prescriptive and competing SOM frameworks are especially deserving of ongoing research…including studies focused on practices-capabilities-performance relationship. (Roth and Menor 2003)

Therefore, significant effort is needed to gain understanding on the pattern of operations choice in the service sector and the capabilities that service companies must have to establish competitive advantage.

This thesis seeks to address the questions raised above by investigating the capability-sets for effective service operations strategy, the process of acquiring multiple capabilities, and the facilitating organizational decisions. We draw on literature on operations capability (Corbett and van Wassenhove 1993; Hayes and Wheelwright 1979), the "sand cone" model and service agility (Ferdows and De Meyer 1990; Menor et al. 2001; Miller and Roth 1988; Nakane 1986), and organizational theory (Feldman 2000; Feldman and Pentland 2003; Howard-Grenville 2005). The following section outlines the research focus of this thesis and how it aims to contribute to the continued development of the evolving service operations strategy field.

1.2 The Research Focus

Service companies need to understand fully the process of establishment of strategy and the key strategic decision areas to achieve competitive advantage. The three essays aim to contribute to the literature in the above areas through empirical research. The following sub-sections outline the more precise research focus for each of the three essays.

1.2.1 Capability-Sets for Service Operations Strategies

Quality, delivery, cost and flexibility have been seen as the critical capabilities for companies to develop a competitive edge (Roth 1996; Skinner 1969; Wheelwright 1984; Youndt et al. 1996). A core element of operations strategy concerns the capabilities companies need to have in order to be competitive in the marketplace

(Miller and Roth 1994; Skinner 1978). Previous studies have been devoted primarily to either the "focused" operations strategy (Lapre and Scudder 2004; Sasser et al. 1978; Skinner 1974), whereby companies should concentrate on the particular capabilities they have for competitiveness, or the "agile" operations strategy (Burgess 1994; Fliedner and Vokurka 1997; Menor et al. 2001), calling for excellence in quality, delivery, cost and flexibility simultaneously.

The resource-based view theory has suggested that companies are unique in their resource components (Mahoney and Pandian 1992; Paiva et al. 2008; Schroeder et al. 2002). Since a company typically needs to allocate a considerable amount of resources to develop its capabilities, the choice of capabilities needs to be consistent with its resource profile. Therefore, a focused or agile operations strategy may not be suitable for all companies. Chapter 3 of this thesis seeks to investigate empirically the question: "What are the performance outcomes of combinative capabilities in services?". Through examining the impact of different capability choices on business performance, this chapter aims to shed light on the potential strategic options from which companies may choose in order to gain competitive advantage. A further understanding on the capability choices was achieved by investigating the linkage between environmental factors and the choices on capabilities.

Based on analysis of the survey data, our results indicate that various capability combinations from which service companies can choose have significant impact on business performance. In particular, service quality and delivery are the essential elements of the capability choices driving business performance. Customer preference, rather than environmental predictability or volatility, was found to affect capability choices significantly. This study extends the current literature on service operations strategy by examining empirically the impact of all potential capability-

based operations strategies across multiple industries, as well as their linkage with environmental factors.

1.2.2 Understanding the Cumulative Capability Building Process by Revisiting the "Sand Cone" Model

In contrast to the conventional wisdom of trading-off one capability for another, the literature has suggested that it is possible for companies to achieve operational excellence in multiple capabilities simultaneously (Clark 1996; Ferdows and De Meyer 1990; Flynn and Flynn 2004; Hayes and Pisano 1996). The model, described as the "sand cone" model, should be built cumulatively, from quality to delivery to cost to flexibility (De Meyer et al. 1989; Ferdows and De Meyer 1988; Hall 1987; Nakane 1986; Noble 1995). Competitive progression theory provides a theoretical foundation for the observed "sand cone" effect (Roth 1996). According to the competitive progression theory, building competitive capabilities cumulatively can simultaneously "increase operational know-how and reduce process variation associated with waste and non-value-added over an innovation cycle, and in turn, influence business performance" (Rosenzweig and Roth 2004). The "sand cone" model view, however, is contentious. First of all, the reason that companies achieve multiple competitive capabilities may be they manage to push their capability trade-off frontier upward. In consequence, they have superior capabilities, even though the trade-offs still exist. Secondly, there are companies acquiring multiple capabilities without following the "sand cone" sequence, which poses the question whether the "sand cone" model is context or industry contingent.

According to the "sand cone" model, each capability constitutes the foundation for the development of the next, and companies must consolidate the capabilities at the base of the pyramid before adding those situated near the top. However, it may be

difficult for companies to build new capabilities without influencing those already acquired because the development of a new capability may divert scarce resources from the set of established capabilities and thereby ultimately undermine their effectiveness.

Building on current theory and using empirical observations, Chapter 4 of this thesis aims to address the question: "What is the impact of flexibility on preexisting capabilities such as quality, delivery, and cost?", and shed light on the ways in which capabilities interact with each other during the service strategy formulation process. Using data from the workshops of a major vehicle repair company, our results show that the impacts of adding flexibility to previous established capabilities vary depending on the distance between flexibility and the capability along the pyramid. More specifically, the impact is high on cost, but insignificant on quality. This study contributes to the literature on the "sand cone" model and service agility by examining the nexus between flexibility and the other competitive capabilities and the linkage between the "sand cone" model and service agility. It also has a methodological contribution by relying on objective "hard" measures which are also readily available from most service organizations, rather than perceptual measure, which represents another valuable tool for future studies.

1.2.3 Exploring the Linkage between Organizational Mechanisms and Service Agility

It has been suggested that companies need to provide responsive services with high quality and speed, at low cost, and respond to uncertainties with flexible delivery in order to satisfy and retain customers in a rapidly changing environment (Adam Jr and Swamidass 1989; Corbett and van Wassenhove 1993; Zaheer and

Zaheer 1997). The concept of service agility has emerged to refer to the ability to excel simultaneously on quality, delivery, cost and flexibility (Menor et al. 2001). Agile companies are seen as being able to adapt to environmental changes and transform changes into opportunities to enhance their competitive position (Youssef 1992).

Although the connection between service agility and business performance has been examined in the literature, few studies have been devoted to understanding the pattern of operations choices companies can make to support becoming agile (Dyer and Shafer 1999; Vokurka and O'Leary-Kelly 2000).

Organization theories have suggested that companies can be responsive to demand and adaptive to environmental change via building certain types of organizational mechanisms (De Meyer et al. 1989). These mechanisms collectively develop a supportive organization environment, which encourages individuals to strive to achieve multiple objectives simultaneously (Daft 1998; Ghoshal and Bartlett 1994; Tushman and O'Reilly 1996).

Based on the literature on service agility and organization theories, Chapter 5 of this thesis seeks to address the question: "How can organizational mechanisms help companies to achieve service agility?". We investigated the impact of a set of structural mechanisms – metaroutines and job enrichment, and contextual mechanisms – incentive system and trust, on service agility.

Based on analysis of our survey data, our results indicate that organizational mechanisms do significantly affect the operations strategy for service agility. Specifically, incentive systems and trust directly affect service agility. In addition,

the interactions between structural and contextual mechanisms have significant impact on service agility.

This study contributes to the literature on service operations strategy and organization theories by providing a further understanding on how organizations could shift the trade-offs and achieve agility through applying structural and contextual mechanisms. It also sheds light on the ostensive-performative view of routines set forth by Feldman and Pentland (2003).

The following chapter looks at the major concepts and themes within the relevant bodies of literature. In particular, operations and service strategy literature is reviewed with the aim of identifying particular areas where this study could make a valuable contribution. Chapters 3, 4 and 5 develop the three consecutive essays. Finally, Chapter 6 draws overall conclusions, and implications for academics and managers are considered.

CHAPTER 2 – LITERATURE REVIEW

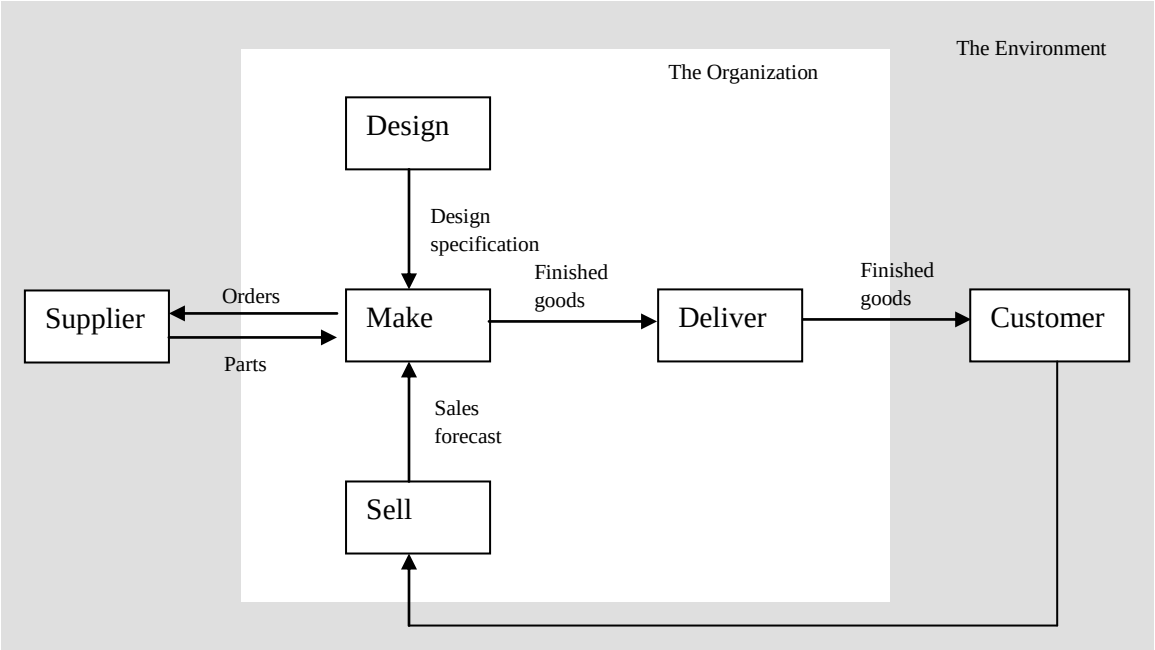
Whilst the main focus in this study is service operations strategy, in this chapter we review extensively the literature on manufacturing operations strategy to serve as the foundation of service operations strategy since both belong to the operations strategy area of literature. This chapter seeks to inform the direction of research in this study. It follows the evolution of operations strategy by starting with literature on operations strategy capabilities, strategic decisions and strategy choices in section 2.1. The literature on services and service operations strategy is reviewed in section 2.2, and section 2.3 identifies the gaps and opportunities for research.

2.1 Operations Strategy Framework

The early evidence of manufacturing management can be traced back to the Industrial Revolution of the eighteenth and nineteenth centuries when low-skilled labour was used to produce standard parts in high volumes. More scientific approaches were introduced by pioneers such as Frederick W. Taylor and Henry Ford, which led us to the era of mass production at the start of the twentieth century. During World War II, the development of the area of manufacturing research entered a rapid growth period due to the need to solve complex problem of logistics and weapons system design. As a result, manufacturing management emerged as a formal discipline in the 1950s and 1960s. Materials Requirements Planning (MRP), Just-In-Time (JIT), Total Quality Management (TQM), Supply Chain Management (SCM), Business Process Reengineering (BPR) and e-commerce became the main trends from the 1980s to today. The role of manufacturing management can be considered to:

> Manage the transformation of an organization's inputs into finished goods… An organization consists of sets of processes which link together in order to meet customer needs… Processes can be carried out by separate individuals (individual processes), contained within a department (functional processes) or occur in several functional areas (cross-functional processes). (Greasley 2005)

The process view of an organization can be illustrated by Figure 2.1 (Greasley 2005). Since customers usually perceive the value they gain based on the performance of the delivery system, the set of processes is also called the value chain (Melan 1993).



Source: Greasley (2005), p. 12.

Figure 2.1 Process View of an Organization

In order to manage manufacturing function, companies need to make decisions in three broad areas (Chase et al. 2006):

- Strategic (long-term) decisions
- Tactical (intermediate-term) decisions
- Operational planning and control (short-term) decisions

In this doctoral study, the strategic level decisions that affect the company's long-term effectiveness in meeting customers' needs are the main focus.

Generally, strategy describes how a company intends to create and sustain value for its shareholders. Manufacturing strategy, accordingly, involves decisions that relate to the designs of operational processes, as well as the structure and infrastructure needed to support the process, which coordinate with the goals of the whole organization and enable it to adapt to the changing needs of the customers. Analysis of the sample of manufacturing/operations definitions in Table 2.1 indicates that previous literature has been consistent in the manufacturing strategy proposition.

The literature has suggested that there are two aspects of manufacturing strategy – process and content (Anderson et al. 1991; Leong et al. 1980; Voss 1992). Specifically:

> *Content* means the collection of decisions which are made (deliberately or by default) within the operations strategy domain. Content is concerned with the strategic decisions which shape and develop the long-term direction of the operation and form the building blocks of an operations strategy. *Process* means the way in which operations strategies are (or can be) formulated. It is a reflection both of what operations managers should do and what they actually do in practice. It is the procedures which are, or can be, used to formulate operations strategy. (Slack and Lewis 2008)

2.1.1. Operations Strategy Content and Operational Capabilities

Since the overall objective of operations strategy is to re-concile market requirements and operations resources, its content reflects the interaction between the operation's objectives and the decision that it takes concerning resource deployment. Hence, good understanding on both the operation's objectives and decision areas becomes particularly important and relevant.

Table 2.1 A Sample of Definitions of Operations/Manufacturing Strategy

Authors	Definition
Booz Allen and Hamilton 1982	*The way a product should be sourced, manufactured and distributed, as well as the levels of process flexibility, product mix, customer service, product quality, product cost, productivity and other manufacturing requirements.*
Chase et al. 2006	*Setting broad policies and plans for using the resources of a firm to best support its long-term competitive strategy.*
Davis et al. 2003	*The development of a long-term plan for determining how best to utilize the major resources of the firm so that there is a high degree of compatibility between these resources and the firm's long-term corporate strategy.*
Hayes and Wheelwright 1984	*A sequence of decisions that, over time, enables a business unit to achieve a desired manufacturing structure, infrastructure, and set of specific capabilities.*
Mayer and Moore 1983	*A plan that describes the way to produce and distribute the product, including the choice of process technology, degree of vertical integration, the number and location of facilities, factory focus and the manufacturing infrastructure.*
Oxford English Dictionary 2006	*A plan to transform an organization's overall strategic objective into operational deliverables. It involves the design of the product or service and the processes by which the product or service is produced; the way in which production is managed and controlled; and the design of processes for the constant improvement of the operation.*
Schroeder et al. 1986	*A long-range plan or vision for the operations function, including mission, objectives, policies and distinctive competence.*
Slack and Lewis 2008	*The total pattern of decisions which shape the long-term capabilities of any type of operation and their contribution to overall strategy, through the reconciliation of market requirements with operations resources.*
Swamidass and Newell 1987	*The effective use of manufacturing strengths as a competitive weapon for the achievement of business and corporate goals.*

Skinner (1969) defined the objectives of operations as quality, delivery, cost and flexibility. They have been widely used to today (Boyer and Lewis 2002; Neely and Wilson 1992; Noble 1995; Platts and Gregory 1990; Stalk et al. 1990), though more detailed sub-dimensions have been proposed to these objectives, especially flexibility

(D'Souza and Williams 2000; Jack and Raturi 2003; Neely and Wilson 1992; Platts and Gregory 1990; Sethi and Sethi 1990; Slack 1991). To achieve these objectives, companies need to build the corresponding capabilities which provide competitive advantage (Brown et al. 2005). Since capabilities represent a company's ability to "integrate, build, and reconfigure internal and external competences to address rapidly changing environment" (Teece, Pisano, and Shuen 1997), superior operations effectiveness based on capabilities "not only serves to buttress a company's existing competitive position… but also is inherently difficult to imitate" (Hayes and Upton 1998).

Quality: Quality reflects how closely the specification required by the design or by customers is met (Greasley 2005). There are two aspects of quality – product quality and process quality (Davis et al. 2003). The former aspect emphasizes the features of the product. The latter aspect is related to the reliability of the product. Since quality is largely dependent on the conformity between the current product design and process and customer requirement, perceptions of it can vary as to the particular market that it is aimed to serve. Companies that strive to provide a level of quality that is significantly superior to that of their competitors are believed to achieve increased dependability, reduced costs and improved customer services (Dilworth 1993; Greasley 2005).

Delivery: There are two dimensions within delivery; speed and dependability. Delivery speed refers to the time lag between the request for the product and the final delivery (Greasley 2005). This dimension is important because the speed of delivery is considered as a determinant in purchasing decisions (Davis et al. 2003). Dependability, or reliability, reflects whether companies can consistently deliver their goods to customers on schedule (Dilworth 1993). This dimension emphasizes

consistency, i.e., reducing the variance in delivery times (Davis et al. 2003). Dependability is believed to be associated with higher customer satisfaction due to the high level of trust. It can also lead to lower cost through forcing companies to streamline the delivery process (Greasley 2005).

Cost: Cost refers to "the finance required to obtain the inputs (i.e., transforming and transformed resources) and manage the transformation process which produces finished goods" (Greasley 2005). Cost is particularly important if companies are competing in a segment of the market that buys on the basis of low cost or is extremely price sensitive. Cost efficiency can help companies to achieve a competitive advantage by providing the product to a market niche that competitors cannot provide due to the entry barrier of cost.

Flexibility: From a strategic perspective, flexibility indicates to what extent the variability of different demands could be deal with. Different flexibility dimensions have been used and investigated in previous studies. For instance, Gerwin (1993) identified seven dimensions falling into categories of the market-oriented and the process-oriented. Other types of dimensions have also been put forward from different perspectives or with different considerations (Browne et al. 1984; Sethi and Sethi 1990; Upton 1995; Vokurka and O'Leary-Kelly 2000). In general, the literature tends to agree that flexibility can be measured from two aspects; range and time. Range captures the amount of change and time reflects the speed of the change (Slack 1983). In terms of the types of flexibility, volume and mix have been widely used in the literature. Volume flexibility represents "the ability to change the level of output of a manufacturing process", and mix flexibility reflects "the ability … to produce a number of different products" (D'Souza and Williams 2000). With flexibility, "companies can adapt to changing customer needs in terms of product

range and varying demand and to cope with capacity shortfalls due to equipment breakdown or component shortage" (Greasley 2005).

2.1.2. Operations Strategy: Content and Strategic Decisions

A set of decision areas is required to achieve the above key operational capabilities. Different writers on operations strategy focus on slightly different sets of decisions. In general,

> A distinction is often drawn between the strategic decisions that determine an operation's structure, and those that determine its infrastructure. Structural issues primarily influence the physical arrangement and configuration of the operation's resources. Infrastructure strategy areas influence the activities that take place within the operation's structure…investing in advanced process technology and building more or better facilities can raise the potential of any type of operation…the best and most costly facilities and technology will only be effective if the operation also has an appropriate infrastructure which governs the way it will work on a day-to-day basis. (Slack and Lewis 2008)

Table 2.2 provides a summary of the structural and infrastructural decision areas from several chosen studies. Literature in the 1970s and 1980s tended to concentrate on the structural areas of the operations strategy such as capacity, plant location and manufacturing process. Later studies have identified the importance of the "soft" aspects of operations strategy. In particular, organizational structure and human resource related policies have start to gain attentions and further studies are called for on these topics (Kinnie and Staughton 1991; Mills et al. 1995).

2.1.3. The Operations Strategy Process

Various schools of thought on the operations strategy process have appeared in the literature. Early studies follow a structured view by linking corporate strategies,

competitive criteria and product and process decisions in a hierarchical way (Hill 1989; Skinner 1969; Wheelwright 1984). Some researchers later took a less structured approach by considering the process of formulation of operations strategy as a sequence of decisions (Anderson et al. 1991; Swamidass and Newell 1987; Voss 1992). For instance, Platts (1994) suggested four aspects of process; point of entry, participation, procedure and project management. With this view, "a process should specify how an organization might be attracted to implement the process; who should participate in the process and how the project of implementing the process should be managed" (Mills et al. 1995).

In order to link to the content of operations strategy and address the operations objectives directly, many studies consider the process as the creation of competence in a production and operation system (Hayes and Pisano 1994; Miller and Roth 1994; Tracey et al. 1999; Vickery et al. 1993; Zahra and Das 1993). Since in essence the content of operations strategy defines its components, and the process indicates how the strategy is made, this view of process that is oriented on capability creation is closely linked to the strategy content at a high level without being distracted by the detailed tasks. This view is adopted by this doctoral study.

In summary, a company's operational capabilities define its ability to achieve its operations objectives and provide its competitive advantage. The establishment of operational capabilities requires solid support from a set of structural and infrastructural areas, including people, technology and organizational system, as well as other supporting platforms. Operations strategy involves decisions in operational capability choices, establishment and organization structure and infrastructure so as to achieve performance objectives, which are usually shaped by customers' needs, competitors' actions and companies' marketing positioning.

Table 2.2 Decision Areas in Operations Strategy Content

Decision Areas							
Structural	*Capacity*	*Plant capacity*	*Capacity*	*Capacity*	*Capacity*	*Plant and equipment*	*Capacity*
	Facilities	*Plant location*		*Facilities*	*Facilities*		
	Process and technology	*Process and technology*	*Process*	*Technology*	*Technology and processes*		*Delivery system*
	Span of process	*Make or buy*	*Process positioning*	*Vertical integration*	*Vertical integration*		*Make-or-buy decisions*
Infrastructural	*Quality*	*Quality assurance*	*Quality assurance and control*	*Quality*	*Quality management*	*Production planning and control*	*Quality assurance and control*
	Control policies	*Production and inventory control just-in-time*	*Manufacturing planning control systems inventory*	*Production planning*	*Manufacturing infrastructure*	*Production planning and control*	*Operations planning and control systems*
	New products	*New product introduction*		*New product development*	*Scope new products*	*Product design engineering*	
	Human resources	*Management of people*	*Work structuring Payment system Clerical procedures*	*Workforce performance measurement and reward*	*Human resources*	*Labour and staffing*	*Work structure Payment systems Clerical procedures*
	Suppliers	*Suppliers*			*Vendor relations*		
		Manufacturing organization	*Organizational structure*	*Organization*		*Organization and management*	*Organizational structure*
	Information systems	*Manufacturing systems*					
	Platts 1990	Schroeder and Lahr 1990	Hill 1989	Hayes et al. 1988	Fine and Hax 1985	Skinner 1969	Greasley 2005

Figure 2.2 illustrates the framework of operations strategy, with its interaction with performance objectives and market

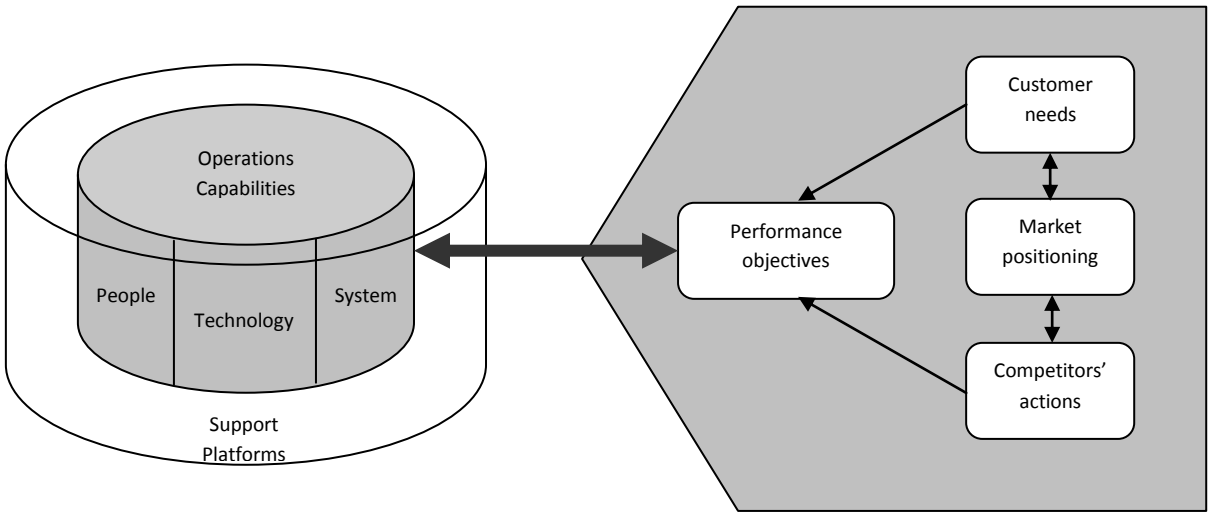


Figure 2.2 Operations Strategy Framework

2.1.4. Operations Strategy Choices: The Trade-offs View and The Efficient Frontier

The notion of trade-offs was central to the concept of operations strategy during the 1960s and 1970s. The original idea of trade-offs is that a factory could not excel simultaneously in multiple objectives since the improvement in one area would have to be at the expense of another area. Any attempt to be good at everything can only result in being mediocre at everything (Davis et al. 2003; Skinner 1969). For example, companies wishing to have fast delivery cannot in addition be very flexible, offer a wide range of products and be a low cost producer. Trade-off theory is grounded on the rationale that (1) companies' resource (e.g., time and ability) are finite, (2) various objectives are related or incompatible, and (3) technology level and operational system/methodology are given (Chase et al. 2006; Greasley 2005; Skinner 1969). Companies' resources are limited so that the amount of the work that companies can accomplish is finite.

Related objectives lead to competition in resources. Consequentially, trade-offs are difficult to avoid, since achieving more of one objective necessitates less of another. In addition, since new technologies or advances in operational systems can reduce resource dependence and improve operational capabilities, trade-offs are usually contingent on a given technology and management methodology.

Following the trade-offs view, companies need to decide which operational objective is most critical to their success and then concentrate their resources on the particular priority. The notion of factory focus is grounded on trade-off theory (Skinner 1974). It suggests that factories should deliberately narrow their product range or market segments so as to reduce the operational complexity, increase day-to-day resource management clarity and ability, and eventually outperform those trying to achieve multiple objectives. In essence, the "focused" practice requires managers to be excellent at identifying the relative importance that customers place on and deriving the most important objective for companies to be successful. With a turbulent business environment and fast-changing customer preferences, it becomes extremely difficult for companies not only to capture customers' needs accurately over the medium or long term, but also to be sustainably successful while relying on only one winning priority.

The idea of trade-offs can be well illustrated by the concept of performance frontiers, which originates from the concept of production frontiers in the economics field. A production frontier refers to the maximum output that can be produced when the given set of inputs are used to their full potential (Samuelson 1947). Specifically, the performance frontier takes a wider perspective by referring to output as all dimensions of operational performance (e.g., quality, delivery, cost and flexibility), and hence is defined as the maximum performance that can be achieved with a given

set of operating choices (Schmenner and Swink 1998). Figure 2.3 illustrates the concept of performance frontiers by showing the relative performance of two companies in the same industry in terms of their cost efficiency and variety of products. The trade-offs concept can be explained by the frontier curve 1, where the increase of complexity of product variety requires the sacrifice in cost efficiency, i.e., increase in cost. Therefore, companies have to decide whether they want to be a cost leader as company A, or provide more products to customers as company B.

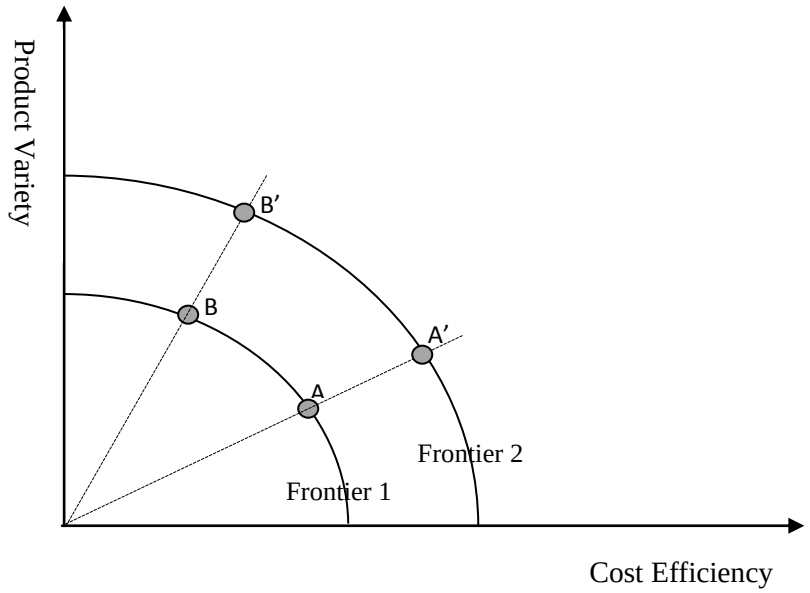


Figure 2.3 Performance Frontiers

As mentioned earlier, the performance frontier is formed or shaped by the technology (Skinner 1996) and operation system (Clark 1996; Hayes and Pisano 1996). With the advances in technology and operating systems, new and more effective frontiers such as frontier 2 (as illustrated in Figure 2.3), will emerge. In comparison with frontier 1, companies on frontier 2 can achieve better performance with same operating choices. According to the operations management literature, the operating system refers to "the aggregate set of policies used to manage quality, production planning and control, and other procedures" (Schmenner and Swink 1998), which can be classified into "structural" and "infrastructural" decisions.

Therefore, by improving structural and infrastructural organizational decisions, companies can overcome the immediate trade-offs to achieve multiple dimensions of operational performance, including quality, delivery, cost and flexibility.

2.1.5 Operations Strategy Choices: The Sand Cone Model

Based on a study of Japanese manufacturing companies, Nakane (1986) was the first to point out that companies can build multiple competitive capabilities instead of being constrained by trade-offs. However, he argued that companies need to build their capabilities according to a predetermined sequence since the generation of a new capability is ineffective unless a certain level of the preceding ones has been achieved. Specifically, quality is the basis for the development of every other capability, followed by delivery. In turn, quality and dependability are preconditions for the achievement of cost efficiency. Finally, flexibility can be obtained only once the previous three capabilities are fully established. Further support for this argument was provided by several follow-up studies (De Meyer et al. 1989; Ferdows and De Meyer 1988; Ferdows et al. 1986; Hall 1987). Ferdows and De Meyer (1990) formalized the model by depicting the capability building process as a "sand cone", as illustrated in Figure 2.4. The essence of the sand cone model lies in the sequenced capability building process in which the set of available capabilities serves as the necessary foundation for the establishment of new capabilities.

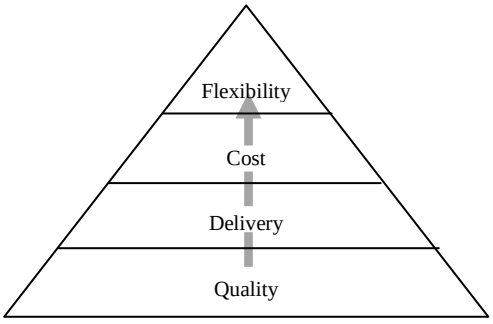


Figure 2.4 The "Sand Cone" Model

The Competitive Progression Theory (CPT), proposed by Roth (1996), offers a theoretical foundation for the sand cone model. According to CPT, organizations can improve their operational know-how and reduce their operational waste through learning processes associated with acquiring new capabilities (Roth 1996, Rosenzweig and Roth 2004). Rosenzweig and Roth (2004) provided further empirical evidence for the sand cone model.

2.2 Service Operations Strategy

In the past a couple of decades, the agricultural sector and the manufacturing sector have declined dramatically in many countries, in particular in industrialized economies. In contrast, the service sector has grown into the dominant sector, accounting for the majority of GDP and employment (Fitzsimmons and Fitzsimmons 2004; Kasper et al. 2006). Table 2.3 lists the service sector's contribution to the economy (in 2002) and employment (in 2003) in the countries of the Organization for Economic Co-operation and Development (OECD) and China. The fast growth of service sector's contribution, however, does not indicate that manufacturing becomes less important. On the contrary, the increasing weight of service sector has been partially a result of both vertical disintegration of manufacturing and geographical shift of manufacturing centre from developed countries to developing countries.

Despite the position of the service sector, the contribution of service-related research to the operations field is still very limited. Service Operations Management tends to rely on findings from the manufacturing context. This imbalance has been recognized by many scholars (Johnston 2005; Meredith and Roth 1998; Nie and Kellogg 1999; Roth and Menor 2003). A number of top journals, including *Production and Operations Management*, *Management Science* and *Journal of*

Operations Management, have published special issues on research in the service sector.

In general, strategy considerations in service enterprises are in many ways similar to those in manufacturing companies, which is why the current studies on service operations are deeply rooted in the findings from the manufacturing context. However, due to the peculiar characteristics associated with services, research dedicated to services, with different frameworks from traditional manufacturing studies, is very much needed (Nie and Kellogg 1999; Roth and Menor 2003).

2.2.1 Characteristics of Services

In Operations Management, "services have been treated as aberrant departures from the presumed normality of production and product marketing" (Spring and Araujo 2009). Intuitively, services can refer to the efforts or deeds that service companies provide, which often require customers' involvement. There have been various definitions in the literature. In this thesis, we follow the definition of Kasper and colleagues (2006):

> Services are originally intangible and relatively quickly perishable activities whose buying, which does not always lead to material possessions, takes place in an interactive process aimed at creating customer satisfaction.

Literature has suggested that services have four basic characteristics : intangibility, heterogeneity, inseparability, and perishability (Lovelock and Gummesson 2004). First of all, services are usually an activity or an experience without physical form.

Table 2.3 Contribution of Service Sector in OECD countries and China

Country	Service sector's contribution to gross value added 2002 (in %)	Civilian employment in the services sector 2003 (in %)
Australia	71.2	74.8
Austria	65.6	64.8
Belgium	71.7	73.8
Canada	63.8a	74.7
Czech Republic	56.7	55.8
Denmark	71.2	72.9
Finland	64.6	68.5
France	72.1	73.0
Germany	69.2	65.6
Greece	69.5	61.1
Hungary	65.3	60.8
Iceland	61.8b	69.6
Ireland	54.7	65.8
Italy	69.0	62.9
Japan	68.0	66.6
Korea	53.4	63.6
Luxembourg	79.0	77.2
Mexico	69.6	58.7
Netherlands	71.6	76.6
New Zealand	67.8c	69.5
Norway	60.4	74.7
Poland	66.9	53.0
Portugal	67.4	54.7
Slovak Republic	63.8	55.9
Spain	67.0	63.6
Sweden	70.0	75.2
Switzerland	-	72.0
Turkey	57.5	43.4
United Kingdom	72.1	75.2
United States	75.6	78.3
China	33.6b	27.7b

Source: Kasper et al. (2006), p.9; Yang (2004).

Key: a 2000, b 2001, c 1998, - not available

Note: industry vertical integration and geo-shift may contribute to the high service weight in OECD markets

However, many services are actually built around tangibles. For instance, transportation services cannot be provided without vehicles. With the participation of customers in the service production process, the variation and dynamics in

customers' perceived needs lead to unavoidable heterogeneity in all services. Furthermore, since generally customers are present when services are provided, the production and consumption of services happen simultaneously. In addition, because of intangibility, services tend to be difficult to keep in stock, hence, they are perishable.

Services are also seen to differ from manufacturing in terms of management approach (Thomas 1978). Service production process tends to be decentralized, services are usually associated with a reduction in the opportunity for developing economies of scale and obtaining operating leverage for profit margin, and the pricing of services is often based on value rather than cost.

Although services can be generally distinguished from manufacturing by the dimensions mentioned above, services themselves vary in the degree of each characteristic. For instance, some services are more reliant on tangibles or more standardized than others, hence, they are closer to products. Therefore, some researchers have conceptualized a goods–services continuum in which services are an extension of products (Oliva and Kallenberg 2003). Gronroos (2000) even claims that "every business is a service business, and the product becomes just one element in the total, ongoing service offering". Vargo and Lusch (2008) have also pointed out a transition in the nature of business environment from the "goods-centric" to "service-dominant". This argument seems to be very appealing nowadays with more and more manufacturers trying to bundle their products with services, or even treating products as an add-on to the services (Gebauer 2008).

Services have their unique characteristics, but there is no clear-cut between services and manufacturing. As Brown et al. (2005) have pointed out, service and manufacturing operations can be considered as "collaborative activities in providing

goods and services to customers", and one relevant distinction between them is that "materials do not think or act for themselves, whereas customers can and do". This view accurately recognizes the fundamental commonality between the nature of services and manufacturing, which supports the theory of continuity from manufacturing to service operations. At the same time, it captures the key difference between services and manufacturing – customer involvement, which indicates the potential variation of service operations from manufacturing operations and the importance of service-oriented operational research.

2.2.2 Service Operations Strategy: Content and Process

As with the manufacturing operations strategy logic (Hayes et al. 1988; Miller and Roth 1994; Skinner 1978), competitive capabilities that are in line with the service concept are essential in service operations strategy. In services, customers rely on their perceived competitive capabilities to evaluate the utility they can gain and make choices among competitors. Hence, service companies seek to build capabilities based on their desired target market, which leads to their strategic design choices (Roth and Menor 2003). Various service capabilities have been examined or proposed in the literature (Fitzsimmons and Fitzsimmons 2004; Menor et al. 2001; Roth and van der Velde 1991; Zeithaml et al. 1993), and the four capabilities mentioned earlier turn out to be the key competitive capabilities in the service context. However, the content focus of each capability might vary slightly for service operations, as shown in Table 2.4.

Similar to the traditional operations strategy, the main decision areas for service operations strategy can be categorized into "structural" and "infrastructural" (Roth and Menor 2003). In a service context, infrastructural decisions are particularly

important due to the direct customer involvement or customer contact. From a customer contact perspective, the service system is a continuum from high to low customer involvement during the creation of the service product, and its operating efficiency is "a function of the degree to which the customer is in direct contact with the service facility relative to a total service creation time for the customer" (Chase and Tansik 1983). Since customers' preferences and expectations are likely to vary (Price et al. 1989), the direct involvement of customers brings an extra burden in the service delivery process by increasing service cost and delivery speed due to the additional communication and coordination time and efforts.

In order simultaneously to balance the seemingly contradictory objectives of service operating efficiency and varied customer preferences, service companies need to have a set of organizational mechanisms to "overcome inertia and implementing innovation and change" (Tushman and O'Reilly 1996). Since infrastructural choices are mainly people oriented, they are, therefore, the most effective ways to facilitate the success of service delivery systems. In particular, the Roth-Chase-Voss model (Roth et al. 1997) indicates that "specific infrastructural issues dealing with people, leadership, service process and performance management constitute a complex set of decisions and are generally long-term in nature" (Roth and Menor 2003). Infrastructural questions, such as employee empowerment, rewarding and organizational culture, are all concerns of service strategists and in need of academic attention (Roth and Menor 2003).

Table 2.4 Operational Capabilities in Services

Performance Characteristic to Be Emphasized	Features that Manufacturing Operations Might Provide	Applicability to Service Operations
Quality	Skilled workers	Yes
	Adequate precision of equipment	Maybe
	Motivation for pride of workmanship	Yes
	Effective communication of standards or job requirements	Yes
Dependability	Effective scheduling system	Yes
	Low equipment failure	Yes
	Low absenteeism, turnover, no strikes	Yes
	High inventory investment	Maybe
	Commitment of personnel to perform as required	Yes
Cost efficiency	Low overheads	Yes
	Special-purpose equipment and facilities	Yes
	High utilization of capability	Yes
	Close control of materials	Maybe
	High productivity	Yes
	Low wage rates	Yes
Flexibility	Dependable, rapid supplies	Yes
	Reserve capacity	Yes
	Multiskilled workers who can be shifted	Yes
	Effective control of work flow	Yes
	Versatile processing equipment	Yes
	Low setup time and cost	Maybe
	Integration of design and production	Maybe

Source: Dilworth (1993), p.62.

2.2.3 Service Operations Strategy Choices

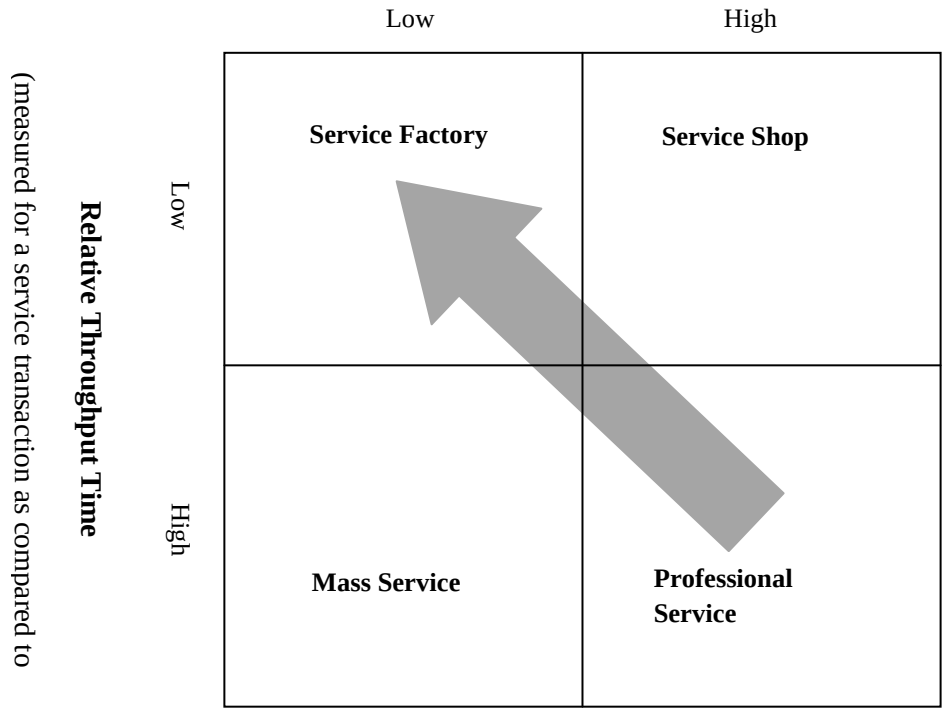
Early research on service operations strategy sought to gain strategic insights via service classification. Various dimensions have been used for service classification, including the nature of the service act, the direct recipient of the services, the nature of service delivery, the degree of customer contact and customization, and the degree of labour intensity (Collier and Meyer 1998; Kellogg and Chase 1995; Lovelock 1983; Schmenner 1986; Silvestro et al. 1992). One of the most widely cited service

categorizations is that of Schmenner (Schmenner 1986). He proposed a matrix in which four quadrants, labelled “service factory”, “service shop”, “mass service” and “professional service”, are defined along the degree of interaction and customization and the degree of labour intensity. The matrix was later improved relying on the dimensions of the degree of variation and relative throughput time, as shown in Figure 2.5 (Schmenner 2004).

The diagonal of this matrix indicates that the service companies should address two aspects of their operations if they wish to achieve greater productivity. On one hand, they need to reduce the variation by standardizing the services. On the other hand, they need to increase service efficiency by decreasing operational traffic and reducing waste. It is clear that the lure of “service factory” is based on the belief that variation needs to be minimized, and more importantly, there are trade-offs between the variation or flexibility and the service cost and efficiency.

In contrast to the trade-off view, some service operations researchers argue that it is imperative for service companies to be able compete on all major dimensions since they are facing a highly volatile customer-driven environment (Harker and Zenios 2000; Melnick et al. 2000; Menor et al. 2001).

The concept of agile manufacturing emerged from studies of the US government and manufacturers on Japanese manufacturing practice (Burgess 1994). A report by the Iacocca Institute of Lehigh University (1991) defined agile manufacturing as



Source: Schmenner (2004)..

Figure 2.5 Service Matrix

a manufacturing system with extraordinary capabilities (internal capabilities: hard and soft technologies, human resources, educated management, information) to meet the rapidly changing needs of the marketplace (speed, flexibility, customers, competitors, suppliers, infrastructure, responsiveness). A system that shifts quickly (speed, and responsiveness) among product models or between product lines (flexibility), ideally in real-time response to customer demand (customer needs and wants).

Menor et al. (2001) brought the agility concept into services and referred to it as "a provider's ability to excel simultaneously on service quality, delivery, flexibility and low cost". Service agility strategy, accordingly, refers to the service operational decisions and plans "involving the developing, positioning, and aligning of managerial policies and needed resources" to become agile (Boyer et al. 2005).

A service company's operations strategy defines the actual competitive strength relative to its primary competitors in terms of important capabilities such as quality, delivery, cost and flexibility (Roth and van der Velde 1991). These competitive capabilities need to be deployed into a service delivery system that includes the structural (e.g., technology, capacity, and facility) and infrastructural elements (e.g., people, information systems, and performance measurement) of the operations (Roth and Menor 2003). Therefore, service operations strategy choices can be described as a service company's selection of competitive capabilities or priorities, as well as the decisions in broad structural and infrastructural areas.

2.3 Gaps and Opportunities for Service Operations Strategy Research

Despite the fact that the field of operations management is still dominated by research related to traditional manufacturing, scholars in the service field have begun to play an increasingly important role in the past decade or so (Sampson and Froehle 2006; Spring and Araujo 2009). Due to the commonalities in the basic operational nature, current studies in service operations strategy use traditional operations strategy theories as the foundation. There has been growing interest in the convergence between services and manufacturing often called "servitization" (Gronroos 2000; Neely 2007). This has been defined as the integrated system of goods, services, support, self-service and knowledge (Vandermerwe and Rada 1988). With the increasingly visible notions of product-service systems (Baines et al. 2007; Spring and Araujo 2009), there have been calls to test and refine theories of operations strategy in the service context to become valid in the field of service operations, which in turn can be used to guide practice in service operations strategy (Nie and Kellogg 1999). Building on the above literature review, it is possible to

identify research opportunities in the broad area of service operation strategy, in particular framing these in the context of operational capabilities.

First, the decision on the strategy content is the foundation and first step to establish a successful service operations strategy. It has become the consensus that companies need competitive capabilities to survive or stay ahead of rivals (Porter 1996). Quality, delivery, cost and flexibility, are generally seen as the key capabilities for both manufacturing and service companies (Boyer and Lewis 2002; Menor et al. 2001; Noble 1995; Platts and Gregory 1990; Stalk et al. 1990). The resource-based view has suggested that companies are heterogeneous in their assets and capabilities, and their strategies should recognize the differences and align with their characteristics (Paiva et al. 2008). Hence, it is important for service companies to develop operations strategies that provide the right kinds of capabilities to be competitive (Anand and Ward 2004; Anderson et al. 1989; Teece et al. 1997). According to the view of combinative capabilities and competitive progression theory, companies learn to improve their operational know-how and reduce operational waste during the process of capability acquisition (Kogut and Zander 1992, Roth 1996). Therefore, multiple capabilities can be built as a result of the expansion of organizational knowledge (Menor et al. 2001). Instead of examining the impact of individual operations capability on business performance in an isolated way, it is imperative for service companies to understand the role and outcomes of operations capability choices in order to build effective service operations strategies.

The second area concerns how capabilities can be built up in service operations strategy. Two particular opportunities can be identified. The first deals with acquiring multiple competitive capabilities. The “sand cone” model has provided clear guidance on acquiring four competitive capabilities. Companies need to have

quality and delivery to serve as preconditions for the achievement of cost efficiency, and flexibility can be developed only when the previous three capabilities have been fully established (Ferdows and De Meyer 1988; Hall 1987; Nakane 1986). Although there has been a consensus in terms of the sequence of capability building, the literature so far fails to address what companies need to be aware of or prepare when acquiring additional capability, i.e., the impact of new capability on the existing capability set. This is important because capability development requires resources, which are usually limited for most companies (Barney 1991; Das and Teng 2000). Therefore, companies intending to implement multi-capability strategy need to understand the consequence of building additional capability.

As direct reflection of the variation of customer demand and preferences (Frei 2006), flexibility is a key element in the design of service processes. Due to its interdependence with other capabilities and to the fact that it is usually added near the end of the optimal sequence suggested by the "sand cone" model, the development of flexibility serves is the best targeting capability to examine the issue mentioned above. Specifically, research questions such as the impact of flexibility development on preexisting quality, delivery, and cost capability, and whether the impact is more significant for some of the capabilities than others, need to be addressed.

The second aspect relates to strategic decision areas in organization systems or mechanisms. Decision areas can be categorized into "structural", "infrastructural", and "integration" (Roth and Menor 2003). In a service context, customer involvement increases the dynamics and complexity of delivery systems, infrastructural decisions, which shape the organizational programs, policies, and people, become particularly important. This area is especially relevant to companies

trying to build all core competitive capabilities due to associated complexity. Based on the combinative capability view, the previous literature has advocated the idea of breaking the trade-offs and accumulatively acquiring all core competitive capabilities, thus becoming agile (Frei 2006; Menor et al. 2001). The recognition of the importance of service agility has called for studies to examine the link between organizational drivers and agility strategy (Boyer et al. 1997; Fiegenbaum and Karnani 1991). Organization-context literature has pointed out that companies are able to establish both efficiency and flexibility through building a carefully selected set of systems and processes that collectively develop a supportive organization context that encourages members to deal with conflicting demands (Daft 1998; Ghoshal and Bartlett 1994; Tushman and O'Reilly 1996). Therefore, strategic decision areas in organizational mechanisms are expected to play a role in enacting service agility. Furthermore, it is important to analyse the linkage between organizational mechanisms and service agility in a systematic way.

In summary, this study recognizes two areas of research opportunities in the current literature on service operations strategy and attempts to address them by answering the following three research questions:

1) What are the performance outcomes of operations capability choices– combinative capabilities, in order to inform the building of effective service operations strategies?
2) What are the impacts of acquiring additional capability, in particular flexibility, on the existing capabilities such as quality, delivery and cost?
3) How may various organizational mechanisms enact service agility?

Each of these three research questions is examined using empirical research in the following three chapters.

Overall, this doctoral study suggests that a service company chooses and builds key operational capabilities – quality, delivery, cost and flexibility – to gain competitive edge and improve business performance. The choices in operational capabilities are usually influenced by external environment. It is important for service companies to follow the logical sequence in building multiple capabilities and to understand the potential impact of adding extra capability to those capabilities that companies have established. In addition, organizational mechanisms can be used to help service companies in achieving service operations strategy. The research framework of this study is as shown in Figure 2.6.

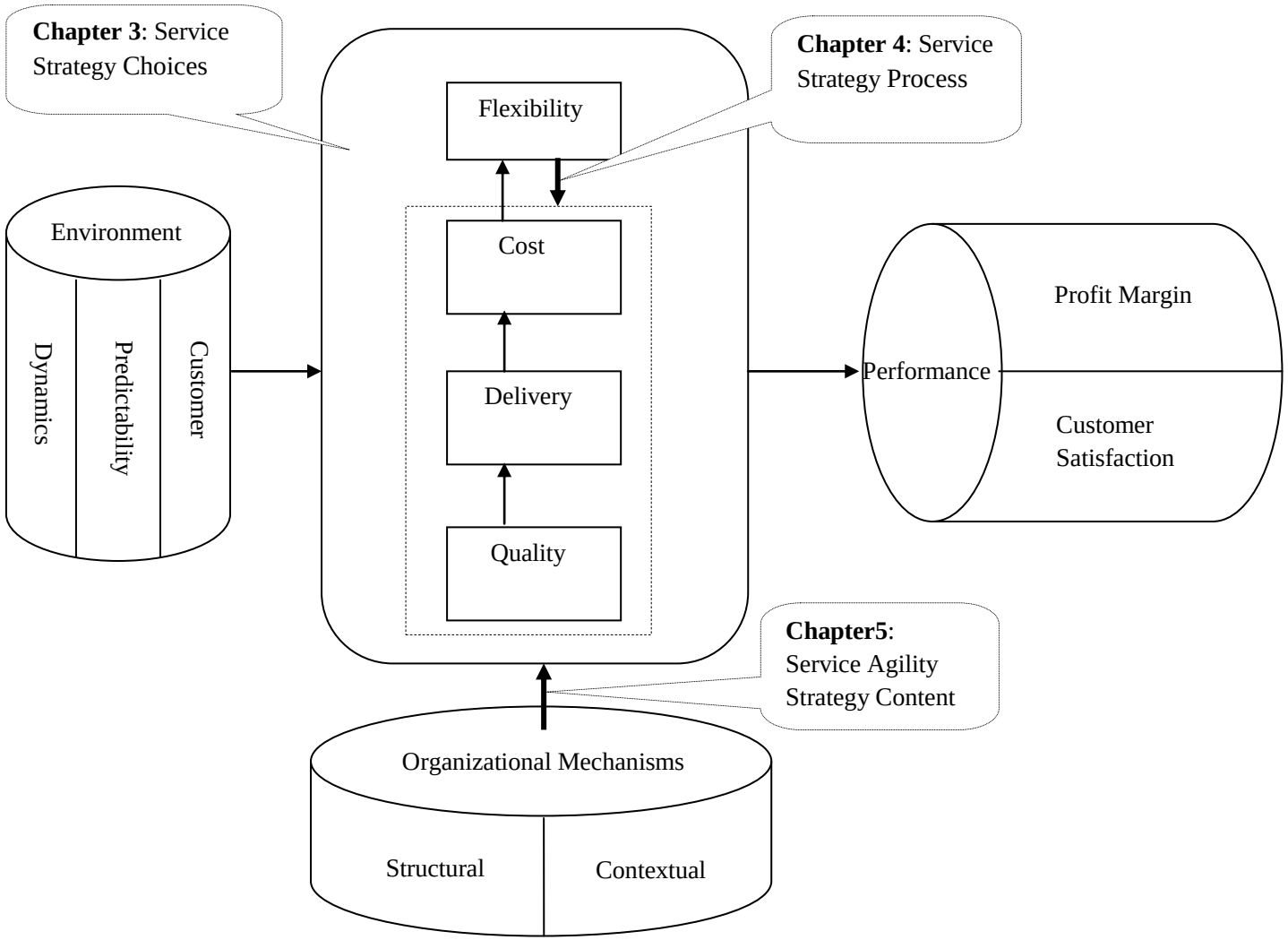


Figure 2.6 Research Framework

CHAPTER 3—COMBINATIVE CAPABILITIES, SERVICE OPERATIONS STRATEGY AND BUSINESS PERFORMANCE

3.1 Introduction

Since Skinner (1974; 1969) first put forward the concept of a focused factory and suggested that certain operations capabilities can be used as competitive advantages, a significant number of studies have emerged examining various types of operations capabilities and their connections with companies' position in the marketplace (Fitzsimmons and Fitzsimmons 2004; Garvin 1984; Vickery et al. 1993; Ward et al. 1998; White 1996). Quality, delivery, cost, and flexibility emerged as the most important capabilities in the majority of the studies (Ferdows and De Meyer 1990; Roth 1996; Wheelwright 1984; Youndt et al. 1996).

To develop and support an organization's competitiveness, companies need to develop strategies that provide the right kinds of capabilities for them to succeed (Anand and Ward 2004; Anderson et al. 1989). In the growing body of operations strategy research, most studies have been related to whether trade-offs are necessary among competitive capabilities (Bennigson 1996; Boyer and Lewis 2002; Hayes and Wheelwright 1984) or the consequences of individual operational capability for performance (Cleveland et al. 1989; Swamidass and Newell 1987; White 1996). This predominant focus emphasizes the importance of operational tasks, which is in line with what Skinner (1978) described as "what the operational function must accomplish". These studies only provide an understanding of the effectiveness of individual operations capability for operations managers' reference in an isolated way. A critical question left unanswered is the strategy design – the pattern of

operations choices that companies should make. This is regarded as the core element of an operations strategy (Hill 1989; Miller and Roth 1994).

The combinative capabilities view and competitive progression theory have suggested that organizations improve their operational know-how and reduce their operational waste through the learning process associated with acquiring new capabilities so as to influence business performance positively (Kogut and Zander 1992; Roth 1996). Organizations are able to build multiple capabilities through expanding their knowledge base and strengthening their learning ability and not as the result of compromises and trade-offs (Ferdows and De Meyer 1990; Menor et al. 2001). This chapter follows the view of combinative capabilities and seeks to examine the relationships between service operations strategy and different sets of combinative capabilities and business performance. The majority of operations strategy research has been performed in the manufacturing context. There is a need for greater understanding of the nature and effectiveness of the operations strategies of companies in service businesses (Anderson et al. 1989; Gebauer 2008; Heskett et al. 1994). Therefore, the main objective of this study is to develop our understanding of the role and outcomes of operations capability choices in order to inform the building of effective service operations strategies. Operations strategy choices can be seen as combinatorial choices of capabilities (Roth 1996), so our first research question is "what are the performance outcomes of combinative capabilities in services?".

It has been suggested that operations strategy can be environment contingent (Anand and Ward 2004; Swamidass and Newell 1987). This study seeks to incorporate the business environment into strategy designs. We aim to address the second research question, "what are the impacts of the environment on service

operations strategy?", through identifying the environment-dependent strategies. In addition, following Miller and Roth (1994), who identified strategic groups with similar operating tasks in manufacturing, we seek to do the same in our sample of service organizations in order to reveal insights into companies' current choices and underlying structures of competition.

This chapter is organized into five sections, the first of which is this introduction. The following section provides a review of operational strategy, business performance, and environment as the background for our research. In section 3, the effectiveness of various strategic choices and their interactions with the environment are tested, as well as the classification of strategic groups. Section 4 discusses the analysis results. We conclude in section 5 with a summary of the findings and conclusions, as well as the research limitations.

3.2 Literature Review

As a complex business function, operations need to be managed from a strategic point of view in order to contribute to the competitiveness of companies (Anderson et al. 1989; Fine and Hax 1985). In general, operations strategy can refer to operational decisions and plans involving the developing, positioning, and aligning of capabilities to achieve competitive objectives (Boyer et al. 2005; Skinner 1969; Swink and Way 1995). This study focuses on the choices of the generic capabilities of quality, delivery, cost, and flexibility (Burgess 1994; Fliedner and Vokurka 1997; Yusuf et al. 1999).

Since the service operations strategy serves to achieve the business objectives, this study seeks to evaluate the connections between service operations strategy and business performance (Swamidass and Newell 1987; Ward and Duray 2000). In

addition, previous literature has suggested that strategies can be generic by nature or aligned with the environment (D'Aveni 1995; Kotha and Orne 1989; Miller 1992). This study seeks to investigate how the business environment affects the link between service operations strategy and performance.

3.2.1. Resource-based view and service operations strategy

Companies need to deploy and coordinate different resources in order to develop capabilities (Coates and McDermott 2002; Schroeder et al. 2002). The process of capability selection involves the evaluation and arrangement of various resources (Paiva et al. 2008), which requires the formulation, gathering, and creation of organizational knowledge (Marucheck et al. 1990). The resource-based view (RBV) offers a theoretical foundation to understand the process of capability choices and strategy formulation (Schroeder et al. 2002; St. John et al. 2001).

According to the RBV theory, companies can be considered as collections of resources (Barney 1991). Different companies vary in their resource components (Wernerfelt 1984). Accordingly, the capability choices and operational strategy formulation are based on different resources and internal arrangements (Paiva et al. 2008). Therefore, a company's competitive advantage in the marketplace and its competitive positioning are largely dependent on its ability to assemble and deploy the most appropriate stocks of resources (Collis and Montgomery 1995).

Although competitive advantage is mainly achieved by exploiting companies' internal assets and knowledge, resources can only become valuable in the context of market forces. Therefore, the process of resource selection and consolidation needs to be consistent with the external conditions and the competitive environment. Accordingly, some generic combinations of resources tend to produce more powerful

effectiveness in driving business performance than others due to the fit with the market requirements (Bourgeois 1985).

Furthermore, the RBV theory takes a dynamic view of resource use and development. Accordingly, companies can not only build capabilities and formulate operations strategy in a cumulative way, but also in a "constructive destruction" manner to replace existing capabilities with new required ones. In essence, the RBV theory suggests that companies should choose their operations strategy based on their internal and external situations besides being "focused" or "all-round". It is the unique capabilities choice aligned with companies' resource profile and circumstances that provides a competitive edge.

3.2.2 Service operations strategy and business performance

Many operations management studies have tried to understand the link between competitive capabilities and business performance (Amoako-Gyampah 2003; Pagell and Krause 1999; Ward et al. 1995). Most research has focused on the impacts of individual critical operational capability on performance. For instance, Garvin (1984) proposed that quality positively affects profitability. Hayes and Clark (1985) found that quality is linked to higher productivity. Ferdows and De Meyer (1990) and Noble (1995) argued that effective operations strategies generally begin with quality as a base. Loveman (1998) found that high service quality leads to higher customer satisfaction and profit. The positive link between operation speed and financial performance was found by Frei et al. (1999). Ward and Duray (2000) also only found the connection between quality and business performance after testing all four critical manufacturing capabilities. Swamidass and Newell (1987) showed that performance is positively related to flexibility.

These studies provide insights into the critical operation capabilities in an isolated manner. Achieving excellence in any individual capability is undoubtedly very important. However, companies often have to compete on the basis of a variety of capabilities (Flynn et al. 1995; Ward et al. 1996). In order to build additional capabilities, companies need to explore their existing knowledge that can be used in the acquisition process. New knowledge is created through generating new applications from existing knowledge (Kogut and Zander 1992). The organizational knowledge, or operational know-how, accrues through organizational learning during the process of building combinative capabilities—intersectional multi-capability (Rosenzweig and Roth 2004). The shared process and operational know-how of combinative capabilities reduces the operational variability, which leads to reduced operational waste, or non-value-added (Roth 1996). Both operational know-how and reductions in non-value-added are positively connected to business performance (Rosenzweig and Roth 2004). Competitive progression theory (CPT) offers a theoretical foundation for the development of combinative capabilities (Roth 1996). According to CPT, companies are able simultaneously to increase operational know-how and reduce process variation in the process of building multiple capabilities to influence business performance (Rosenzweig and Roth 2004).

Although CPT has suggested a path for capability-based improvement, companies still need to decide what types of capabilities they should acquire to be competitive in the marketplace. A company's operations strategy should be about selection and formulation, or combinations of capabilities that are on the basis of its own resources and therefore unique (Schroeder et al. 2002).

Since companies' business performance relative to competitors reflects their competitive standing, it is the best criterion to examine the effectiveness of

operations strategies on companies' competitive strength (Vickery et al. 1993). We propose that:

Hypothesis 1a: Service operations strategies with different combinations of capabilities positively influence business performance.

A company's stock of prior knowledge constitutes the basis for organizational learning and determines its ability to absorb new knowledge (Cohen and Levinthal 1990; Lane et al. 2006; Tsai 2001). Companies with more existing knowledge are likely to obtain additional knowledge more easily (Garud and Nayyar 1994). Through acquiring additional capabilities, companies learn new knowledge and combine new knowledge with existing knowledge to expand the knowledge stock. Accordingly, the more capabilities companies have built, the more operational know-how and reductions in non-value-added can be achieved, and a greater impact on business performance. This leads to hypothesis 1b. However, literature also suggests that institutionalized capabilities may be misaligned with current environmental requirements and lead to "core rigidities—inappropriate sets of knowledge" (Leonard-Barton 1992).

Hypothesis 1b: Service operations strategies with more capabilities have a greater positive influence on business performance.

3.2.3 Environment and service operations strategy

The contextual influence of the environment on strategy has drawn much attention in the management literature (Joshi and Campbell 2003; Miller and Roth 1988; Nahm et al. 2003; Pugh and Hickson 1969). Contingency theory, for example, has long suggested that the level of alignment between strategies and environment partly shapes organizational performance (Mintzberg 1979; Swink and Way 1995). A number of studies have examined the different organizational reactions to various

environmental changes and shown the criticality of fit between the external environment and elements of strategy (Eisenhardt and Schoonhoven 1990; Swamidass and Newell 1987; Ward and Duray 2000). Braglia and Petroni (2000) found that environmental change can stimulate companies to improve flexibility. Swamidass and Newell (1987) showed that there is a linkage between environmental uncertainty, higher levels of operations flexibility, and a more important role of operations managers in strategic decision making. However, in contrast, Pagell and Krause (1999, 2004) did not find any evidence to support Swamidass and Newell's (1987) argument. Their studies suggested that perceived environmental uncertainty, including munificence, instability, and complexity, does not drive the level of flexibility capability. In the context of an emerging economy, Amoako-Gyampah (2003) found that the concerns that operations managers have about the environmental dynamism do not have a direct impact on the selection of quality, delivery, cost, or flexibility as the components of the operations strategy.

Despite interest in the interaction between the environment and elements of strategy, there have been very few studies that have looked at the roles of the environment in shaping operations strategy choices (Amoako-Gyampah 2003). D'Aveni (1995; 1994) has suggested a set of managerial tools from which companies can choose on the basis of fit in response to a changing environment. Ward et al. (1995) found that dynamism is significantly related to quality, delivery, cost, and flexibility among companies with low profitability and quality, delivery, and flexibility among companies with high profitability.

Building on the combinative capabilities approach (Roth 1996), this study sets out to examine the strategy choices from the capability set perspective so as to

understand how the effectiveness of certain strategy choices may vary under different environments.

Organizational theory literature has suggested that the environment is a multidimensional concept (Duncan 1972). Various sources of environmental change, such as markets, competitors, technology, and regulatory agencies, have been examined in previous studies (Bourgeois and Eisenhardt 1988; Child 1997; Lawrence and Lorsch 1967; Venkatraman and Presscott 1990). Dess and Beard (1984) identified three environmental dimensions, munificence, complexity, and dynamism, which have become the most widely accepted in the literature (Christmann 2000; Gebauer 2008; Homburg and Bucerius 2006; Kabadayi et al. 2007; Kim and Lim 1988; Yasai-Ardekani and Nystrom 1996). Munificence relates to the capacity or environmental resources of a given industry to support companies' growth. Complexity captures the heterogeneity and concentration of environmental elements. Dynamism is the dimension referring to the change and instability of the environment. In this study, since we are trying to explore the service operations strategy in a rapidly changing environment, environmental dynamism is our focus.

Environmental dynamism has been considered to have two aspects—the rate of change and the degree of instability. Previous studies have proposed two sub-dimensions, unpredictability and volatility, to capture the distinct characteristics of dynamism (Anand and Ward 2004; Bourgeois and Eisenhardt 1988; Miller and Friesen 1983; Volberda 1996). Therefore, this study explores whether companies employ different operations strategies to cope with an unpredictable and volatile environment.

The uniqueness of services, in comparison with manufacturing, lies in services being associated with direct customer contact during the service process (Harvey et al. 1997). The increasing interactions between service providers and customers gradually establish the co-producing role of customers in fulfilling the services (Bitner 1992; Grove et al. 2000). The nature of services provides companies with the opportunities to use proactive operations strategies to engage with customers (Schneider and Bowen 1995) and refine the strategies by repositioning services (Shostack 1992). However, in order to achieve this goal, companies need to understand and be able to respond to customers' needs. To address the importance of customers' influence on operations strategy in the service industry, we take into account customer preferences, the perceived importance of quality, delivery, cost, and flexibility, in our environmental factors (Gebauer 2008). Specifically, we propose that:

Hypothesis 2: There is a significant relationship between environmental factors, unpredictability, volatility, and customer preferences and service operations strategy.

3.2.4 The service operations strategy choices

Some researchers have proposed taxonomies (Kathuria 2000; Miller and Roth 1994; Wheelwright and Hayes 1985; Zhao et al. 2006) or typologies (Akhtar and Tabucanon 1993; Kim and Lee 1993; Ward et al. 1996) of strategic groups of companies. These are useful in revealing insights into underlying structures of operational competition, capturing the complexities of organizational reality, and ultimately supporting strategy theory development (Frohlich and Dixon 2001; Miller and Roth 1994).

In this study, the sample size limits our ability to develop a comprehensive taxonomy or typology. Instead, our goal is to gain insights into the service operations strategies that are driving business performance through understanding the pattern of capability choices companies have applied.

In summary, in order to shed light on capability-based service operations strategy, this study examines the impacts of various service capability choices on business performance and the connections between service capability choices and environmental factors. The research framework is illustrated in Figure 3.1.

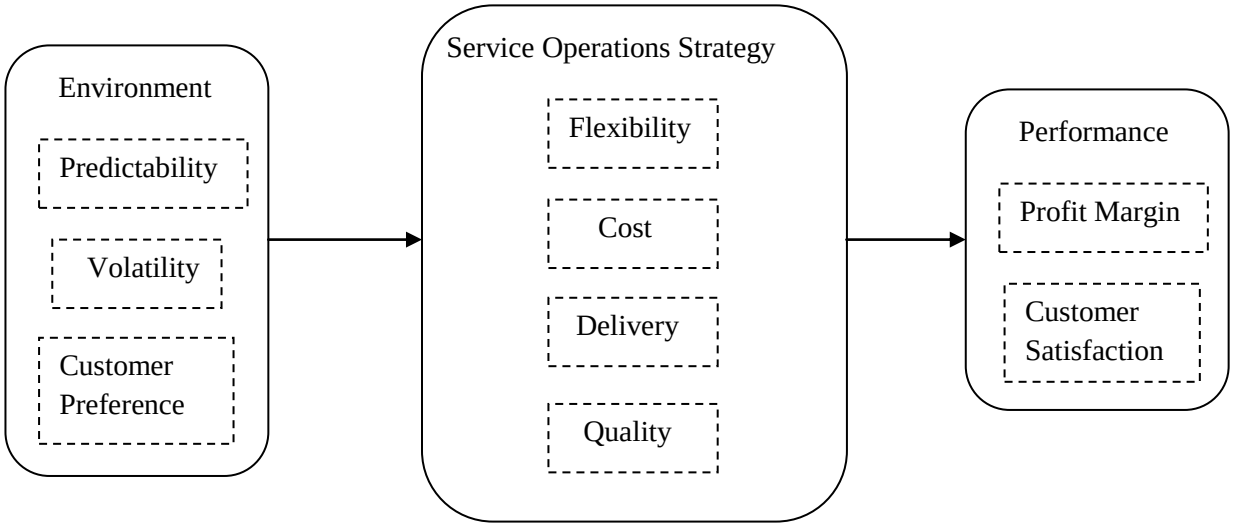


Figure 3.1 Research Framework of Chapter 3

3.3 Methods

3.3.1 The sample

The data set used in this research is drawn from a survey on service agility conducted between July 2008 and November 2008, with the assistance of the Institute of Customer Service (ICS). The ICS is a professional body for customer service, leading customer service performance and professionalism. The membership of ICS is drawn from a broad base including B2B and B2C services; there is no bias

or selection towards certain sectors or types of companies. The respondent target of this study included all 300 members of the ICS. A mixed-mode survey (Deutskens et al. 2006) was performed as the data-gathering procedure. In the first phase, the online questionnaire URL was sent to all the participants by up-to-date email addresses provided by the ICS in July 2008. The online questionnaires were designed on the platform of the Form Factory on the London Business School's portal. A mail survey was later sent out to the professional addresses of all the non-respondents in October 2008. The mixed-mode survey was used for two primary reasons. First, the literature has suggested that each survey mode offers different advantages. For instance, online surveys are associated with faster responses, lower costs, and a wider geographic reach (Green et al. 2003; Illieva et al. 2002; Schuldt and Totten 1994), while mail surveys are better at avoiding invalid addresses and technology barriers (Cobanoglu et al. 2001; Malhotra 1999). Therefore, the two modes can be supplements to each other. In particular, we conducted the online survey first with the full respondent target aiming for a wide reach and fast response, and then the mail survey in the second round to make sure that the non-responses were not due to invalid addresses or technology unfamiliarity. Furthermore, despite some studies' indication that different survey modes may produce different results (Dillman 2000; Roster et al. 2004), more and more research has demonstrated that there is no significant difference in convergent validity between the modes (Deutskens et al. 2006; Epstein et al. 2001; Knapp and Kirk 2003). Therefore, the mixed-mode survey can deliver solid results because of the convergent validity.

The business unit (BU), where the service strategy is formulated, was the unit of analysis. The corresponding respondents were senior executives typically holding the title of Head of Operations or Managing Director. A total of 62 responses were

received, out of which 40 were from the online survey and 12 were from the mail survey. No significant difference has been found between the online responses and the mail responses, or between early and late responses. The response rate was 15.5%. A total of 59 responses were included in the final analysis: 3 incomplete ones were dropped. Table 3.1 highlights descriptive statistics characterizing the 59 business units.

Table 3.1 Sample Profile

	# of Responses	Percentage
Sector		
Automotive	5	8.5%
Financial Services	6	10.2%
Non-profit & Public Sector	13	22.0%
Retail	9	15.3%
Services	17	28.8%
Telecommunication	5	8.5%
Others	4	6.7%
# of Employees		
Fewer than 100	14	23.7%
100–500	12	20.3%
501–1000	7	11.9%
1001–5000	10	16.9%
More than 5000	16	27.1%
# of Branches		
Fewer than 10	29	49.2%
10–50	10	16.9%
51–100	6	10.2%
101–500	10	16.9%
More than 500	4	6.8%
Turnover (£M)		
Less than 10	29	49.2%
10–50	10	16.9%
More than 50	20	33.9%
Total	59	100%

3.3.2 Measures

All the measures were established through drawing on existing scales and testing them in preliminary test interviews. Operational capability measures were adopted from Menor et al. (2001). Measures of environmental factors were mainly in line with studies performed by Anand and Ward (2004) and Gebauer (2008). The detailed

measures and resources are summarized in Table 3.2. The respondents were asked to rate each measure on 7-point, self-anchoring scales. They indicated the relative competitive strength of each capability, where "1=very weak" and "7=very strong". Single items were used to capture the business performance in terms of profitability

Table 3.2 Measures and Sources Overview

Constructs/Measures	Sources
Quality	
Item 1: Courteous service	
Item 2: Consistency (reliability)	
Item 3: Customer perceived quality	Menor et al. 2001
Item 4: Accurate information (credibility)	
Item 5: Empathy	
Item 6: Timely information	
Item 7: Conformance	
Delivery	
Item 1: Delivery speed	
Item 2: Convenient service	Menor et al. 2001
Item 3: On-time delivery	
Item 4: Handling customer complaints	
Cost	Menor et al. 2001
Item 1: Cost	
Flexibility	
Item 1: Production/service system responsiveness	Menor et al. 2001
Item 2: New service/product introduction speed	
Item 3: Customization of products/services	
Predictability	
Item 1: Demand for our products/services is highly predictable	
Item 2: Rate of products/services innovation in our sector is highly predictable	Anand and Ward 2004
Item 3: Rate of innovation in operating processes/systems in our sector is highly predictable	
Item 4: Change of the tastes and preferences of customers in our sector is predictable	
Volatility	
Item 1: Upswings and downswings of demand change very rapidly	
Item 2: Rate of products/services in our sector is very rapid	Anand and Ward 2004
Item 3: Rate of innovation in operating processes/systems in our sector is very rapid	
Item 4: Change of the tastes and preferences of customers in our sector is very rapid	
Customer preference	
Item 1: Our customers are sensitive to products/services' quality	
Item 2: Our customers are sensitive to products/services' delivery	Gebauer 2008
Item 3: Our customers are sensitive to products/services' cost (price)	
Item 4: Our customers are sensitive to products/services' flexibility	

(objective profit level) and customer satisfaction (relative to the competitors). The questionnaire draft was tested among the London Business School consulting club members to fill in for a preliminary study, and then used as interview materials with 15 volunteer MBA students to gather more detailed feedback in terms of wording and structure before finalizing the questionnaire. Table 3.3 shows the descriptive statistics of operations capability dimensions, including the Cronbach's alpha, mean, and standard deviation of each item. Descriptive statistics including the mean, standard deviation, and Pearson correlations are provided in Table 3.4.

Table 3.3 Descriptive Statistics for Operations Capability Dimensions (n=59)

Underlying construct	Mean	Std dev.
Quality (Cronbach's α=0.93)		
Courteous service	5.41	1.50
Consistency	5.13	1.54
Customer perceived quality	5.19	1.58
Accurate information	5.20	1.37
Empathy	5.30	1.50
Timely information	4.98	1.52
Conformance	4.93	1.60
Delivery (Cronbach's α=0.89)		
Delivery speed	4.79	1.45
Convenient services	5.28	1.48
On-time delivery	5.16	1.57
Handling customer complaints	5.36	1.50
Flexibility (Cronbach's α=0.72)		
Product/service system responsiveness	4.40	1.43
New service/product introduction speed	4.53	1.48
Customization of products/services	4.62	1.69

Since the majority of the measures were self-report subjective items, we used two tests to assess the risk due to common method bias. First, Harman's one-factor test was performed by entering all the principal constructs into a principal components factor analysis. There was no single construct accounting for the majority of the covariance, which indicated no substantial common method bias. We then conducted

a partial correlation method test by using the highest factor from the principal component factor analysis as a control variable on all the dependent variables in the PLS model. This factor did not produce a significant change in the variance explained in any of the dependent variables, which again suggested no substantial common method bias (Podsakoff and Organ 1986).

3.3.3 Control variables

Many studies have pointed out that companies with a relatively small size or limited resources are expected to perceive different levels of environmental pressure and respond differently (Amoako-Gyampah 2003; Braglia and Petroni 2000; Vickery et al. 1999). As a consequence, the difference in resource deployment and environmental adaptability may lead to different organizational or operations strategies (Kotha and Orne 1989; Marucheck et al. 1990; Parthasarthy and Sethi 1992). In this study, we introduced three variables—turnover, number of branches, and number of employees—to capture the variation in company size and resources.

3.3.4 Model

Structured equation modelling (a path model) was used to examine the impacts of service capability choices on business performance. Structural equation modelling enables researchers to 1) examine the latent variables, 2) test multiple equations simultaneously, and 3) explore the indirect effects (Bollen 1989). The identification of the strategies' effectiveness was achieved through establishing them as latent variables to test their impact on business performance together with the control factors.

Cluster analysis was employed to identify the service operation strategy choices of the respondents.

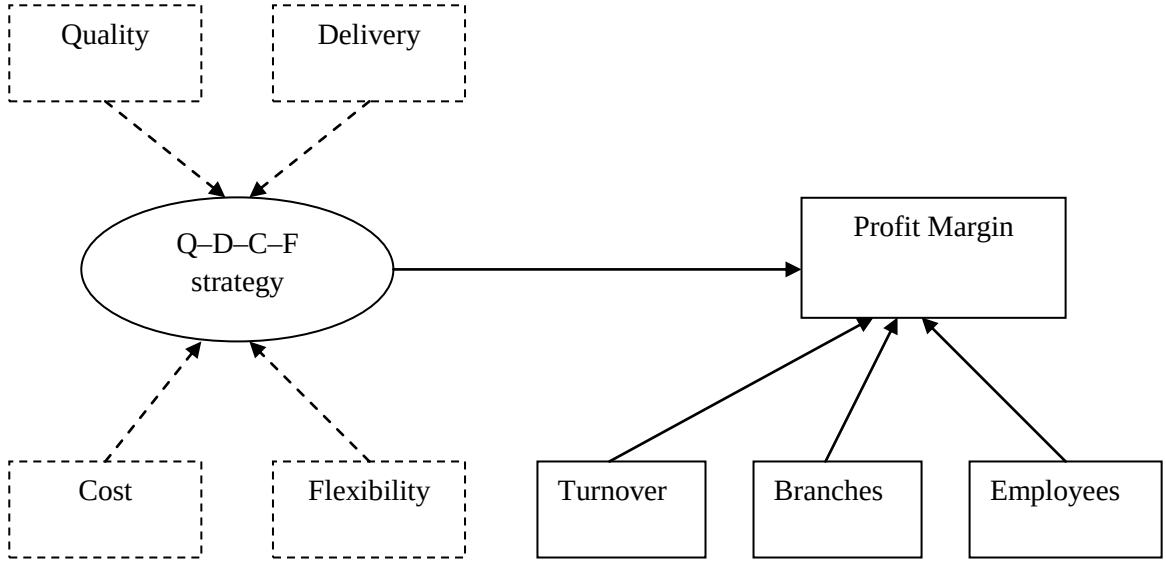
Table 3.4 Correlations and Descriptive Statistics for Observed Variables (n=59)

	PM	CS	Quality	Delivery	Cost	Flexibility	Predictability	Volatility	Customer	Turnover	Branches	Employees	Mean	SD
Profit Margin	1.00	0.16	0.38	0.29	0.13	0.20	0.10	-0.20	0.15	-0.08	0.01	0.11	3.84	1.21
Customer Satisfaction		1.00	0.43	0.39	0.03	0.33	0.22	-0.16	0.10	-0.27	-0.30	-0.28	5.40	1.24
Quality			1.00	0.88	0.58	0.77	0.04	-0.18	0.27	-0.15	-0.14	-0.15	5.17	1.21
Delivery				1.00	0.56	0.71	0.01	-0.05	0.18	-0.15	-0.09	-0.21	5.17	1.29
Cost					1.00	0.48	0.08	-0.06	0.08	-0.10	-0.18	-0.16	4.33	1.42
Flexibility						1.00	-0.04	-0.05	0.42	-0.24	-0.13	-0.21	4.55	1.21
Predictability							1.00	-0.29	0.13	-0.11	-0.02	0.01	4.32	1.21
Volatility								1.00	-0.09	-0.21	-0.13	-0.32	3.99	1.30
Customer									1.00	0.02	0.17	0.10	5.40	1.40
Turnover										1.00	0.69	0.85	3.13	1.58
Branches											1.00	0.68	2.15	1.38
Employees												1.00	3.03	1.57

3.4 Results and Discussion

3.4.1 Operation strategies

We set all the possible combinative capability sets as latent variables and tested their impact on two types of business performance, profit margin and customer satisfaction. We introduced the number of employees, number of branches, and turnover as control variables in the models. Figure 3.2 presents the model in which the combinative capability set contained all four capabilities.



Note: The Q–D–C–F strategy is a latent variable. Quality, delivery, cost, and flexibility are the indicator/manifest variables.

Figure 3.2 Operations Strategy Path Model

In total 11 models were examined. The statistics on the overall model fit are shown in Table 3.5. The chi-square statistics indicated an excellent overall fit ($p>0.1$), except for the Q–D–C customer satisfaction model (see Table 3.5). The supplementary stand-alone fit indices (GFI, AGFI, RMR, and RMSEA) were generally well above the rule-of-thumb model fit value (Byrne 2001). The GFIs were above 0.90 and the AGFIs were above 0.80, indicating a good fit. RMRs showed an acceptable goodness-of-fit with values below 0.10. Most of the RMSEA figures were

well below 0.08, demonstrating an excellent model fit. Overall, the results provided solid evidence that the models tested fitted the data well.

All the combinative operations strategy options were tested as latent variables; the factor loadings for each latent construct are shown in Table 3.6. Most of the loadings are greater than 0.75 and all the loadings are above 0.60. This suggests that the operations strategy variables are reliably measured.

In order to obtain a full picture of the effectiveness of various combinative operations strategies on business performance, we tested the models with control variables only to serve as a base model, and then introduced strategy variables into the models.

A summary of the main effects is listed in Table 3.7. Tables 3.8 to 3.18 in Appendix 2 show detailed hierarchical model results, indicating the impacts of various combinative operations strategies on the profit margin and customer satisfaction.

The base models, with control variables only, indicated that companies' turnover and employee size may link to the profit margin in the surveyed companies. Companies with a higher turnover showed a lower profit margin, while companies with more employees were associated with a higher profit margin. There was, however, no statistical evidence that company characteristics have any impact on customer satisfaction.

After introducing the strategy variables into the base models, the turnover and number of employees not only still significantly linked to the profit margin, but most of them showed a higher significance level. As in the base models, no statistical evidence was found that company characteristics affect customer satisfaction.

Models in which strategy variables are significant have a significant R-square increase in comparison with the corresponding base models, indicating the improvement of explanatory power by introducing strategy variables. Overall, all models show relatively low R-squares, which is, however, not uncommon in literature (Anand and Ward 2004; Rosenzweig and Roth 2004; Williams et al. 1995). The primary reason for the low R-square is that there are many other factors significantly influencing both profit margin and customer satisfaction, including macro market situation, product lifecycle, competition, pricing, cultural and social factors. Due to the limitation of the survey, we were not able to control all the variables. The focus of this study is to examine the linkage between strategy variables and business performance, rather than finding the best fit explanatory factors for business performance.

As shown in Table 3.7, all the combinative operations strategy options except C–F had significant positive links to companies' profit margins in our surveyed sample. This may indicate that there are multiple capability choices that companies can implement to achieve high financial performance, which supports hypothesis 1a. This finding is consistent with the operations strategies suggested by the RBV theory in that companies vary in their strategies due to the differences in their resource profiles. According to the main effect models, a service operations strategy based on almost any combination of the four competitive capabilities as their operations strategies seemed to be associated with an improved profit margin. One exception was that there is no statistical evidence that cost and flexibility combined strategy affected the profit margin significantly.

Table 3.5 Model Overall Fit Statistics (n=59)

Fit Indices	Fit Statistics Value										
Profit Margin	**Q–D–C–F**	**Q–D–C**	**Q–D–F**	**Q–C–F**	**D–C–F**	**Q–D**	**Q–C**	**Q–F**	**D–C**	**D–F**	**C–F**
Chi-square	15.7477	9.8990	12.9912	9.1444	9.5436	7.3248	3.318	4.7684	5.0395	5.9536	6.2242
Degree of Freedom	17	11	11	11	11	6	6	6	6	6	6
Probability Level	0.5418	0.5395	0.2939	0.6086	0.5718	0.2919	0.7680	0.5738	0.5388	0.4284	0.3986
Goodness-of-Fit (GFI)	0.9381	0.9551	0.9411	0.9583	0.9559	0.9612	0.9816	0.9736	0.9725	0.9672	0.9658
Adj. Goodness-of-Fit (AGFI)	0.8689	0.8857	0.8500	0.8938	0.8876	0.8643	0.9356	0.9077	0.9036	0.8853	0.8804
Root Mean Square Residual (RMR)	0.1010	0.0911	0.1014	0.1008	0.1014	0.0847	0.0819	0.0951	0.0863	0.0993	0.0959
Root Mean Square Error of Approximation (RMSEA)	0.0000	0.0000	0.0564	0.0000	0.0000	0.0847	0.0000	0.0000	0.0000	0.0000	0.0256
Customer Satisfaction											
Chi-square	21.2597	18.1145	10.4852	14.2864	15.9204	7.3248	3.4350	4.7684	5.1405	5.9536	6.3340
Degree of Freedom	17	11	11	11	11	6	6	6	6	6	6
Probability Level	0.2149	0.0790	0.4873	0.2175	0.1441	0.2919	0.7526	0.5738	0.5259	0.4284	0.3868
Goodness-of-Fit (GFI)	0.9200	0.9233	0.9519	0.9383	0.9315	0.9612	0.9810	0.9736	0.9720	0.9672	0.9653
Adj. Goodness-of-Fit (AGFI)	0.8306	0.8049	0.8776	0.8429	0.8256	0.8643	0.9335	0.9077	0.9020	0.8853	0.8784
Root Mean Square Residual (RMR)	0.1039	0.0970	0.0996	0.1045	0.1061	0.0852	0.0808	0.0974	0.0843	0.0999	0.0965
Root Mean Square Error of Approximation (RMSEA)	0.0663	0.1056	0.0000	0.0724	0.0886	0.0617	0.0000	0.0000	0.0000	0.0000	0.0313

Table 3.6 Factor Loadings for Operations Strategy as a Latent Variable (n=59)

Factor	Q–D–C–F	Q–D–C	Q–D–F	Q–C–F	D–C–F	Q–D	Q–C	Q–F	D–C	D–F	C–F
Quality	0.97	0.95	0.98	0.96		0.88	0.72	0.83			
t-stats	9.80	8.90	9.83	8.06		8.71	6.30	7.79			
Delivery	0.90	0.92	0.89		0.90	0.99			0.71	0.80	
t-stats	8.64	8.49	8.46		7.16	10.86			6.15	7.32	
Cost	0.60	0.60		0.60	0.62		0.79		0.78		0.66
t-stats	4.89	4.95		4.69	4.75		7.41		7.19		5.38
Flexibility	0.79		0.79	0.80	0.78			0.93		0.89	0.72
t-stats	7.09		7.02	6.50	6.09			9.68		8.84	6.28

Table 3.7 Summary of the Main and Interaction Effects of Operations Strategy Variables (n=59)

Profit Margin	Q–D–C–F	Q–D–C	Q–D–F	Q–C–F	D–C–F	Q–D	Q–C	Q–F	D–C	D–F	C–F
Main Effect Model											
Main Effect	+***	+***	+***	+***	+**	+***	+**	+**	+**	+**	+
Customer Satisfaction											
Main Effect Model											
Main Effect	+***	+***	+***	+***	+**	+***	+	+**	+	+	+

Note: significance *p<0.10, **p<0.05, ***p<0.01

We next look at the relationship between combinative capability choices and customer satisfaction. The results in Table 3.7 show that, in comparison with the profit margin, fewer combinative operations strategy options had significant positive links to customer satisfaction in our sample. Specifically, strategy options with three or four capabilities were significantly associated with customer satisfaction. However, among the strategy options with two capabilities, only Q–D and Q–F were significantly linked to customer satisfaction. Although fewer combinative operation strategy options were significantly associated with customer satisfaction than profit margin, this finding is still in line with hypothesis 1a that companies do have various strategy options to choose from in driving performance on customer satisfaction.

According to Table 3.7, most combinative operations strategy options with two capabilities positively linked to the profit margin and customer satisfaction at lower significance levels (0.05 level) than the strategy options with three or four capabilities (0.01 level). This may suggest that in the surveyed companies, the more capabilities companies have acquired and included in their service operations strategy, the higher positive association the service operations strategy has on business performance, which supports hypothesis 1b. This finding is in line with the arguments in combinative capabilities and organizational learning that companies can increase their stock of knowledge through acquiring additional capabilities. As a consequence, they can enhance their ability to achieve operational know-how and reductions in non-value-added so as to improve performance.

Overall, the research indicates that in the surveyed companies a wide range of combinative capabilities may be significantly associated with performance and service operations strategy with more capabilities having a more significant linkage with performance. It is interesting to examine these findings in the context of

competitive progression theory or the "sand cone" model. This may suggest that there is a clear sequence to achieving multiple capabilities. Specifically, it may indicate that companies can follow the order of quality, delivery, flexibility, cost, and flexibility establishment to become agile and improve profitability. However, since our study is based on one country and small sample size, further studies in more countries and with bigger sample size are needed to improve the generalizability of the findings.

Some combinative choices, such as the combination of delivery, cost, and flexibility, or the combination of quality and flexibility, were not consistent with what the cumulative model suggested in the "sand cone" sequence, yet were effective from the perspectives of both the profit margin and customer satisfaction. However, a closer examination of the results indicates that they may not contradict competitive progression theory or the "sand cone" model, which suggests that companies are able to acquire multiple capabilities by following the sequence of quality, delivery, cost, and flexibility (Ferdows et al. 1986; Nakane 1986; Roth 1996). An examination of the significance levels of strategy variables' main effects may indicate that there were certain trends in the surveyed companies. First of all, strategies with more capabilities demonstrated higher significance levels. Strategy variables with the combination of four capabilities were all significant at the 0.01 level in both profit margin and customer satisfaction models. Most of the strategies with three capabilities also showed a significance level of 0.01. In comparison, most of the strategy variables with two capabilities were only significant at the 0.05 level. This evidence is in line with the argument that companies should seek to influence business performance by acquiring combinative capabilities (Roth 1996), rather than perceiving capabilities as trade-offs (Skinner 1969). The more cumulative

capabilities there were in the strategies, the more significant the link with business performance.

We now examine whether our findings indicate that certain capabilities were more important than others for the service operations strategies to be effective. Although service operations strategies with three capabilities all significantly positively linked the profit margin and customer satisfaction, the strategies with quality had a higher significance level (at 0.01) than the strategies with the combination of delivery, cost, and flexibility (at 0.05). For strategies with two combined capabilities, strategies with either quality or delivery had significant connections with the profit margin. Only the quality–delivery and quality–flexibility strategies were found to be connected with customer satisfaction significantly. In particular, the strategy with the combination of quality and delivery showed a higher significance level (at 0.01) than the other effective strategies with two capabilities (at 0.05). The pattern above was consistent with previous research indicating that quality is the most essential capability for strategies to be effective or highly significant in the surveyed companies. Delivery also seemed to be an important component of effective strategies in the surveyed companies. In other words, quality and/or delivery seemed to be necessary components for the service operations strategy. This was in line with what the "sand cone" model proposed, cumulatively building capabilities from quality to delivery to low cost to flexibility, where quality and delivery can be considered as the foundation for the strategy to succeed. From quality to flexibility, each step requires increasingly higher levels of integration and coordination, as well as more learning (Rosenzweig and Roth 2004). Through establishing quality, companies can often gain a high degree of control over process, which will be a key factor for the subsequent capability-based improvements (Corbett and van

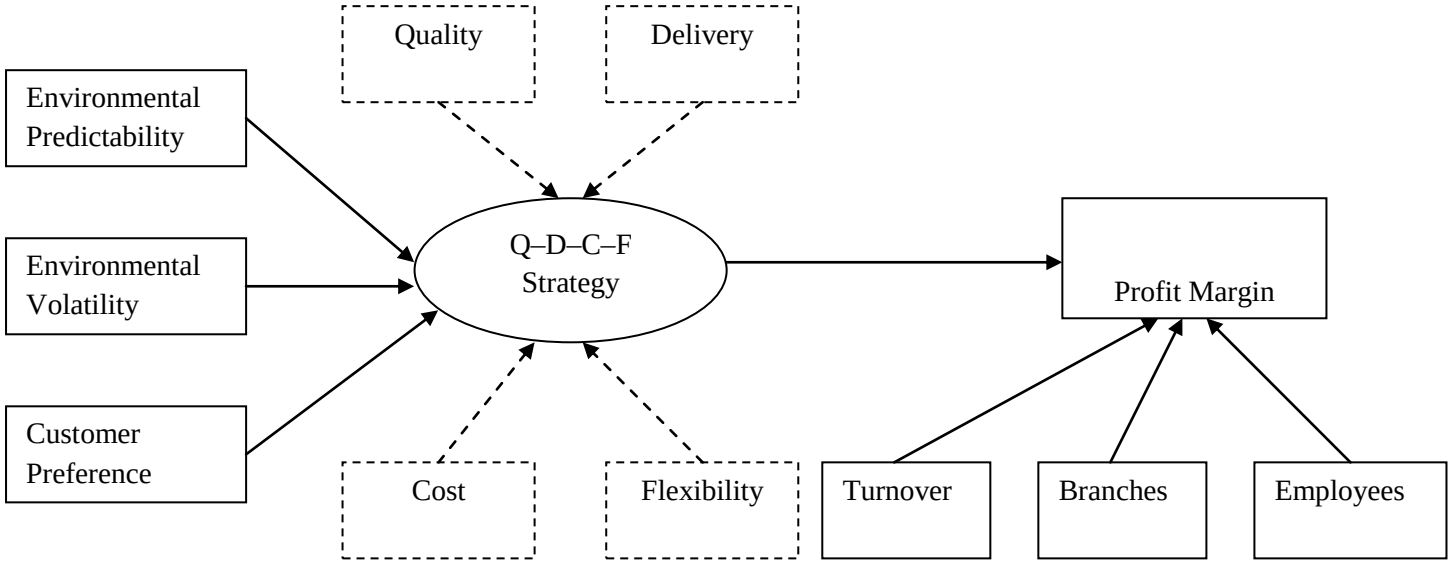
Wassenhove 1993). Similarly, building delivery capability requires a broader degree of process specificity and relationship-building initiatives (Roth 1996), which allows companies to be more adaptive to demand changes without incurring a high cost. Therefore, strategies with a quality and/or delivery component provide a solid basis to increase organizational knowledge, or operational know-how, so that companies can be more efficient in managing their activities and gain more outputs from their investment than their peers (Rosenzweig and Roth 2004).

To seek further evidence, we tested the main effect of each capability individually, as shown in Tables 3.18–3.21 in Appendix 2. Both quality and delivery were highly linked with companies' profit margin and customer satisfaction. However, no statistical evidence was found to support that cost has a significant linkage to the profit margin or customer satisfaction. Flexibility was connected with customer satisfaction. But no statistical evidence was found on the connection between flexibility and profit margin.

3.4.2 Environment and operation strategies

We used structural equation modelling to test the impact of environmental variables, predictability, volatility, and customer preference by setting them as antecedents of various operations strategies, as illustrated in Figure 3.3 where the operations strategy was a combination of four capabilities. In order to obtain a detailed understanding, we kept the link between operations strategies and performance in the models, together with the control variable—the number of employees, number of branches, and turnover.

In total 11 models were examined. A summary of the results is listed in Table 3.23. Tables 3.24 to 3.34 in Appendix 2 show detailed model results.



Note: The Q–D–C–F strategy is a latent variable. Quality, delivery, cost, and flexibility are the indicator/manifest variables.

Figure 3.3 Operations Strategy and Environment Path Model

With the environmental variables in the path models, the significance directions of operations strategies' main connections with performance stayed the same as in the previous models, except that the D–F strategy significantly linked to customer satisfaction, rather than the profit margin.

No evidence was found that environmental predictability significantly connected to any of the operations strategies in both the profit margin and customer satisfaction models. Similarly, no evidence was found that environmental volatility significantly linked to the choice of operations strategies, except for the weak link (significant at the 0.10 level) with the Q–D strategy. At first glance, our results may not seem to

Table 3.23 Summary of the Effects of Environmental Variables (n=59)

Profit Margin	**Q–D–C–F**	**Q–D–C**	**Q–D–F**	**Q–C–F**	**D–C–F**	**Q–D**	**Q–C**	**Q–F**	**D–C**	**D–F**	**C–F**
Predictability	-	-	-	-	-	-	-	-	-	-	-
Volatility	-	-	-	-	-	-*	-	-	-	-	-
Customer	+**	+**	+**	+**	+**	+**	+**	+*	+	+*	+
Customer Satisfaction											
Predictability	-	-	-	-	-	-	-	-	-	-	-
Volatility	-	-	-	-	-	-*	-	-	+	-	+
Customer	+**	+**	+**	+**	+**	+**	+*	+***	+	+**	+

Note: significance *p<0.10, **p<0.05, ***p<0.01

follow some previous studies (Eisenhardt and Schoonhoven 1990; Swamidass and Newell 1987; Ward and Duray 2000). However, the previous literature suggested quite a mixed picture of the connection between environmental factors and competitive capabilities or operations strategies. In a number of empirical studies, no direct relationship between environmental dynamism and manufacturing strategy has been found (Amoako-Gyampah 2003; Van Dierdonck and Miller 1980; Ward et al. 1995).

A potential explanation for the insignificant link between environmental predictability and volatility and service operations strategy might be that half of the predictability and volatility measures were innovation-related, which can differ across industries. It is believed that companies that are not high technology-based or long product cycle-oriented may not consider innovation as a great concern (Amoako-Gyampah 2003). Therefore, it was not surprising that no statistical evidence was found to support that environmental predictability and volatility have any significant influence on the strategy variables.

In contrast, customer preference in the surveyed companies demonstrated strong associations with the majority of the operations strategies. Specifically, all the strategy variables except for D–C and C–F were significantly linked to customer preference. The higher expectations that customers had, or the more sensitive customers were towards quality, delivery, cost, and flexibility, the better equipped companies were with each operations strategy. No particular pattern was found in terms of the significance levels of the connections between customer preference and various strategies.

The results were in line with what we expected, that customers' needs of the surveyed companies seemed to connect to companies' operations strategy in the way that the higher expectations customers had on the four competitive dimensions, the better operations strategies were. The fact that operations strategies were heavily shaped by the requirement of customers may indicate that the companies dealt with illustrated the key difference between service and manufacturing. In services, customers influence the design of the service process and/or the delivery of the service through their presence, interaction, and/or participation, which is called customer contact (Fitzsimmons and Sullivan 1982; Kellogg and Chase 1995; Schmenner 1986). Therefore, it was of no surprise that companies followed customers' preferences and expectations to establish their operations strategies. As Roth and van der Velde (1991) argued, if manufacturers' competitiveness lay in "order-winning and order-qualifying" (Hill 1989), service companies had to focus on "customer/account winning and account qualifying".

In addition, as part of the overall company strategy set, the operations strategy needed to coordinate and interact with other strategies. In particular, it was important for service companies to align their operations strategy with their marketing strategy so as to enable them not only to identify and but also to satisfy customers' needs (Roth and van der Velde 1991). By doing so, operations strategy, like marketing strategy, was led by customers.

3.4.3 The operations strategy choices

Cluster analysis was employed to identify the existing operations strategy choices from the respondent capability profiles using the K-means procedure. Although the K-means procedure has its limitations in its sensitivity to outliers and the

requirement for fairly stable seed points (Milligan 1980), it is still the most commonly applied procedure for cluster analysis. In total 59 observations were entered into the cluster procedure; 1 was dropped due to missing data. The decision on the total cluster number was dependent on the tightness of the clusters, as measured by the R^2 and pseudo-F statistics (Milligan and Cooper 1985). The 4-cluster model provided the best fit. We also looked into ANOVA to verify the clusters. Finally the Wilks Lambda test indicated that the null hypothesis that the 3 clusters were equal across all the defining variables could be rejected.

The four operations strategy groups are shown in Table 3.35. We can interpret the four groups as "slackers", "straddlers", "traditionalists", and "agile achievers" based on the importance of a competitive capability relative to other clusters and within a cluster. Terms "Straddlers" and "Traditionalists" are taken from Menor, Roth and Mason's paper (2001). Table 3.36 provides the results of discriminant analysis with the strategic group as the dependent variable and the four clustering variables as independent variables, as an indication of model validity. The canonical correlations, which were all significant, measured the relative strength of the relationship between the set of competitive capability clustering variables and the strategic service group membership. The first discriminant function indicated an overall consistency dimension where canonical loadings were high on four capabilities. The second function had relatively high scores on quality and cost. The third discriminant function focused on delivery.

Group 1: Slackers. The slackers' group, representing only 5% of the sample, showed low levels of service quality, delivery, cost, and flexibility. Companies in this group not only had not established competitive advantages in low cost and flexibility, but also lacked the basic foundation of service—high quality and reliable

delivery. The results indicated that this group did not seem to have established any distinctive capabilities in its operations strategies. Therefore, it may be difficult for the companies to survive in the medium or long term without a significant improvement in their capabilities and clear operations strategies.

Group 2: Straddlers. Companies in the straddlers' group performed better on all four competitive capabilities than the slackers' group. However, they were not superior in any specific capabilities. This group represented 28% of the sample. Companies in this group may be in the process of improving their competitive capabilities and establishing operations strategies. They can become a threat to the traditionalists once they have caught up on the quality and delivery capabilities.

Group 3: Traditionalists. The traditionalists, representing 28% of the sample, distinguished themselves from straddlers and agile companies by their focus on the two foundational capabilities—quality and delivery. They had higher levels of quality and delivery than the straddlers; however, they had a significantly lower level of cost efficiency. This group's strategy choice was in line with the traditional manufacturing or production-line approach view that cost and flexibility are trade-offs of quality and delivery. Companies in this group chose to stick to the fundamental capabilities and establish operations strategies accordingly.

Group 4: Agile achievers. This was the largest group with 39% of the sample. The agile achievers were those with high levels of all four capabilities. The operations strategy this group implemented was in line with the service agility strategy advocated by many researchers (D'Aveni and Gunther 1994; Menor et al. 2001; Rosenzweig and Roth 2004; Yusuf et al. 1999).

Table 3.35 Service Operations Strategy Choices by Group

	Operations Strategy Groups' Descriptive Statistics				
	Slackers (n=3) Group 1	**Straddlers (n=16) Group 2**	**Traditionalists (n=16) Group 3**	**Agile (n=23) Group 4**	**F-stats**
Competitive Capabilities					
Quality					
Cluster Mean	1.10	4.52	5.58	5.87	84.70
Standard Error	0.17	0.41	0.48	0.64	(p<0.001)
Delivery					
Cluster Mean	1.33	4.34	5.72	5.87	50.93
Standard Error	0.58	0.73	0.60	0.71	(p<0.001)
Cost					
Cluster Mean	1.33	3.75	3.51	5.70	50.56
Standard Error	0.58	1.06	0.64	0.56	(p<0.001)
Flexibility					
Cluster Mean	1.67	3.93	4.88	5.13	17.16
Standard Error	1.15	0.70	0.76	1.04	(p<0.001)

Note: terms— "Straddlers" and "Traditionalists", are borrowed from Menor et al. (2001).

Slackers: low competitiveness across all capabilities.

Straddlers: mediocre competitiveness across all capabilities

Traditionalists: high competitiveness in quality and delivery

Agile: high competitiveness in all capabilities.

Table 3.36 Results of Discriminant Analysis

Canonical Function Correlation	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	7.51	88.7	88.7	0.94
2	0.91	10.7	99.4	0.69
3	0.05	0.6	100.0	0.21

	Canonical Loadings			Canonical Coefficients		
Predictor Set	Function 1	Function 2	Function 3	Function 1	Function 2	Function 3
Quality	**0.77**	**-0.52**	-0.29	**0.77**	-0.25	**-0.96**
Delivery	**0.58**	-0.48	**0.59**	0.21	-0.43	**0.89**
Cost	**0.54**	**0.81**	0.22	**0.59**	**0.82**	0.06
Flexibility	**0.50**	-0.21	0.34	-0.10	-0.01	**0.53**

Table 3.37 Service Operations Strategy Groups' Performance

	Operations Strategy Groups' Performance			
	Slackers (n=3) Group 1	**Straddlers (n=16) Group 2**	**Traditionalists (n=16) Group 3**	**Agile (n=23) Group 4**
Business Performance				
Profit Margin				
Cluster Mean	2.25 (2,3,4)	3.75 (1)	3.87 (1)	4.10 (1)
Standard Error	1.39	1.17	1.11	1.23
Customer Satisfaction				
Cluster Mean	4.33 (3)	4.75 (3,4)	6.01 (1,2)	5.57(2)
Standard Error	3.06	1.00	1.01	1.04

Note: the numbers in parentheses indicate the group numbers from which this group was significantly different at the 0.01 level.

The service agility strategy was based on the belief that companies cannot be in an advantageous position unless they develop all-round capabilities in quality, delivery, cost, and flexibility under the current market condition.

Overall, the cluster analysis results illustrate the operations strategies that our sample companies chose to establish. The resultant operations strategy groups here had much in common with those that Menor et al. (2001) found in the retail banking industry, where the straddlers', traditionalists', and agile groups were nearly identical to the groups in our study. We did not find the niche group that was argued to be between agile and traditionalists in terms of capability performance.

Since Nakane (1986) provided evidence that companies could go beyond trade-off and build multiple capabilities simultaneously, many studies have been focused on what capabilities companies should build and how to build them. In particular, the concept of service agility emerged as one of the most accepted operations strategies. This emphasizes the importance of effectively organizing and exploiting an organization's resources to establish multiple competitive advantages in quality, delivery, low cost, and flexibility (Fliedner and Vokurka 1997; Kidd 1994; Rosenzweig and Roth 2004). The agile achievers' group, which represented 39% of the sample, has demonstrated the agile status. More than one-quarter of the companies in our sample, the traditionalists' group, have focused on quality and delivery to differentiate themselves from the competitors. This is consistent with our earlier findings that this choice can achieve a better profit margin and higher customer satisfaction level. Companies in the straddlers' group were likely to be those that have not yet defined clear operations strategies or at least have not been able to establish them. A lack of effective strategies may put them at risk in the market competition. However, the current status may also provide an opportunity for

them to design the most appropriate strategy that fits the market requirement and leads to higher performance. A few companies that were in the slackers' group were clearly in urgent need of improving their competitive capabilities.

We assessed the strategic groups on business performance, as depicted in Table 3.37. The *slackers'* group derived a lower profit margin than the other groups. There was, however, no significant difference in terms of profit margin among the *straddlers'*, *traditionalists'*, and *agile* groups. The *slackers'* and *straddlers'* groups showed lower levels of customer satisfaction relative to the *traditionalists'* and *agile* groups.

This finding indicated that companies that implemented certain levels of capabilities did outperform those that had not built any capabilities, e.g., the *slackers'* group. This result was also in line with the earlier analysis in this study that there are different service operations strategy choices companies may apply to drive a high profit margin and customer satisfaction. Companies in the *traditionalists'* group, focusing on service quality and delivery, may achieve similar levels of business performance to companies that excel in all four capabilities.

3.5 Conclusion

This chapter seeks to understand the performance outcomes of service operations strategies with different combinative capabilities, and the impacts of environmental factors on service operations strategies. We used an empirical approach to identify the combinative capabilities that positively influence business performance and the environmental factor that drives service operations strategy.

3.5.1 Service operations strategy

Following the capability view of operations strategy (Boyer et al. 2005; Skinner 1974; Swink and Way 1995), this study empirically investigated how various service operations strategies with different combinations of capabilities affect business performance. Overall, we found that a majority of the operations strategy options have significant positive connections with business performance. Specifically, 7 out of 11 strategies are effective from both profit margin and customer satisfaction perspectives, and an additional 3 strategies are positively linked to the profit margin. One implication of these results is that companies are not constrained in their operations strategy choices. This finding supports the RBV-oriented operations strategy in that companies should have the opportunity to define their operations strategy based on their assets portfolio and resource deployment capabilities (Collis and Montgomery 1995; Paiva et al. 2008), rather than force themselves to apply the same operations strategy. The results indicate that companies may choose to build their operations strategy associated with all four capabilities, any three capabilities, or two selected capabilities, particularly those involving quality or delivery. The wide service operations strategy choices may offer opportunities for companies to align their capability choices with their resource profile to gain a competitive edge.

In addition, our results were also in line with the competitive progression theory or "sand cone" model view from two perspectives. First, the strategy variables with three or four capabilities demonstrated higher significance levels than the strategies associated with only two capabilities. This pattern supported the view that companies may seek to build more combinative capabilities to guide their operations and drive their business performance. Second, our results indicated that service operations strategies that drove business performance were associated with either quality or delivery. Therefore, quality and delivery may be considered as essential components

of any effective strategies, or the foundation as argued in the "sand code" model that companies will establish quality and delivery capabilities before achieving low cost and flexibility.

3.5.2 Service operations strategy and environment

This study sought to examine the linkage between the environment and the service operations strategy. In particular, we tested the models with environmental predictability, volatility, and customer preference being the antecedents of various operations strategies. Previous studies presented a mixed picture of the impacts of environmental dynamics on operations strategies. No connection between environmental predictability and volatility and operations strategies was found in our study, which suggested that the establishment of operations strategies in our sample companies may be not driven by the pressure of environmental dynamics; this is consistent with some of the previous literature (Amoako-Gyampah 2003; Van Dierdonck and Miller 1980; Ward et al. 1995). Customer preference was found to affect operations strategies significantly. Specifically, companies were likely to establish higher levels of operations strategies when the customers they were facing were more sensitive to the corresponding service dimensions. The overall results may indicate that the service operations strategy choices of surveyed companies were more driven by the customers' preference than by the pressure of existing market dynamics. This finding emphasized the characteristics of the service industry where customers heavily influence companies' behaviour through customer contact (Fitzsimmons and Sullivan 1982; Kellogg and Chase 1995; Schmenner 1986).

3.5.3 The operations strategy choices

Four distinct types of operations strategies were identified by the importance they place on competitive capabilities: slackers, straddlers, traditionalists, and agile achievers. Companies in the agile achiever group may have followed the "sand cone" model to establish cumulative capabilities in quality, delivery, cost, and flexibility. Slackers, on the contrary, were those companies with disadvantages in all four capabilities. Quality and delivery were the main focus and strength of the traditionalists. Straddlers were those companies that had better capabilities than the slackers, although they had not yet turned any capabilities to their competitive advantage.

The findings indicated that companies in the slackers' and straddlers' groups did not seem to have established distinctive operations strategies. The companies that had implemented distinct operations strategies either followed the traditional manufacturing or production-line view to focus on quality and delivery, or positioned themselves as all-around champions by becoming competitive in all four capabilities. Strategic options with three combinative capabilities or with the combination of quality and flexibility, which have been suggested to influence business performance positively, did not seem to be preferred choices among the surveyed companies.

3.5.4 Contribution and limitations

Ever since the concept of a focused factory was introduced almost four decades ago (Skinner 1969), a significant body of research has sought to find out what types of operations strategies companies should apply to improve their marketplace positions. This study sought to contribute to the literature from the following three aspects. First, we contribute to the combinative capabilities theory and competitive progression theory by empirically examining the linkage between business

performance and service operations strategies with different numbers of combinative capabilities across multiple industries. Our findings suggested that various sets of combinative capabilities positively influence business performance and the strategies with a higher number of capabilities have a higher impact on business performance. The results add empirical support to the combinative capabilities and competitive progression theory in that organizations learn know-how and reduce non-value-added through building multiple capabilities so as to improve performance (Kogut and Zander 1992; Menor et al. 2001), and the more capabilities organizations have acquired, the higher learning ability they have and the better performance they can achieve (Garud and Nayyar 1994; Lane et al. 2006; Lichtenthaler 2009; Tsai 2001).

In contrast to manufacturing, there has been only limited empirical study of operations strategies in service. This study added to the current service operations literature by empirically examining the effectiveness of operations strategies and the environmental antecedents. In particular, our results indicated that, in contrast to some previous manufacturing-oriented operations strategy studies, environmental predictability and volatility did not exhibit any significant connection with operations strategies. Instead, operations strategies seemed to be influenced heavily by customer preference, a service industry characteristic. This finding indicated that customers certainly play a very important role in shaping the operations strategies in the service industry, and overshadowed the general environmental dynamics in our sampled companies.

Lastly, we examined the actual operations strategies companies in our sample companies. We identified four groups of strategies that companies implement, two of which were consistent with the effective combinative operations strategy options we identified. This finding indicated that the companies seemed to apply a few strategies,

rather than implement a variety of strategies. This may be because the companies followed the strategies that have been widely accepted or successful. Alternatively, this may be aligned with the competitive progression theory in that there was a logical order for companies to establish their capabilities. Future research is needed to identify the real cause.

There are a number of limitations to this study. First, our analysis was based on self-reported survey items that are potentially subject to response bias. In particular, common method bias is a general concern with regard to this type of survey data. However, the Harman's one-factor test and a partial correlation method we applied indicated that there was no evidence to suggest that the bias will affect our results in any significant way. In addition, one of the performance measures, profit margin, is an objective variable, which also reduces the risk of common method bias.

A second limitation lies in the research context and sample size. This study is based on survey in one country, which limits the generalizability of its findings. The small sample size also limits the statistical power and precludes the examination of more complex causal models, as well as restricts the study's generalizability.

Another limitation is the static nature of the survey data. We did not collect longitudinal data to capture how companies can establish operations strategies, respond to environmental changes, and affect business performance over time. Future studies might investigate whether the effectiveness of operations strategies may change through time.

In summary, this research provided empirical evidence of the impacts of various potential operations strategies on business performance, as well as identifying their antecedent environmental factors. We also classified the service operations strategy

choices implemented by our sampled companies. The findings sought to shed light on the combinative capabilities options that companies may apply in driving business performance.

CHAPTER 4 – THE SAND CONE MODEL REVISITED: THE IMPACT OF SERVICE FLEXIBILITY ON QUALITY, DELIVERY, AND COST

4.1 Introduction

The ability of an organization to achieve operational excellence along multiple competitive capabilities such as cost, quality, delivery, and flexibility simultaneously is increasingly regarded as a source of competitive advantage. Initially developed in the field of manufacturing and dubbed agility (D'Aveni and Gunther 1994; Yusuf, Sarhadi et al. 1999), this concept has recently attracted the attention of service management scholars as well (Menor, Roth et al. 2001; Aranda 2003; Verdu-Jover, Llorens-Montes et al. 2004). Building upon this literature, this chapter aims to shed new light on the process by which service companies achieve operational excellence along multiple competitive dimensions, and on the impact that developing capabilities to handle output variations has on cost, quality and delivery performance.

Whilst the importance of agility has been widely recognized in the literature (Burgess 1994; Anand and Ward 2004; Narasimhan, Swink et al. 2006), it has also been suggested that the existence of trade-offs prevents firms from developing different competitive capabilities simultaneously (Hayes and Wheelwright 1984). Researchers have dedicated a considerable amount of attention to study these trade-offs and to identify the conditions that favor the generation of agility. Most of these efforts have been devoted to study how firms can achieve this goal by building new capabilities progressively. Literature on the sand cone model (Ferdows and De Meyer 1990; Noble 1995) and the competitive progression theory (Roth 1996) have argued that, to become excellent along multiple dimensions, companies should develop capabilities in a pre-specified sequence. In addition, to effectively develop a

new capability, firms must consolidate the capabilities at the base of the pyramid before adding those situated near the top (Nakane 1985; Ferdows and De Meyer 1990; Rosenzweig and Roth 2004).

One assumption underlying this perspective is that the firm's existing capabilities (i.e., the base of the pyramid, henceforth referred to as the *existing capabilities base*) will support the new capability being added, without being weakened by it. Not surprisingly, when organizations identify a new competitive priority, they dedicate attention primarily to the development of the competencies required to sustain it, taking almost for granted that the existing capabilities base will not be weakened by this effort. Yet, it may be quite difficult to build new capabilities without influencing the ones already acquired, because of the emergence of new competitive priorities may divert scarce critical resources from the set of established capabilities and undermine their effectiveness.

This risk becomes particularly relevant for those capabilities that are typically situated at the top of the pyramid, such as flexibility. Flexibility, i.e. the ability to rapidly handle output variations swiftly and with minimal disruptions, is a fundamental source of competitive advantage in turbulent markets (de Groote 1994). Its importance is even greater in a service context, because the highly heterogeneous nature of customer demand and the co-participation of customers in the service delivery process create additional sources of variability compared to a manufacturing environment (Frei, 2006).

Due to its interdependence with other capabilities and to the fact that it is usually added near the end of the optimal sequence suggested by the sand cone model, the development of flexibility can have a significant effect on quality, delivery, and cost. Not surprisingly, research has sought to determine whether and how flexibility

interacts with the other capabilities (White 1996). Yet, so far scholars have analyzed primarily the question of how the development of flexibility may be facilitated by existing capabilities, but they have not fully investigated the consequences that this quest for flexibility may have on the competitive capabilities that have been already developed and consolidated.

This chapter aims to shed light on this issue. Building upon extant theory and using empirical observations our study addresses three specific research questions: (1) What is the impact of handling output variations on preexisting capabilities such as quality, delivery, and cost? (2) Is the impact more significant for some of these capabilities? (3) Is the impact contingent on the efficiency level of the organization (i.e. is the development of flexibility more difficult for organizations with limited resource slack)?

To answer these questions, we analyze longitudinal data from 84 workshops belonging to a vehicle repair company in the UK. Using Data Envelopment Analysis and hierarchical regressions the chapter sheds new light on the nexus between flexibility and the other competitive capabilities. The chapter makes several contributions to the literature. First, we demonstrate that some tradeoffs between quality, delivery, cost and flexibility do exist, even when flexibility is developed after the other capabilities are fully consolidated. Second, we shed new light on the validity of the sand cone model. We demonstrate that the resource reallocation process associated with the development of flexibility affects cost, delivery and quality to different degrees and that it follows the sand cone sequence in reverse order. Cost is the capability most affected by the development of flexibility, followed by delivery, whereas quality is only marginally impacted. Finally, the chapter also makes a methodological contribution by proposing a method for measuring

competitive capabilities that is based on objective, quantitative data rather than perceptual measures.

The remainder of the chapter is organized as follows. Section 2 reviews the literature. Section 3 discusses the impact of flexibility on the other competitive capabilities and propose testable hypotheses. Section 4 and 5 describe the methodology and present our results. Section 6 concludes with a discussion of the limitations and suggested directions for future research.

4.2 Theoretical Background

4.2.1 Competitive capabilities, the sand cone model, and service agility

Even though research has shown the clear advantages of the simultaneously master of quality, delivery, cost and flexibility (Adam Jr and Swamidass 1989; Corbett and Van Wassenhove 1993; Zaheer and Zaheer 1997), it is extremely difficult for companies to become excellent along multiple competitive dimensions at the same time. When resources are limited, the dispersion of investments across various capabilities may cause firms to lack focus, waste scarce critical resources, and ultimately remain inferior in every dimension (Skinner 1974; Hayes and Wheelwright 1984).

Whilst the majority of the empirical studies thus far have attempted to establish whether possessing certain levels of the first capabilities in the sequence facilitates the acquisition of subsequent capabilities, more limited attention has been paid to the question of whether the acquisition of a new capability reinforces or hampers the capabilities that have already been built. A potential reason of such neglect might be that sand cone model literature has positioned the pyramid sequence of capability establishment as a way to overcome trade-offs and achieve multiple competitive advantages. The impact of acquiring new capabilities on existing ones can be

perceived as the acknowledgement of the existence of trade-offs. This is, however, a significant gap because, due to resource scarcity (Mahoney and Pandian 1992; Das and Teng 2000), acquiring new competencies and shifting the focus to new competitive priorities, may divert resources and management attention from the existing capabilities base. While the idea that due to "inevitable limitations of equipment and process technology […] a factory cannot perform well on every yardstick" (Skinner 1974) p. 115) was at the core of the focused-factory argument, in today's markets focusing on a single capability may no longer be a viable option (Berry and Cooper 1999; Flynn and Flynn 2004). Increasing levels of rivalry oblige firms to become excellent along multiple competitive dimensions simultaneously (e.g., Boyer, Ward et al. 1996; Ketokivi and Schroeder 2004). In the service sector, the need for agility has induced companies to devise various approaches to break some of these trade offs (Frei 2006). Nevertheless, the risks and trade-offs described by the proponents of the focused-factory perspective cannot be completely ruled out, even when companies build capabilities in accordance with the sand cone sequence. Firms desiring to attain service agility must therefore be able to assess whether and to what extent the development of a new capability will affect the capabilities that they have already developed and consolidated and, also, which ones, among these capabilities, will be most affected.

The likelihood that the efforts for the acquisition of a new capability will have an impact on existing capabilities is especially great when the capability to be acquired is situated at the end of the sequence prescribed by the sand cone model. This is the case for flexibility, which is usually developed after the consolidation of quality, delivery dependability, and cost.

4.2.2 Flexibility in service operations

Flexibility has been generically defined as the ability of an organization to effectively handle uncertainty in its operational environment (Koste and Malhotra 1999). Different aspects of the construct have also been emphasized in the literature, depending on the nature of the environmental uncertainty requiring flexibility (Gerwin 1993; Browne, Dubois et al. 1984; Sethi and Sethi 1990; 1993; Vokurka and O'Leary-Kelly 2000; D'Souza and Williams 2000). For instance, Upton (1994) identified flexibility along three distinct elements: range, mobility and uniformity. Range can be further categorized into sizes of components that can be processed, volumes of outputs and products which may be produced. In this research, we focus on volume flexibility (Sethi and Sethi 1990; Jack and Raturi 2003; Field and Sinha 2005). This type of flexibility is required to address uncertainty in demand quantity, i.e. variations in the volume of output. It represents "the ability of an organization to change volume levels in response to changing socio-economic conditions profitably and with minimal disruptions" (Jack and Raturi 2003: p. 519).

In addition to the recent efforts to conceptualize and operationalize the construct, the operations management literature has dedicated attention to flexibility also in relation to its impact on organizational or operational performance (Swamidass and Newell 1987; Fiegenbaum and Karnani 1991; Parthasarthy and Sethi 1993; Ward, Duray et al. 1995). In an attempt to shed further light on the value of flexibility, some studies have shifted the focus of the analysis to the interaction between flexibility and other capabilities. The cumulative and sand cone models have demonstrated that companies can improve operational performance if they build quality, delivery, cost, and flexibility capabilities sequentially (Noble 1995; Menor et al. 2001; Yusuf et al. 1999; Nakane 1986). The results suggest that the first three of these capabilities provide the necessary foundation for the subsequent establishment of flexibility

(Nakane 1986; Ferdows and De Meyer 1990).

Previous studies, however, have not considered whether and why adding flexibility affects quality, delivery, and cost *after* these capabilities have been built and consolidated, nor have they examined whether or not this impact changes with the degree of efficiency of an organization. The trade-off argument implicitly suggests that the development of a new capability should be more difficult for organizations that are closer to the efficiency frontier. Yet, to our knowledge, the role of efficiency and resource slack in the capability building process has been somehow overlooked by the literature.

The literature reviewed above indicates that the nexus among flexibility, other capabilities and performance is complex and deserves further investigation both from a theoretical and from an empirical viewpoint. The review also reveals that most of the empirical literature in this field has used perceptual, survey-based measures to assess capabilities. A validation of the above findings using objective measures would therefore represent another useful contribution.

4.3 Hypotheses

4.3.1 Direct impact of flexibility on quality, delivery and cost

The trade-off hypothesis that is at the core of the focused factory paradigm implies the existence of a negative relationship between flexibility and the other capabilities. We argue that, even when companies build capabilities according to the sand cone model sequence, the presence of tradeoffs cannot be completely ruled out.

The ability to accommodate rapid and unpredictable changes in demand with minimal disruptions provides evidence of flexibility. Yet, as for service firms creating buffers is not an option, rapid changes in demand can only be addressed through correspondingly rapid variations in the output level. In turn these variations

cause fluctuations in the level of utilization of resources and may negatively affect quality, delivery and cost performance.

There are economic factors underlying this negative relationship, some of which have been already discussed by the focused factory literature. For instance, addressing changes in the output level affects cost through several mechanisms. A first mechanism pertains to the changes in the equipment required to achieve flexibility. Firms can address changes in the aggregate level of demand by investing in flexible equipment and processes. However, flexible technologies are usually significantly more expensive to acquire (Gaimon and Singhal 1992). To build flexibility firms can also allocate additional resources to the development of extra capacity. However, since excess resources can only be used for very closely related activities (Hoskisson and Hitt 1990), when demand decreases, excess resources remain idle and also cause a concomitant increase in operating costs.

A second economic mechanism pertains to the impact of flexibility on labor expenses. In a service environment, as a result of the non-repetitive nature of the tasks and of the customers co-participation in the process, changes in the volume of output are often associated with changes in the type of output. Therefore, organizations willing to develop volume flexibility often need to acquire asset and capabilities to deal with mix flexibility as well. For instance, they need multiskilled employees (Boyle et al. 2006), who are usually more expensive to recruit and, especially, to train. Finally, increases in flexibility have been found to cause an increase in operational complexity, which is again a major source of cost (Salvador, Rungtusanatham et al. 2007).

Delivery performance is also negatively affected by increases in the output volume. Well-known results from queueing theory suggest that waiting time increases more than linearly when server utilization increases. In a service environment, this effect is further amplified by the more limited tolerance that human operators display for overutilization and work overload (Glaser et al. 1999; Robinson, O., and A. Griffiths, 2005). Even reductions in the output volume may cause deterioration in performance, if they occur frequently. Continuous changes in utilization result in process variability, which has been associated with poor quality (Oakland 1996). The operations literature has identified other negative consequences of these variations, including an increase in costs associated with frequent overages or underages in production (Lee and Yano 1988) and unreliable delivery (Avram and Wein 1992).

There are also cognitive and behavioral mechanisms suggesting that coping with output variations may have a negative impact on the other competitive capabilities of the firm, particularly in a service environment. Due to the non-repetitive nature of services, dealing with demand spikes causes increases in the degree of task complexity and task variety (i.e., "the extent to which novel and unexpected events are encountered in the planning and conversion processes that necessitate the use of different procedures or methods to carry out the work" [Dunk 1995, p. 64]). These increases have negative consequences for both quality and delivery performance. Task complexity has been found to affect task performance directly (Campbell 1988) and also indirectly through its impact on perceived complexity (Maynard and Hakel 1997), which reduces workers' motivation and self-efficacy (Gist and Mitchell 1992). Task variety causes process variability too, which has been recognized by the TQM literature as a barrier to quality (Oakland 1996); it also requires operators with greater cognitive ability, as they must search for more efficient strategies for

successful task execution. When this ability is not present, increased task variety may lead to more errors and affect either quality or delivery performance. On the one hand, if not quickly discovered and properly fixed, errors are transferred to the costumer, with a consequent deterioration of perceived quality. On the other hand, identifying and fixing defects reduces the deterioration of quality performance, but it requires extra time thereby affecting dependability. Although some of these effects may be attenuated if flexibility is built after the other capabilities have been fully consolidated, they cannot be completely disregarded. We propose therefore the following hypotheses:

H1: Handling changes in output volume is associated with an increase in operating costs

H2: Handling changes in output volume is associated with a decrease in delivery timeliness

H3: Handling changes in output volume is associated with a decrease in service quality

4.3.2 Differences in the magnitude of impacts

We have argued that, as resource scarcity prevents firms from developing new competencies without diverting resources from their consolidated capabilities base, addressing changes in output volume has, on average, a negative impact on quality, delivery and cost. Yet, we expect the magnitude of this impact to differ across capabilities, because the consequences of the resource reallocation process may not be necessarily the same for all of them. As a result, firms should decide which capability, or capabilities, they are willing to let deteriorate to facilitate the development of new competitive strengths. We expect that firms would choose either

the capabilities judged the least important from a competitive standpoint, or those less likely to be affected by the resource reallocation process. We also expect that, to identify these capabilities, firms apply the sand cone sequence in the reverse order, either deliberately or unintentionally.

A first argument underlying this hypothesis considers that firms apply the sand cone sequence in the reverse order deliberately. Competitive capabilities have been defined as "the firm's actual, or 'realized,' competitive strengths relative to primary competitors in its target markets" (Rosenzweig and Roth, 2004; p. 354). As the capabilities at the basis of the pyramid support all the other capabilities, dismantling them will also threaten the capabilities lying on this foundation and built after them. Therefore, rational firms are expected to purposely subtract resources first from the competitive strengths that they deem the least important in their target market, i.e. the capabilities near the top of the sand cone, such as cost. Conversely, they would subtract resources or divert management attention from the capabilities at the basis of the pyramid, such as quality, only if no extra resources are available even after cost or delivery have been already sacrificed to the purpose.

Another perspective supports this hypothesis. Over time, the tacit knowledge and the operational competencies that underlie each competitive capability get consolidated, i.e. they are codified, made explicit, and eventually embedded into organizational routines that facilitate their retention (Nonaka and Tekeuchi, 1996). Therefore, even if a firm subtracts resources evenly from all the capabilities in its base, the capability with the greatest degree of consolidation will be the one least affected by the resource reallocation process. If capabilities are developed progressively, the degree of consolidation will be higher for older capabilities, i.e. those lying at the bottom of the pyramid. Therefore, if quality, delivery and cost are

developed in accordance to the sand cone model sequence, it is reasonable to expect that quality will be the capability with the greatest degree of consolidation and the one least affected by a shift in resources, followed by delivery, and then cost. Based on the above arguments, we propose therefore the following hypotheses:

H4: Handling changes in output volume has a greater negative impact on cost than on delivery timeliness

H5: Handling changes in output volume has a greater negative impact on cost than on service quality

H6: Handling changes in output volume has a greater negative impact on delivery timeliness than on service quality

4.3.3 Moderating effect of resource slack

The focused factory hypothesis suggests that firms face tradeoffs between different competitive priorities when they try to build them simultaneously, and when they operate on, or close to, the efficient frontier (i.e. when they have no resource slack). Ceteris paribus, the presence of slack helps firms develop the organizational competencies required to support the new competitive capability without subtracting resources from the existing capabilities base. For instance, the increased number of mistakes or quality problems induced by higher variability can be fixed ex-post if extra time is available, before they are transferred to customers. Also, without slack, the additional workload caused by quality problems increases server utilization and negatively affects delivery performance. However, if idle resources are available, the extra work required to fix quality problems ex-post may not necessarily produce delays. The presence of resource slack has also some indirect effects on the relationship between flexibility and quality, delivery and cost performance, for instance, by reducing the negative impact of task variety and task complexity on task performance (Dunk 1995).

Although the sand cone model and the competitive progression theory somehow imply that even efficient firms can minimize the impact of tradeoffs if they follow the appropriate capability building sequence, the role of resource slack remains important even when firms build capabilities according to the sand cone sequence. We argue that resource slack moderates the relationship between flexibility and quality, delivery and cost and that the moderating effect is different for each of the three capabilities. That is, we expect that addressing output variations has different consequences for quality cost and delivery performance, depending on the degree of ex-ante efficiency of the organization.

Firms with great amounts of resource slack (i.e. firms with low levels of ex-ante efficiency) can afford the development of a new capability without diverting resources from their existing capabilities base. For these firms, the additional resources required to build the new capability would not be necessarily subtracted from those supporting the existing base, but they could be made available through efficiency improvement efforts conducted ex-ante, i.e. before the development of the new competitive priority. Thus, it is unlikely that their cost, delivery or quality performance are affected by the development of flexibility.

Conversely, firms with moderate amounts of resource slack will have to divert at least some of the resources already allocated to other capabilities for the development of flexibility, because resources in excess are typically insufficient to handle output variations effectively. Thus, some capabilities in their existing base, although not all of them, will be affected by this resource reallocation process. Consistent with what discussed above, we expect that the capabilities near the top of the sand cone will be the ones most significantly affected, either because judged the

least important competitive strengths, or because the degree of consolidation of the organizational competencies underlying them is not sufficiently high.

Finally, efficient firms with no resource slack at all are forced to divert resources not only from the less important capabilities but also from the capabilities at the bottom of the sand cone, such as quality. Thus, not only we expect the relationship between flexibility and quality, delivery and cost to depend on the degree of ex-ante efficiency. We also expect the negative impact of addressing output variations on quality, delivery and cost to be more significant for the capabilities closer to the basis of the sand cone. We propose, therefore, the following hypotheses:

H7: The moderating effect of resource slack on the relationship between output changes and delivery is stronger than the moderating effect of resource slack on the relationship between output changes and cost.

H8: The moderating effect of resource slack on the relationship between output changes and quality is stronger than the moderating effect of resource slack on the relationship between output changes and cost.

H9: The moderating effect of resource slack on the relationship between output changes and quality is stronger than the moderating effect of resource slack on the relationship between output changes and delivery.

4.4 Methods

4.4.1 Research setting

The research hypotheses were tested using longitudinal data collected from a British vehicle repair company (hereafter referred to as ServCo) that operates through a network of 84 workshops in the UK (Table 4.1). Originally established as a subsidiary of a large telecom operator (hereafter referred to as TechCo) to manage its fleet, ServCo recently revised its business model and decided to provide services to outside organizations and private customers as well.

ServCo's workshops were an ideal research setting for our study. After developing the first three competitive capabilities in accordance with the sand cone model

prescription (quality, delivery then cost), the company was forced to increase the flexibility of its operations to respond to the new business mandate.

Table 4.1: Workshops geographical distribution

Region	N	%
South East	13	15.48%
London	10	11.90%
North West	10	11.90%
South West	10	11.90%
East of England	8	9.52%
Scotland	8	9.52%
West Midlands	7	8.33%
East Midlands	6	7.14%
Yorks & Humber	6	7.14%
Wales	4	4.76%
North East	1	1.19%
Northern Ireland	1	1.19%
TOTAL	84	100%

Quality (i.e. the ability to correctly repair a vehicle) and then delivery were identified as the most important competitive priorities for ServCo, since its inception. In the high-margin telecom sector, the opportunity cost of idle vehicles for TechCo was extremely high and certainly higher than ServCo's operating cost (vehicles failing the Ministry of Transport Roadworthiness test were denied permission to circulate and could not be used by TechCo). This pressure led ServCo to develop operational skills in the area of quality management and delivery.

When competition increased, the ability to control cost also became an important priority. As ServCo is a subsidiary of TechCo, its wages are in line with the telecom sector and are higher than that of other vehicle repair companies. To compensate for these higher wages, the company was obliged to develop an outstanding ability to control non labor-related costs.

To profit from its quality reputation, and to compensate for its higher wages the company decided to target the more lucrative market of private external customers. Quality and delivery remained important competitive priorities under this new

mandate (to recoup its higher wages, ServCo is obliged to charge higher prices than its direct competitors and must therefore guarantee extremely high service standards in terms of quality and delivery to justify these higher prices). At the same time, in this new environment service flexibility has also become an important competitive priority. The new business mandate that requires ServCo to manage vehicles both from TechCo and from external customers significantly increased the variety of customers and caused large demand fluctuations. Furthermore, in order to minimize the distance that a customer would need to drive to reach an appropriate workshop, ServCo requires that each workshop be able to process every type of job and serve every customer. As a result of these changes, ServCo's workshops experienced greater variations in their output levels than they were used to in the previous business environment.

Altogether, these considerations suggest that ServCo's workshops are a perfect case for our analysis: already strong in quality, delivery and cost control capabilities, they were recently obliged to add flexibility to their existing capability bases.

ServCo was chosen for methodological reasons as well. The company reports large and partly unexplained performance differences among workshops and was interested in understanding the underlying drivers of these differences. This guarantees both an adequate sample variance for our analysis and also the full management support throughout our research.

After some discussions with ServCo, it was decided to analyze the time period comprised between the first quarter 2006 and the first quarter 2007. This specific window was chosen because the company suggested the changes required to respond to the new business mandate (extension of service to external customers) were mostly felt during that period. Accordingly, ServCo provided access to two datasets

with detailed information on all the jobs completed in each of its 84 workshops during two time intervals. The first data set included workshop-level statistics for all the jobs completed between January 1, 2006, and March 30, 2006 which was representative of the pre-flexibility environment. The second data set included workshop-level statistics for all the jobs completed between January 1, 2007, and March 30, 2007 and was representative of the new environment with flexible operations. The data sets were extracted from ServCo's IT system and validated by the company management (the data used for this study was also used to compute quarterly performance indicators presented to the executive committee). Descriptive statistics of the workshop operations are displayed in Table 4.2.

Table 4.2: Workshops operational characteristics

	1st Quarter 2006		1st Quarter 2007	
	Mean	St dev	Mean	St dev
Average output [th. £]	223.99	119.98	217.54	115.94
Total cost [th. £]	187.52	94.72	195.53	99.97
% vehicles delivered on time	0.84	0.06	0.86	0.05
% of vehicles passing the MOT test	0.73	0.21	0.80	0.20
DEA Efficiency	0.426	0.228	0.419	0.221
Profitability	0.140	0.114	0.074	0.144
Number of technicians	6.71	3.02	n.a.	n.a.

4.4.2 Operationalization of variables

4.4.2.1 Competitive capabilities

Although both subjective and objective approaches have been used in the literature to measure competitive capabilities, management scholars have mostly relied on perceptual variables (Aranda 2003; Zhang, Vonderembse et al. 2003; Anand and Ward 2004). Clearly, subjective measurement has the advantage of being easier to collect and can be a reasonable alternative when quantitative data are not available (Gerwin 1993). Yet it also has limitations: its validity is based on the underlying

assumption that managers possess a detailed and explicit knowledge of their operations, which is not always the case. For this reason, whenever available, objective measures have been preferred (Upton 1994; Pagell and Krause 1999). While more difficult to obtain, objective measures overcome some of the limitations of perceptual measures, such as informant bias (Milliken 1987; Vokurka and O'Leary-Kelly 2000).

Following this rationale, in this study we used an objective approach to the measurement of competitive capabilities. Changes in the quality, delivery and cost capabilities were operationalized as changes occurred in the quality, delivery and cost indicators between Q1 2006 and Q1 2007. Quality was measured as the percentage of Large Goods Vehicles passing the heavy Roadworthiness test carried out in Department of Transport test stations (the most important quality indicator for ServCo). Delivery performance was measured as the percentage of jobs completed on-time (a job is considered on time if the vehicle is returned to the customer no later than 30 minutes after the quoted due date/time). As ServCo incurs four major expenses in running a workshop: total material cost, total labor cost, accommodation charges and other overheads, changes in the cost capability were measured as changes in the above items after adjusting for inflation and location. The adjustment was necessary especially for labor related expenses. As ServCo offers more generous wages to employees working in expensive areas, workshops located in these expensive areas could display efficiencies spuriously reduced by this wage effect. Changes in labor cost were adjusted for changes in the average earnings per head at the county level (minimum level of disaggregation at which these statistics were available from the Office of UK National Statistics). Likewise, changes in material cost were adjusted to take into account changes in the consumer price index for

vehicle spares (also available from the Office of UK National Statistics).

Flexibility was conceptualized as volume flexibility (Sethi and Sethi 1990; Jack and Raturi 2003) i.e. as the ability of a workshop to modify its output level from time *t* to time *t+1* profitably and with minimal disruptions. Accordingly, it was measured through changes in the average amount of work carried out by each workshop from Q1 2006 to Q2 2007 after controlling for profitability changes. As no significant price variations were introduced by ServCo during this period, changes in total revenue from sales could be effectively used as a valid measurement for this variable. Once again, the variable was adjusted to take into account exogenous changes in the economic environment of each geographical area.

4.4.2.2 Multidimensional efficiency

The test of hypotheses 7, 8 and 9 (moderating impact of resource slack) required the computation of multidimensional efficiency ratios. An efficiency ratio reflects the ability of a workshop to excel along multiple competitive capabilities, i.e. to provide high-quality services with the shortest delay using the minimum amount of resources. To compute the efficiency ratios, we used Data Envelopment Analysis (DEA) based and an input/output approach (Boussofiane, Dyson et al. 1991). We employed an output-oriented DEA model in which the inputs were held constant and the efficiency ratios were determined by the extent to which the outputs could be improved to reach maximal efficiency (Frei and Harker 1999). The optimization problem was formulated as follows:

$$\text{M}ax\ \Omega_0 = \sum_{r=1}^{3} \mu_r y_{rj0} \qquad (1)$$

subject to: $vx_{j0} = 1,$

$$\sum_{r=1}^{3} \mu_r y_{rj0} - vx_j \leq 0, \qquad j = 1,...,n$$

$$- \mu_r \leq -\varepsilon, \qquad r = 1, 2, 3$$

where y_{rj} is the amount of output r from workshop j; x_j is the amount of input to workshop j; μ_r is the weight given to output r, v is the weight given to input, n is the number of workshops and ε is a small positive number.

Three variables were used as output measures: in addition to the quality and delivery measures described above (percentage of large goods vehicles passing the Ministry of Transport test first time and percentage of jobs completed on-time), total revenue from sales was also included as an output to account for the total amount of work completed. The same four major expenses used to measure cost were used as inputs, i.e.: total material cost, total labor cost, accommodation charges and other overheads.

4.4.2.3 Control variables

Three control variables were used in the model to account for the fact that other exogenous factors could affect workshop performance in addition to the posited effects of dealing with output changes. First, as economies of scale could make larger workshops more efficient regardless of their inherent capability level, we controlled for workshop size (measured by the number of full time technicians working at each site). Second, we controlled for the percentage of business originating from non-recurrent customers (named percentage of external trade by ServCo). This control was necessary because changes in this variable could cause changes in the complexity of tasks (and hence in cost, quality and delivery performance), in addition to those generated by volume flexibility. Finally, in order to tease out the

Table 4.3: Pearson Correlations (N = 84)

Variable	Mean	Std Dev	Min	Max	1	2	3	4	5	6	7	8
1. ΔOutput (changes in output volume)	-0.08	0.08	-0.28	0.14								
2. Changes in total cost	0.03	0.11	-0.28	0.28	0.42							
3. Changes in delivery	0.03	0.05	-0.12	0.19	-0.19	-0.09	.					
4. Changes in quality	0.16	0.52	-1.00	3.00	-0.16	-0.07	-0.04					
5. Profitability changes	-0.07	0.10	-0.30	0.24	0.39	-0.61	-0.09	-0.04				
6. DEA Efficiency 2006	0.43	0.22	0.12	1.00	-0.03	0.04	-0.05	-0.20	-0.12			
7. Output Q1 2006 (revenue from sales in th. £)	223.99	119.98	51.91	574.08	-0.02	-0.02	-0.09	0.07	0.06	-0.83		
8. Workshop size (N. of technicians)	6.71	3.02	2.00	14.00	0.01	0.00	0.05	0.08	0.07	-0.82	0.86	
9. % external trade	0.37	0.12	0.09	0.70	0.40	0.03	-0.06	-0.01	0.35	-0.37	0.38	0.24

performance changes induced by output variations, we controlled for changes in the degree of profitability of each workshop.

Pearson correlations for the regression variables are displayed in Table 4.3.

4.4.3 Econometric models and analysis

To assess the impact of output variations on quality, delivery and cost, we first estimated the general models:

$$\mathrm{Y_i} = \beta_0 + \beta_1 \Delta output_i + \sum_j \beta_j control_{ij} + e_i \qquad (2)$$

where:

- $\mathrm{Y_i} = (X_{i,t+1} - X_{i,t})/(X_{i,t})$ denotes the relative change in the capability X for workshop *i* from time *t* (Q1 2006) to time *t+1* (Q1 2007), with X = quality, delivery or cost;
- $X_{i,t}$ denotes the average level of capability X at time *t* for workshop *i* (e.g. $\mathrm{Quality}_{it}$ = average percentage of Large Goods Vehicles that passed the Ministry of Transport test first time between January 1, 2006 and March 30, 2006);
- $\Delta output_i$ denotes relative changes in the output level of workshop *i* from time *t* to time *t+1*, i.e.: $\Delta output_i = (R_{i,t+1} - R_{i,t}) / R_{i,t}$, where $\mathrm{R}_{i,t}$ = revenue from sales for workshop *i* at time *t*.
- $control_i$ = output (at time *t*), size, % of external trade and differences in profitability between *t* and *t +1* for workshop *i*.

Hypotheses 1-3 were tested by analyzing the magnitude and the significance of the coefficients β_1 in the three regression models (2). Hypotheses 4, 5 and 6 were tested by analyzing differences in the coefficients β_1 in the three regression models (2) through a Wilk's lambda test. Finally, to test hypotheses 7, 8 and 9 we first

calculated the multidimensional efficiency ratios for the 84 workshops at time *t* (i.e. from April 1, 2006, through June 30, 2006), using the DEA model (1). We then estimated the moderated models (3) below and examined differences in the coefficients β_3 in the three regression models by means of a Wilk's lambda test:

$$Y_i = \beta_0 + \beta_1 \Delta output_i + \beta_2 efficiency_i + \beta_3 \Delta output_i * efficiency_i + \sum_j \beta_j control_{ij} + e_i \quad (3)$$

To further validate the results of this step, we also conducted a split sample analysis and re-estimated the regression models (2) for two subsamples, one including high efficiency firms (with above-median multidimensional efficiencies) and one including low efficiency firms (with below-median multidimensional efficiencies). The results of the split sample analysis were consistent with the moderated models and are not reported here in the interest of space.

Before estimating the model, we conducted several tests to assess the properties of our data. We examined the variance inflation factors, we ran a multicollinearity diagnosis analysis, and we tested for heteroskedasticity by means of a White test and an examination of the plot of residuals. No evidence of multicollinearity or heteroskedasticity was found in the data. All variance inflation factors were below 2, correlation coefficients indicated no signs of multicollinearity. The hypothesis of homoskedastic errors could not be rejected (none of the White tests conducted for the different models was close to statistical significance), while the residuals plots also exhibited random behaviors. Given the properties of our data, all models were estimated using ordinary least squares regressions in the interest of maximizing the efficiency of the estimators.

4.5 Discussion of results

First of all, it is interesting to note that significant differences in efficiency exist

among workshops. The summary statistics for the DEA scores reported in Table 3 indicates an average input-output efficiency of 43%, with the worst sites being significantly less efficient than the best sites. Different resource allocation schemes, different management approaches and, different operational skills have created significant discrepancies in operational performance among workshops, even is all sites adopt the same business model and have similar structures. This finding echoes the productivity studies in the 80's conducted by researchers from the Harvard Business School. They conducted comparative analyses of various plants across different counties making similar products and using the same type of process to determine how practices varied across sites and their connections with performance (Hayes and Clark 1985, 1986; Clark et al. 1987). Several Japanese management methods, including just-in-time, total quality management and supplier collaboration, were identified to be associated with competitive advantages (Lenfle and Baldwin 2007).

It is also interesting to discuss the average changes occurred in ServCo's operations from Q1 2006 to Q1 2007. In this time interval, the workshops faced an increase in both their average delivery and average quality performance, with the latter being particularly significant. This is a clear indication that the operational capabilities developed by ServCo in these two areas were well consolidated and remained particularly effective. Conversely, in the same period, the company faced an increase in overall cost (despite an slight decrease in the volume of output), and a decrease in both overall efficiency and profitability. Apparently, despite the efforts undertaken to improve the efficiency of operations (a series of operational improvement programs were launched right after the decision to accept external customers), the company could not fully manage the disruptions generated by the

new business model. It is also worth noting that the trends observed are consistent with our hypothesis that – faced to tradeoffs among capabilities – companies decide (or are able) to preserve only the capabilities at the bottom of the sand cone.

The results of the hierarchical regressions assessing the relationship between volume flexibility and the existing capability base are reported in Table 4.4. The direct models (2), which include only the direct effect of volume flexibility, provide strong support for hypotheses 1 and 2 but no support for hypothesis 3. Copying with variations in the volume of output were associated with an increase in operating costs, a deterioration of on- time delivery performance, but no statistically significant changes in service quality.

The Wilk's lambda test used to assess differences in the magnitude of the volume flexibility coefficients provided strong support for hypotheses 4 and 5 ($F = 9.96$ with $p < 0.01$ and $F = 4.30$ with $p = 0.04$, respectively) and no support for hypothesis 6 ($F = 1.03$, $p = 0.31$). The standardized regression coefficients indicate that modifying the volume of output by one standard deviation linked to cost increase by 0.57 standard deviations, but a decrease of only 0.28 standard deviations in the percentage of vehicles delivered on-time and a decrease of 0.17 standard deviations in the percentage of vehicles that passed the MOT test first time. Everything else being equal, the deterioration of cost performance that followed the development of volume flexibility is significantly greater than the deterioration of delivery and quality performance.

Table 4.4: Impact of output changes on quality delivery and cost performance

	Model 1 (n = 84)			**Model 2** (n = 84)			**Model 3** (n = 84)		
Dep. variable: Cost	*Par. estimate*	*St. error*	*p-value*	*Par. estimate*	*St. error*	*p-value*	*Par. estimate*	*St. error*	*p-value*
Output Q1 2006	-0.144	0.000	0.568	0.093	0.000	0.681	0.159	0.000	0.508
Workshop size	0.117	0.009	0.628	-0.017	0.008	0.937	0.126	0.009	0.602
% of external trade	0.083	0.124	0.537	-0.175	0.119	0.181	-0.160	0.122	0.229
Profitability changes	-0.102	0.007	0.406	-0.241	0.006	0.033	-0.329	0.007	0.016
ΔOutput				0.574	0.175	<.0001	0.347	0.352	0.160
DEA Efficiency 2006							0.368	0.134	0.182
ΔOutput x Efficiency							0.332	0.730	0.284
Model F		0.250	0.908		4.770	0.001		3.670	0.002
R^2		0.014			0.254			0.274	
ΔR^2					0.240			0.020	
Dep. variable: Delivery	*Par. estimate*	*St. error*	*p-value*	*Par. estimate*	*St. error*	*p-value*	*Par. estimate*	*St. error*	*p-value*
Output Q1 2007	-0.542	0.000	0.029	-0.657	0.000	0.009	-0.753	0.000	0.004
Workshop size	0.515	0.004	0.030	0.580	0.004	0.014	0.318	0.005	0.206
% of external trade	0.044	0.060	0.737	0.168	0.064	0.232	0.153	0.063	0.269
Profitability changes	-0.079	0.003	0.506	-0.012	0.003	0.918	0.183	0.004	0.190
ΔOutput				-0.277	0.094	0.037	0.255	0.183	0.320
Efficiency							-0.707	0.069	0.015
ΔOutput x Efficiency							-0.775	0.379	0.018
Model F		1.420	0.236		2.090	0.076		2.65	0.0176
R^2		0.074			0.131			0.214	
ΔR^2					0.057			0.083	

Table 4.4: Impact of output changes on quality delivery and cost performance (cont.)

	Model 1 (n = 84)			**Model 2** (n = 84)			**Model 3** (n = 84)		
Dep. variable: Quality	*Par. estimate*	*St. error*	*p-value*	*Par. estimate*	*St. error*	*p-value*	*Par. estimate*	*St. error*	*p-value*
Output Q1 2007	-0.022	0.001	0.930	-0.093	0.001	0.719	-0.292	0.001	0.273
Workshop size	0.116	0.042	0.629	0.156	0.043	0.520	-0.026	0.047	0.921
% of external trade	-0.015	0.593	0.912	0.062	0.651	0.676	-0.008	0.646	0.955
Profitability changes	-0.084	0.032	0.494	-0.043	0.033	0.735	-0.085	0.038	0.562
ΔOutput				-0.170	0.951	0.220	-0.393	1.864	0.149
Efficiency							-0.329	0.708	0.279
ΔOutput x Efficiency							0.318	3.863	0.352
Model F		0.260	0.900		0.520	0.761		1.260	0.284
R^2		0.015			0.035			0.114	
ΔR^2					0.020			0.079	

These results shed some light on how ServCo may resolve the tradeoffs involved with the development of multiple capabilities. Given that it was extremely difficult to cope with demand fluctuations without affecting quality, cost, and delivery performance, the workshops used (either deliberately or unintentionally) the sand cone sequence in reverse order to decide which of the existing capabilities had to be sacrificed in the first place. The ability to control cost - i.e. the capability at the very top of the sand cone - was the one most significantly affected by the development of volume flexibility, either because ServCo deliberately decided so, or because, being the least consolidated capability, it was simply the most difficult to protect. Delivery – which is just one step below cost in the sand cone sequence and slightly less consolidated – was also affected, but to a lesser extent than cost. No statistical evidence was found that quality – the capability at the very bottom of the sand cone and the most consolidated one – was affected. Once again, this may be the result of a deliberate choice: the company judged service quality as its most important competitive strength and protected it accordingly (for instance, by refusing to cut resources dedicated to quality management). However, it could also be the result of a capability consolidation process. The operational routines developed over time by ServCo in the area of quality management might have become so ingrained in the organization to produce tacit knowledge, and to guarantee consistent levels of quality performance, even after some resources had been reallocated and assigned to different tasks.

The moderated models may offer further insights into how the capability dismantling sequence described above is associated with the presence of resource slack. The comparison of the interaction terms provides strong support for hypotheses 7, and no support for hypotheses 8 and 9. However, the models are

consistent with the overall underlying hypotheses that the companyfollows the sand cone model in a reverse order if it is obliged to dismantle some of their existing capabilities. In the cost model, although insignificant, the coefficient of the interaction term ΔOutput *efficiency is positive, indicating that, as ex-ante efficiency increases, the increase in costs caused by output variations increases as well. In the delivery model, the coefficient of the interaction term is negative and strongly significant, also indicating that the negative association between output variations and delivery performance becomes more negative as ex-ante efficiency increases. Furthermore, as hypothesized, the magnitude of the delivery performance deterioration associated with increases in ex-ante efficiency is higher than the magnitude of the cost increase associated with similar changes in ex-ante efficiency ($F = 4.55$ $p = 0.03$). Finally, in the quality model the coefficient of the interaction term is insignificant and its magnitude not statistically different from the other interaction coefficients ($F = 0.52$ with $p = 0.47$ and $F = 1.34$ with $p = 0.25$, respectively).

The insights provided by the moderated models are consistent with the interpretation of the direct models and reinforce the hypothesis that the development of a new capability affects existing capabilities in accordance with the reversed sand cone sequence. There is no statistical evidence to support that the relationship between volume flexibility and cost is moderated by the level of efficiency, but the volume flexibility coefficient in the direct model is strongly positive. In the sites we analyzed, the ability to control cost was negatively linked to the development of the new capability, regardless of the ex-ante efficiency level. Even inefficient workshops (i.e. workshops with great amounts of resource slack) could not cope with demand variations without accepting a deterioration of at least one of their existing

capabilities. When forced to select the capability that had to be sacrificed, most of these sites chose cost. Either because cost was identified as their least important competitive strength, or because it was simply not consolidated enough to be protected from the reallocation of resources required to deal with changes in the output volume.

Conversely, the relationship between volume flexibility and delivery is strongly moderated by efficiency: the impact of volume flexibility on delivery performance is higher for more efficient workshops. The split sample analysis confirms that only workshops with a significant amount of resource slack could deal with changes in their output volume without deteriorating their delivery performance (of course they did face an increase in cost). On the contrary, more efficient workshops that had fewer resources to spare, were forced to accept a deterioration of their delivery performances *in addition* to the increase in costs.

Finally, as in the case of cost, no statistical evidence was found that the relationship between volume flexibility and quality is moderated by efficiency. However, in sharp contrast with cost, the volume flexibility coefficient in the direct model is non significant. The relationships between volume flexibility and cost and between volume flexibility and quality are both unaffected by the ex-ante degree of efficiency, but for very different reasons. Cost is *always* associated with changes in the output volume, regardless of the ex-ante efficiency level, because it is the least important competitive priority and the least consolidated capability. Quality is *never* connected to changes in the output volume, regardless of the ex-ante efficiency level, because it is the most important competitive strength and the most consolidated capability.

4.6 Conclusion

4.6.1 Theoretical contributions and managerial insights

The increasing level of rivalry and the high customer sophistication that characterize today's markets require service companies to improve their agility, i.e., to become excellent along several competitive dimensions such as quality, delivery, cost, and flexibility. This has historically been one of the central themes in the field of operations strategy. The sand cone model and the competitive progression theory have argued that firms can overcome some of the trade-offs associated with the development of multiple capabilities if they build these capabilities according to a precise sequence. An alternative view is that companies can push their capability frontier upwards to overcome some existing challenges, which creates an illusion of being free of trade-off. That numerous companies have failed in their attempts to become agile suggests that this capability development process is not fully understood and that negative interactions may occur between different capabilities, even when companies follow the sequence proposed by the sand cone model. In the service sector, this risk is particularly critical. On the one hand, the high volatility of demand requires service organizations to add flexibility to their portfolio of operational skills. On the other hand, negative interactions between flexibility and a firm's pre-existing capabilities have the potential to threaten the very foundations of the firm operational capabilities.

This chapter sheds new light on the capability building process of service firms and it makes three contributions to the literature. The first and main contribution pertains to the relationship between volume flexibility and the other competitive capabilities of the firm. We originally argued that even when companies develop multiple competitive capabilities in accordance with the sand cone model, some of

the trade-offs advocated by the proponents of the "focused factory" perspective cannot be completely ruled out. That is, even though following the "quality, delivery, cost, flexibility" sequence may facilitate the development of each new capability that is added to the existing capability base, the added capability will inevitably affect the levels of those already established.

Our results suggest that the nexus between volume flexibility and quality, delivery, and cost is more complex than we initially hypothesized. Although the analysis confirms that the presence of tradeoffs limits the ability of a firm to become excellent along multiple competitive capabilities, it also suggests that the magnitude of these tradeoffs is contingent on the type of capability considered. Whereas cost and, to a more limited extent, delivery performance are affected by the development of volume flexibility, quality remains virtually unaltered.

It must be noted that some of the problems in dealing with changes in output volume may be attributable to the specific nature of the service provided by ServCo. Most of the maintenance and repair jobs carried out by the technicians are highly brand-, model- and customer-specific. In such an environment, increases in the volume of work often imply a corresponding increase in the number of brands, models and customers that a technician has to deal with, i.e. an increase in task variety. Although task variety has been often associated with some benefits such as increased job satisfaction and higher productivity (Hackman and Oldham 1976; DeVaro et al. 2007), an excess of variety may be negative because it hampers the learning process associated with task repetition. Compared to focused technicians, technicians who face higher task variety face the negative effect of multitasking: they make more mistakes, require longer to switch from one job to the next, and tend to take longer to complete a task (Meyer and Kieras 1997; Pashler 2000). This has

obvious implications for quality, delivery, and cost performance.

Second, our results shed new light on how the sand cone model contributes to the development of agility and they further confirm its validity in a service environment. The sand cone sequence (quality, delivery, cost and flexibility) has been recognized as the capability-building sequence that most facilitate the development of new competitive strengths. Our results suggest that firms follow the sequence prescribed by the model (in reverse order) also when they are forced to dismantle the capabilities in their existing base. The implicit consequence of this finding is that, once more, quality emerges as the true foundation of a firm's set of operational strengths, and the last competitive capability that organizations are willing to let deteriorate.

In addition, the DEA analysis indicates that there is a great variation across workshops' performance even though they belong to the same company. This finding echoes the research by Hayes, Clark, Chew and Fujimoto (Hayes and Clark 1985, 1986; Clark et al. 1987) who found that variations in operational performance among workshops can be explained by different resource allocation schemes, different management approaches and, different operational skills, even if all sites adopt the similar business model and structures.

A third contribution of our work is methodological. The majority of previous studies in this area have relied on perceptual measures, usually computed via single- or multi-item scales, to assess the competitive capabilities constructs. This chapter provides an alternative, more objective method that relies on quantitative data readily available from most service organizations. This represents another valuable tool for researchers to use in future studies in this area, complementing the more subjective perceptual measures used in prior studies.

Finally, our results also provide some managerial guidelines that help companies develop multiple capabilities and offer some insights into why the number of successful cases of agile service organizations is still limited (Hill 2000). Our analysis suggests that the incorporation of volume flexibility into service processes is not free. However, it also indicates that companies needing to address greater shifts in demand volume can build volume flexibility without too much concern about the deterioration of their quality performance. On the other hand, they should be aware that the development of volume flexibility may affect their ability to control cost and to deliver on time. When firms need to add address demand fluctuations, they should consider whether the additional benefits they would obtain by being able to provide services to a greater number of customers is worth the deterioration of cost, and delivery performance that is likely to result from this decision.

4.6.2 Limitations and future research

Like most research, this study is not exempt from limitations. First, the results are based on the study in one country and one industry, which limits the generalizability of the findings. The variables used in the DEA model to measure the competitive capabilities of quality, cost, delivery, and volume flexibility are objective, but also industry-specific.

Secondly, the observations in our sample were collected within a relatively short time window. As a result, a portion of the observed impact of volume flexibility on cost, quality, and delivery may be associated with post-transition adjustments and might eventually disappear over time, as technicians learn to cope with increased demand volatility.

A third limitation concerns the fact that we have examined the impact of one specific type of flexibility (volume flexibility), while neglecting other types such as mix flexibility (i.e. variations in the type of service provided). As volume flexibility can be built more easily because uncertainty related to the quantity of work is easier to manage than uncertainty related to changes in the nature of the work, the impact of flexibility on quality, delivery, and cost may be underestimated by our analysis. When changes involve only the quantity of work, no new competences are required to handle new jobs, and operators can benefit from the learning curve effect to increase the pace of operations without compromising on cost or quality. Conversely, when the competences required for the provision of services need to change broadly and also quickly, operators may lack sufficient time to build the operational knowledge required to execute the new tasks efficiently and effectively.

These limitations naturally indicate several avenues for future research. First, an extension of this study to other industries and/or countries would be required to improve the generalizability of our results. Second, it would be interesting to examine the impact of other flexibility types, including those incorporating the customer's perspective. Our study has focused on service agility mainly from a business viewpoint: we consider the advantages that multiple capabilities bring to service providers, not to customers. Yet, an emerging stream of literature emphasizes the role of customers as "co-owners" in the design and operation of service delivery processes and proposes the concept of customer agility (Sambamurthy, Bharadwaj et al. 2003; Xue, Hitt et al. 2006). It remains to be verified whether the strategies that maximize agility from the service provider's point of view are also beneficial when examined from the customer's perspective.

CHAPTER 5 – THE ANTECEDENTS OF SERVICE AGILITY: AN ORGANIZATIONAL MECHANISM APPROACH

5.1 Introduction

Previous studies have suggested that companies are under pressure to satisfy and retain customers by simultaneously providing responsive services with high quality and speed, low cost, and the ability to respond to uncertainties with flexible delivery (Adam Jr and Swamidass 1989; Corbett and van Wassenhove 1993; Zaheer and Zaheer 1997). Consequentially, companies need to become agile to be able to use multiple capabilities not only to adapt to environmental changes but also to transform changes into opportunities to increase their competitive positioning (Youssef 1992).

The concept of agility was initially developed in the context of manufacturing. There are a number of attentive views of the nature of agility. For instance, Brown and Bessant (2003) defined agility as "the ability to respond quickly and effectively to changes in market demand". Prince and Kay (2003) described agility as "the ability to respond to sudden changes and meet widely varied customer requirements in terms of price, specification, quality, quantity and delivery". Narasimhan, Swink and Kim (2006) pointed out that" agility involves flexibilities of several sorts, and includes the capability to do unplanned, new activities in response to unforeseen shifts in market demands or unique customer requests". In this study, we follow Menor et al. (2001) and other studies and define service agility as to a company's ability to achieve low cost, high quality, speedy, and flexible services simultaneously (D'Aveni and Gunther 1994; Yusuf et al. 1999). These four types of capabilities have been widely considered as the most important capabilities to achieve competitive edge (Boyer and Lewis 2002; Neely and Wilson 1992; Noble 1995; Platts and

Gregory 1990; Skinner 1969; Stalk et al. 1990). Other capabilities have also been associated with service agility, including customization, automation, product development (Ismail et al. 2006; Ramesh and Devadasan 2007; Yusuf et al. 1999). IT is also frequently linked to agility in terms of a synthesis of existing technologies and organizational capabilities (Goldman and Nagel 1993; Sambamurthy et al. 2003). Overall, the concept of agility is still highly contingent on the research object and context.

The recognition of the importance of service agility and the capabilities required raises the question of what the potential drivers or mechanisms are that help companies achieve agility (Dyer and Shafer 1999; Vokurka and O'Leary-Kelly 2000). There has been a call for more studies to examine the link between organizational structure and infrastructure and agility strategy (Boyer et al. 1997; Fiegenbaum and Karnani 1991; Upton 1995).

Traditional organization theories and operation research have held a trade-off view of the achievement of multiple goals so that companies can only foster certain strengths by sacrificing others (Hannan and Freeman 1983; Levinthal and March 1993; Mintzberg 1979), otherwise they would become "stuck in the middle" (Porter 1980). With evidence being raised against the trade-off postulate (Hayes and Wheelwright 1984; Safizadeh et al. 1996), researchers have found that companies can create structures and systems to reconcile seemingly contradictory tensions and shift the trade-off to attain multiple objectives simultaneously (De Meyer et al. 1989). For instance, organizational routines have been considered to help companies improve efficiency and reduce costs by sacrificing organizational flexibility (Adler et al. 1999; Cohen and Bacdayan 1994; Gibson and Birkinshaw 2004; Lawler 1994). Recently it has been argued that routines are "a repetitive, recognizable pattern of

interdependent actions involving multiple actors" (Feldman and Pentland 2003), and hence can be an important source of flexibility and changes (Feldman 2000; Feldman and Pentland 2003; Howard-Grenville 2005).

Organization-context literature points out that companies are able to achieve ambidexterity—both efficient under current business demands and adaptive to future environmental changes (Gibson and Birkinshaw 2004)—in two ways. The first is to reengineer the organizational structures to improve the formalization and standardization. Alternatively, they can build a carefully selected set of systems and processes that collectively develop a supportive organization context that encourages individuals to handle the conflicting demands, such as efficiency and flexibility (Daft 1998; Ghoshal and Bartlett 1994; Tushman and O'Reilly 1996).

Organizational literature has suggested that there are two sets of organizational mechanisms connected with operations strategy (Brown et al. 2005; Dyer and Shafer 1999; Johnston and Clark 2008; Wright and McMahan 1992). Structural mechanisms refer to the formal, relatively permanent arrangement of human and physical resources within an organization to perform its assignment (Van de Ven and Delbecq 1974). Contextual mechanisms are the systems, processes, and beliefs that shape individual-level behaviours (Denison and Mishra 1995).

Therefore, the main research question of this chapter is how structural and contextual organizational mechanisms can enact service agility. Moreover, this chapter seeks to investigate whether there is systematic evidence that certain types of structure–context combinations are associated with superior agility more than others.

The remainder of this chapter is organized as follows. First, we describe the structural and context mechanisms driving service agility. Second, we describe the

research methods, which include the field study and survey. The following sections outline the results of the field study addressing the research questions, and provide the supporting evidence from the quantitative analysis based on the survey. Finally there is a discussion section.

5.2 Theoretical Foundation

Companies are required to be able to mobilize resources effectively and flexibly (Brown et al. 2005), especially human capital, so as to organize and work with people in the organization to produce and sustain competitive advantage (Kay 1993; Tampoe 1994). As an important component of operations strategy decision areas, organizational structural and contextual mechanisms define the relationship between people and the tasks they perform (Kinnie and Staughton 1991; Mills et al. 1995; Roth et al. 1997).

In essence, the structural and contextual mechanisms reflect the importance of human agency not only in the decision execution but also in the searching and choice in the competitive capability-building process (Ashforth and Fried 1988; Weiss and Ilgen 1985; Wilensky 1967), which is echoed by recent findings on organizational routines (Felman and Pentland 2003).

Based on structuration theory (Giddens 1984), Feldman and Pentland (2003) have pointed out that there are two aspects of organizational routines: ostensive, the abstract ideas of the routine, and performative, the actual performances of the routine by specific people. The ostensive aspect of a routine can serve as a template for behaviour or a normative goal (Nelson and Winter 1982). The ostensive aspect of routine allows us to explain what we are doing (Orbuch 1997). It is the interaction

between the ostensive and performative aspects that reinforces the advantages of routines such as efficiency and at the same time provides organizations' flexibility.

Organizational routines have always been regarded as central to all kinds of organizations' abilities and constitute the repetitive patterns that coordinate activity within the organization (Pentland and Rueter 1994). Since routines arise from the way the work is organized, the schematic forms of routines are shaped by the structural features of organizations (Pentland and Rueter 1994). Accordingly, the accomplishment processes of organizational routines are imbedded in a broad organizational context (Scott 1992). Previous literature has suggested that organizational mechanisms deeply reflect routines' use and their persistence (Adler et al. 1999; Feldman 2000; Gersick and Hackman 1990). Therefore, the dual nature of routines gives us a foundation to explore the important connection between organizational mechanisms and business agility.

5.2.1 Structural Mechanisms

Varying demands require organizations to be able to accomplish a number of different tasks simultaneously that may vary in terms of their complexity and predictability. Accordingly, organizations should design their structures in a way that they will be able to respond more effectively to the environmental demands (Osborn and Hunt 1974). Generally, structure refers to "the formal, relatively permanent arrangement of human and physical resources within an organization to perform its assignment" (Van de Ven and Delbecq 1974). Since the organizational structure defines the responsibilities of every member and the interactions among various functions, its adjustment, such as specializing functional roles or refining the job content, may help organizations break the inertia and reconcile seemingly

contradictory tensions (McDonough and Leifer 1983). The structural approach has been also used in a number of studies on "ambidextrous" organizations (Daft 1998; Jelinek and Schoonhoven 1993; Tushman and O'Reilly 1996). Two types of structural mechanisms, metaroutines and job enrichment, stand out from the literature as the standard approaches to help organizations become agile.

Metaroutines are routines to modify established routines or invent new routines in response to environmental changes (Grant 1996; Volberda 1996). The theoretical foundation of metaroutines is the "dual-routine view", which suggests that the behaviour of organizations is defined by two sets of routines: operational routines refer to the day-to-day behaviour and metaroutines modify the first type of routines over time to keep pace with the external environment (Cyert and March 1963; March and Simon 1958). Organizations are able to behave in an automatic way once operational routines are in place. Metaroutines, in contrast, represent the recognition of the need for change and the identification of an appropriate response in a revised operational routine (Knott 2001). Through the establishment of metaroutines, organizations can shift the contradiction among different demands and maintain the balance of various objectives. Specifically, metaroutines enable managers to pursue an autonomic role, in addition to their administrative responsibility (Simon 1945). The traditional administrative responsibility, on one hand, forces employees to follow the operational routines so as to ensure operational efficiency and control the operational cost and quality. The autonomic role, on the other hand, executes metaroutines to modify the established operational routines or transform non-routines into routines to meet the changing environment so as to achieve operational flexibility. Therefore, organizations can become more agile by developing metaroutines without impairing the operational routines (Adler et al. 1999).

Metaroutines have already been employed in many organizations as a means to systematize the creative process by standardizing internal processes that focus on flexibility or innovation (Nelson and Winter 1982) and generate "dynamic capabilities" (Tranfield and Smith 1998).

Hypothesis 1a. The more a business unit is characterized by metaroutines, the more agile the business unit is.

Job enrichment can be defined as meaningful changes in job tasks, increasing opportunities for responsibility, personal achievement, feedback, growth, and advancement (Herzberg (1968). The "core" job dimensions for enrichment proposed by Hackman and Oldham (1976) include skill variety, task identity, task significance, autonomy, and feedback from the job. Shafer and his colleagues (2001) proposed two forms of job enrichment: flexible assignment, in which employees continue to use a similar set of technical competencies but apply them in different locations throughout the network, and blended assignment, in which various tasks are compressed into one assignment for employees to conduct. Job enrichment could give employees greater control over the order and/or content of their work, and provide them with more freedom from direct supervision (Fein 1974). The benefits of job enrichment have been well documented in the literature. First, the increased responsibility helps employees learn new skills and broaden their views to become more versatile in dealing with various demands and meeting the fluctuating staffing requirements while keeping the headcount under control, which generates cost-effectiveness. Job enrichment also increases the motivating potential of a job through autonomy, so that employees become more innovative and flexible even if the tasks are routine. Furthermore, employees exhibit a higher level of mindfulness and show greater interest in enriched work, which result in increased quality. Finally, job

enrichment is also associated with organizational development by invoking the involvement and commitment of several layers of managers (York 1976), so that successful job enrichment leads to higher productivity by promoting job satisfaction and improving the quality of working life (Norton et al. 1979). Hackman and Oldham (1976) proposed a Job Characteristics Model to describe systematically the relationships between job characteristics and individual responses to the work in which the "core" job dimensions prompt three psychological states that eventually lead to a number of beneficial personal and work outcomes, including high quality of work performance, high work motivation, and high satisfaction. Therefore, we propose that job enrichment acts as an effective method to build agile organizations.

Hypothesis 1b. The more a business unit is characterized by job enrichment, the more agile the business unit is.

5.2.2 Contextual Mechanisms

In addition to the structural mechanisms, recent research has paid more attention to the roles of agents in establishing organizational routines. It has been argued that a simultaneous balance between seemingly contradictory demands could be achieved by building a set of processes, or routines, that enable and encourage individuals to make their own judgements on the effort allocation towards conflicting demands (Tushman and O'Reilly 1996). Organizational context is defined as such systems, processes, and beliefs that shape individual-level behaviours (Denison and Mishra 1995; Ghoshal and Bartlett 1994). The essence of contextual mechanisms lies in the "organic" match between the routine designs and individuals' needs so that meta-level capabilities can feasibly be sustained in one business unit, rather than using a

"dual structure" in which different demands are kept separate (Gibson and Birkinshaw 2004).

Contextual mechanisms are in line with the idea of the enabling type of formalization, i.e., organizational routines should be built in a way to enable employees to deal more effectively with the inevitable contingencies, rather than making the work process foolproof (Adler and Borys 1996). Several features have been documented as being associated with enabling this formalization. Firstly, in an enabling approach, organizations value employees' potential contribution to dealing with unexpected failures and identify opportunities for improvement by creating a two-way communication environment. The standardized work process in an enabling approach brings workers and supervisors together to define cooperatively and to document the effective work methods and task allocations, but with workers managing their own time and conducting their own analysis of the real work process to propose the improvement methods. Secondly, an enabling approach provides employees with an insight into the processes, understanding of the rationale behind each rule, and informative feedback on their performance. Moreover, an enabling approach encourages employees to interact creatively with the broader organization and environment, which improves their understanding of where their own tasks fit into the whole system. The internal and global transparency ensures the process fairness that builds trust and commitment and leads people to go beyond the call of duty by sharing their knowledge and applying their creativity (Kim and Mauborgne 2003). Finally, an enabling approach considers coded routines as suggestions not rigid guidance, and the deviations are more likely to be treated as learning opportunities rather than risks. Therefore, routines create a flexible system by

allowing employees to modify the interface and add functionality to suit their specific work demands.

The establishment of enabling formalization requires the support from the organizational mechanisms that emphasize the human behaviour factors. Organizational context is used in the literature to refer to human-related mechanisms (Gibson and Birkinshaw 2004). It includes two aspects—the structural context, the tangible administrative mechanisms such as incentive or human resource management (Bower and Doz 1979; Burgelman 1983), and the organizational climate, the organizational atmosphere, or environmental characteristics affecting individual behaviours and attitudes (Klein and Kozlowski 2000). Two types of contextual mechanisms—the incentive system, tangible or intangible rewards aligned with the business objective, and organizational trust, mutual reliance, and commitment among employees—have been widely used in the literature related to the structural context and organizational climate (Brockner et al. 1997; Deutsch 1985).

The former motivates employees to strive for their ambitious goals, and the latter facilitates their accomplishment by providing the ideal environment. *The incentive system*, as a core element of human resource strategy, is used to reward employees with tangible and intangible benefits based on their contributions to the organization (Shafer et al. 2001). The concept of an incentive system is aligned with the context of distributive justice, which denotes the equalization and conformation of distribution, respectively (Deutsch 1985), and emphasizes the importance of outcomes on people's fairness perceptions (Adam 1965; Martin 1981; Walster et al. 1973). Studies have suggested that employees in organizations without effective incentive systems are likely to have perceptions of inequitable distribution or unfairness of outcomes.

These perceptions lead to negative emotions and demotivate individuals from actively engaging in their daily tasks (Greenberg 1987). An effective incentive system, in contrast, enables organizational stretch that induces members to strive voluntarily for more, rather than less, ambitious objectives (Ghoshal and Bartlett 1994) and creates the enabling type of formalization though which employees actively cope with the inertia aspect of routines and generate flexibility (Alder and Borys 1996; Feldman 2000). The incentive system, therefore, is expected to be an effective organizational context to introduce flexibility into routines and facilitate organizational agility (Shafer et al. 2001).

Hypothesis 2a. The more a business unit is characterized by a fair incentive system, the more agile the business unit is.

Trust indicates the degree to which two parties can rely on each other's commitment. In transactional business relationships, trust will not automatically appear since every party is usually rationally self-interested in exchange processes (Singh and Sirdeshmukh 2000). So, trust comes from one party's expectation or belief of the other party's particular actions (Barber 1983; Lewis and Weigert 1985; Luhmann 1979). Particularly, employees' trust in the organization is heavily shaped by the work process in that those who receive procedurally fair treatment usually perceive the organization to be trustworthy and able to be counted on in the long term (Brockner et al. 1997). As a consequence, trust provides employees with the confidence and freedom to go beyond the call of duty by sharing their knowledge, applying their creativity, and conducting routine tasks in a way that exhibits flexibility and high quality without sacrificing efficiency and increasing costs.

Hypothesis 2b. The more a business unit is characterized by a high level of trust, the more agile the business unit is.

5.2.3 Coordination of Structural and Contextual Mechanisms

We have argued that highly routinized organizations could either change their organizational structures or establish proper organizational contexts to become agile. We propose that the two approaches can contribute to improving the agility level even more by working together. Since structural changes generally involve very complicated impacts on organizations' operations and employees' behaviours, which tend to be difficult to adjust afterwards, some potential impediments have been recognized to be associated with the structural approach.

To begin with, although metaroutines try to improve organizational flexibility and reduce associated costs by routinizing corresponding processes, they create strong psychological forces to encourage "goal displacement" so that conformance to the standardized procedures becomes the over-riding goal, and the remaining non-routine tasks may be ignored (Merton 1958). This defensiveness will be amplified if the results of the routine tasks are more easily measured and are the focus of reward systems. Moreover, heavy reliance on metaroutines reduces task autonomy and variety compared with pure, unfettered innovation. As a consequence, metaroutines may reduce the intrinsic motivational quality of the innovation process and lead to organizational rigidity (Hackman and Oldham 1980).

In contrast, characterized by high autonomy and individual accountability, job enrichment may risk organizations losing efficiency and learning effectiveness by decreasing the conformance with standardized production procedures (Adler and Cole 1993). Also, the emphasis on job discretion and autonomy in decision-making

might be perceived as providing a greater sense of control over work, which may block employees' willingness to engage in team support (Drach-Zahavy 2004). Furthermore, the implementation of job enrichment requires a high cost in employee training and increases the agency cost by creating information asymmetries and increasing opportunistic behaviours (Eisenhardt 1989).

The potential hurdles demonstrated above indicate that it requires a significant amount of extra resources to implement structural mechanisms successfully, which may obstruct organizations from shifting all the trade-offs and achieving the agile goals of efficiency, low-cost, quality, and flexibility simultaneously.

The contextual approach, however, has been suggested to be able to help to achieve the relative balance of the forces mobilized by the structural mechanisms and those associated with their intrinsic limitations (Adler et al. 1999), instead of physically intervening in various functional units and generating conflict. The contextual approach manages to achieve multiple objectives by decentralizing structures without introducing tensions. Some empirical evidence has demonstrated the advantage and effectiveness of the contextual approach. For example, after analysing several ambidextrous organizations, Tushman and O'Reilly (1997) pointed out some key sources of success, including a decentralized structure, a common, underlying layer of strong culture, and supportive leaders and flexible managers.

In addition, organizational theory argues that the effectiveness of organizational structures is actually embedded in the organizational context (Scott 1992). So, the establishment of contextual mechanisms can facilitate or support the implementations of structural changes. For instance, organizations could also build incentive systems that encourage innovation and cross-functional interactions to

reduce the rigidity associated with metaroutines. Trust plays a crucial role in relieving the doubts of managers and subordinates in each other's competence so as to fulfil their commitments. Trust also helps to build the supportive and decentralized organizations by reinforcing the goal congruence (Adler et al. 1999). Therefore, structural and contextual approaches are able to complement and facilitate each other to help organizations achieve a superior agility level.

Hypothesis 3. Business units that implement both structural and contextual approaches will exhibit higher agility levels than business units that only rely on one of them.

5.3 Research Context and Method

5.3.1 The sample

The data set used in this research is drawn from a survey on service agility conducted between July 2008 and November 2008, with the assistance of the Institute of Customer Service (ICS). The ICS is a professional body for customer service, leading customer service performance and professionalism. The membership of ICS is drawn from a broad base including B2B and B2C services, there is no bias or selection towards certain sectors or types of companies. The respondent target of this study includes all 300 members of the ICS. A mixed-mode survey was used for two primary reasons. First, the literature has suggested that each survey mode offers different advantages. For instance, online surveys are associated with faster responses, lower costs, and a wider geographic reach (Green et al. 2003; Illieva et al. 2002; Schuldt and Totten 1994), while mail surveys are better at avoiding invalid addresses and technology barriers (Cobanoglu et al. 2001; Malhotra 1999). Therefore, the two modes can be supplements to each other. In particular, we conducted an

online survey first with the full respondent target, aiming for a wide reach and fast response, and then a mail survey in the second round to make sure that the non-responses were not due to invalid addresses or technology unfamiliarity. Furthermore, despite some studies' indication that different survey modes may produce different results (Dillman 2000; Roster et al. 2004), more and more research has demonstrated that there is no significant difference in convergent validity between the modes (Deutskens et al. 2006; Epstein et al. 2001; Knapp and Kirk 2003). Therefore, the mixed-mode survey can deliver solid results because of the convergent validity.

The business unit (BU), where the service strategy is formulated, is the unit of analysis. The corresponding respondents were senior executives typically holding the title of Head of Operations or Managing Director. A total of 62 responses were received, out of which 40 were from the online survey and 12 were from the mail survey. No significant difference has been found between the online responses and the mail responses, or between early and late responses. The response rate is 15.5%. In total 59 responses were included in the final analysis; 3 incomplete ones were dropped. Table 5.1 highlights descriptive statistics characterizing the 59 business units.

5.3.2 Measures

All the measures were established through a comprehensive literature review followed by preliminary test interviews. Operational capability measures were adopted from Menor et al. (2001). Measures of organizational mechanisms were mainly in line with studies carried out by Adler et al. (1999), McAdams (2000), and McAllister (1995). The detailed measures and resources are summarized in Table 5.2. The respondents were asked to rate each measure on seven-point, self-anchoring

scales. Single items were used to capture the business performance in terms of profitability (objective profit level) and customer satisfaction (relative to the competitors).

Table 5.1 Sample Profile

	# of Responses	Percentage
Sector		
Automotive	5	8.5%
Financial Services	6	10.2%
Non-profit & Public Sector	13	22.0%
Retail	9	15.3%
Services	17	28.8%
Telecommunication	5	8.5%
Others	4	6.7%
# of Employees		
Fewer than 100	14	23.7%
100–500	12	20.3%
501–1000	7	11.9%
1001–5000	10	16.9%
More than 5000	16	27.1%
# of Branches		
Fewer than 10	29	49.2%
10–50	10	16.9%
51–100	6	10.2%
101–500	10	16.9%
More than 500	4	6.8%
Turnover (£M)		
Less than 10	29	49.2%
10–50	10	16.9%
More than 50	20	33.9%
Total	59	100%

Companies' characteristics, including turnover size, number of branches, and number of employees, were also included in the questionnaire as control instruments. The questionnaire draft was tested among the London Business School consulting club members to fill in for a preliminary study, and then used as interview materials with 15 volunteer MBA students to gather more detailed feedback in terms of wording and structure before finalizing the questionnaire. Table 5.3 shows the descriptive statistics for operation capability dimensions, including the Cronbach's alpha, mean, and standard deviation of each item. Since very few studies have examined both structural and contextual organizational mechanisms in a systematic

way, we applied factor analysis with varimax rotation to all the items to obtain further validation. Table 5.4 presents the results of the varimax factor analysis. All the organizational mechanism constructs were clearly defined with high loading. Eigenvalues, which are the variance of the factors, are usually used to help determine the number of factors. A general rule of thumb is eigenvalues should be greater than 1. All the eigenvalues from the 4 factors were greater than 1. All but 1 of the loadings were greater than 0.5. Descriptive statistics, which include the mean, standard deviation, and Pearson correlations, are provided in Table 5.5.

In addition, since the majority of the measures are self-report subjective items, we used two tests to assess the risk due to common method bias. First, Harman's one-factor test was performed by entering all the principal constructs into a principal components factor analysis. There is no single construct accounting for the majority of the covariance, which indicates no substantial common method bias. We then conducted a partial correlation method test by using the highest factor from the principal components factor analysis as a control variable on all the dependent variables in the PLS model. This factor did not produce a significant change in variance explained in any of the dependent variables, which again suggests no substantial common method bias (Podsakoff and Organ 1986).

5.3.3 Model

We used structured equation modelling (a path model) to investigate the link between organizational mechanisms and service agility. Structural equation modelling enables the research to 1) examine the latent variables, 2) test multiple equations simultaneously, and 3) explore the indirect effects (Bollen 1989). The identification of the connection was achieved through testing the impact of

organizational mechanisms on service agility, a latent variable with four capabilities as indicators, in the presence of control variables. Figure 5.1 shows the path model with the main effects of organizational mechanisms.

Table 5.2 Measures and Sources Overview

Constructs/Measures	Sources
Quality	
Item 1: Courteous service	Menor et al. 2001
Item 2: Consistency (reliability)	
Item 3: Customer perceived quality	
Item 4: Accurate information (credibility)	
Item 5: Empathy	
Item 6: Timely information	
Item 7: Conformance	
Delivery	
Item 1: Delivery speed	Menor et al. 2001
Item 2: Convenient service	
Item 3: On-time delivery	
Item 4: Handling customer complaints	
Cost	Menor et al. 2001
Item 1: Cost	
Flexibility	
Item 1: Production/service system responsiveness	Menor et al. 2001
Item 2: New service/product introduction speed	
Item 3: Customization of products/services	
Metaroutine	
Item 1: Any change in existing practices has to follow predefined and standardized procedures	Adler et al. 1999
Item 2: Any establishment of new practices has to follow predefined and standardized procedures	
Item 3: The problem-solving process is standardized into sequential procedures	
Enrichment	
Item 1: Employees have many opportunities to use various and complex skills	Drach-Zahavy 2004
Item 2: It is up to employees how the problems should be solved	
Incentive sytem	
Item 1: The reward system engages all or most of the members	McAdams 2000
Item 2: The reward system pays out only when the improvement occurs	
Item 3: The reward system's effectiveness is measurable	
Item 4: The reward system is dynamic in that it changes as business needs change	
Trust	
Item 1: Supervisors and employees have a sharing relationship, they freely share ideas, feelings, and hopes about the work they do	McAllister 1995
Item 2: If employees share their problems with their supervisors, they know their supervisors would respond constructively and caringly	
Item 3: Both employees and supervisors would feel a sense of loss if they could no longer work together	
Item 4: Supervisors and employees made considerable emotional investments in their working relationship	

Table 5.3 Descriptive Statistics for Operations Capability and Organization Mechanism Dimensions (n=59)

Underlying construct	Mean	Std dev.
Quality (Cronbach's α=0.93)		
Item 1	5.41	1.50
Item 2	5.13	1.54
Item 3	5.19	1.58
Item 4	5.20	1.37
Item 5	5.30	1.50
Item 6	4.98	1.52
Item 7	4.93	1.60
Delivery (Cronbach's α=0.89)		
Item 1	4.79	1.45
Item 2	5.28	1.48
Item 3	5.16	1.57
Item 4	5.36	1.50
Flexibility (Cronbach's α=0.72)		
Item 1	4.40	1.43
Item 2	4.53	1.48
Item 3	4.62	1.69
Metaroutine (Cronbach's α=0.91)		
Item 1	4.51	1.79
Item 2	4.44	1.79
Item 3	3.93	1.79
Enrichment (Cronbach's α=0.83)		
Item 1	5.03	1.57
Item 2	4.63	1.61
Incentives (Cronbach's α=0.89)		
Item 1	3.93	1.86
Item 2	4.23	1.76
Item 3	4.28	1.91
Item 4	3.63	1.82
Trust (Cronbach's α=0.90)		
Item 1	4.15	1.76
Item 2	4.27	1.87
Item 3	4.46	1.91
Item 4	4.39	1.70

* Please refer to the questionnaire in the appendix for the details of each item.

Table 5.4 Rotated Factor Loading for the Organizational Mechanism Constructs (n=59)

Underlying Construct	F1	F2	F3	F4	Percentage of Variance
Metaroutine					
Item 1			0.589		
Item 2			0.630		
Item 3			0.562		14.71%
Enrichment					
Item 2				0.743	
Item 3				0.741	10.72%
Incentives					
Item 1	0.790				
Item 2	0.794				
Item 3	0.685				
Item 4	0.737				28.89%
Trust					
Item 1		0.917			
Item 2		0.784			
Item 3		0.828			
Item 4		0.874			25.49%

* Please refer to the questionnaire in the appendix for the details of each item.

Table 5.5 Correlations and Descriptive Statistics for the Observed Variables (n=59)

	CS	Quality	Delivery	Cost	Flexibility	Metaroutine	Enrichment	Incentives	Trust	Turnover	Branches	Employees	Mean	SD
Profit Margin	0.16	0.38	0.29	0.13	0.20	0.09	0.14	0.29	0.20	-0.08	0.01	0.11	3.84	1.21
Customer Satisfaction	1.00	0.43	0.39	0.03	0.33	-0.06	0.10	0.33	-0.20	-0.27	-0.30	-0.28	5.40	1.24
Quality		1.00	0.88	0.56	0.77	-0.06	0.05	0.24	0.15	-0.15	-0.14	-0.15	5.17	1.21
Delivery			1.00	0.56	0.71	-0.04	0.06	0.19	0.12	-0.15	-0.09	-0.21	5.17	1.29
Cost				1.00	0.48	0.06	-0.10	0.10	0.17	-0.10	-0.18	-0.16	4.33	1.42
Flexibility					1.00	-0.02	0.19	0.14	-0.07	-0.24	-0.13	-0.21	4.55	1.21
Metaroutine						1.00	-0.04	-0.29	-0.09	0.17	0.31	0.32	4.29	1.64
Enrichment							1.00	0.17	-0.27	-0.25	-0.14	-0.18	4.83	1.38
Incentives								1.00	-0.06	0.02	-0.04	0.04	3.98	1.58
Trust									1.00	0.09	-0.04	0.16	3.68	1.59
Turnover										1.00	0.69	0.85	3.13	1.58
Branches											1.00	0.68	2.15	1.38
Employees												1.00	3.03	1.56

5.4 Results

We tested two path models, one with the main effects of organizational mechanism variables and the other one including the interactions among organizational mechanisms. The statistics of overall model fit are shown in Table 5.6. The chi-square statistics indicate an excellent overall fit ($p>0.1$). The supplementary stand-alone fit indices (GFI, AGFI, RMR, and RMSEA) are generally well above the rule-of-thumb model fit value (Byrne 2001). The GFIs are well above 0.90, indicating a good fit. The AGFIs are above 0.70, indicating a reasonable fit. The RMRs show an acceptable goodness-of-fit with a value well below 0.10. Most of the RMSEA figures are below 0.05, suggesting an excellent model fit. Overall, the results provide solid evidence that the models tested fit the data well.

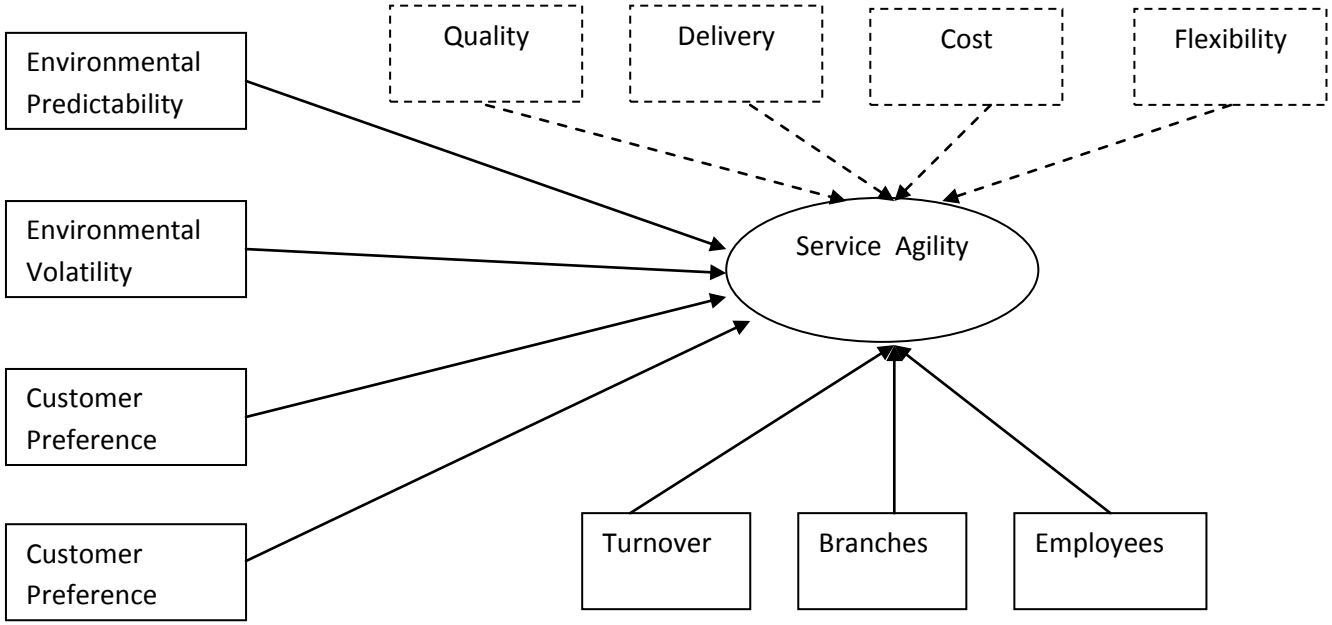
Table 5.7 provides the results for both the main effect model and the model with full interactions among organizational mechanisms. One of the control variables, the number of employees, shows a significant connection with service agility in both models. Companies with a smaller employee size seemed to have a higher level of service agility in the surveyed companies. This finding may indicate that, despite the resource limitation associated with small-size companies (Braglia and Petroni 2000), companies with fewer employees in our survey tend to be more adaptive in response to environmental changes and resource deployment, which provides great support to operations strategies (Kotha and Orne 1989; Parthasarthy and Sethi 1992). However, given our limited sample size, further studies with bigger sample size are needed to improve the generalizability of the findings.

According to the main effect model results, no statistical evidence was found to support that structural mechanisms—metaroutine and job enrichment—have a

significant impact on service agility. Contrary to what we hypothesized, companies in our survey seemed to be unlikely to achieve significantly higher levels of service agility by implementing metaroutines or job enrichment alone. One of the major reasons may be due to the "stiffness" structural mechanisms can cause in organizations' operations and employees' behaviours. For instance, although metaroutines can improve flexibility for routinized organizations, they have also been observed to encourage unnecessary standardization and overshadow non-routine tasks (Merton 1958), which eventually reduce task autonomy and variety, as well as obstacle innovation (Hackman and Oldham 1980). Job enrichment is believed to be associated with the risk of lacking efficiency, discouraging team engagement (Drach-Zahavy 2004), and cost increase (Eisenhardt 1989).

Contextual mechanisms, as expected, were all significantly associated with service agility in the surveyed companies. Companies with better incentive systems and a more trustworthy atmosphere are shown to have higher service agility levels. This finding may indicate that human-oriented mechanisms, which provide a match between the process designs and employees' needs (Gibson and Birkinshaw 2004), turn out to be very effective in influencing companies' service agility level in the surveyed companies. In particular, an effective incentive system can create a "fair" working environment, motivate employees to engage in their job, and inspire individuals to fulfil their potential, so as to increase quality and efficiency, reduce cost waste, and improve adaptability (Ghoshal and Bartlett 1994; Greenberg 1987). Similarly, through establishing a trustworthy environment, companies encourage employees to be committed to each other, improve team engagement level, and eventually become knowledge-sharing organizations with high quality and efficiency (Brockner et al. 1997; Lewis and Weigert 1985).

Figure 5.1: Organizational Mechanisms and Service Agility Path Mode



Note: Service agility is a latent variable. Quality, delivery, cost, and flexibility are the indicator/manifest variables.

Table 5.6 Model Overall Fit Statistics (n=59)

Fit Indices	Fit Statistics Value			
	Main Model		With Profit Margin	
	Main Effect	With Interaction	Main Effect	With Interaction
Chi-square	23.5148	37.8538	31.9371	51.8565
Degree of Freedom	23	35	30	46
Probability Level	0.4311	0.3404	0.3705	0.2561
Goodness-of-Fit (GFI)	0.9361	0.9272	0.9203	0.9082
Adj. Goodness-of-Fit (AGFI)	0.8168	0.7504	0.7927	0.7285
Root Mean Square Residual (RMR)	0.0452	0.0400	0.0510	0.0486
Root Mean Square Error of Approximation (RMSEA)	0.0198	0.0378	0.0337	0.0473

Table 5.7 Service Agility and Organizational Mechanisms (n=59)

Variables	Main Effect Model		Structural and Contextual Interaction Model	
	Estimate	C.R.	Estimate	C.R.
Metaroutine	0.11	1.18	-0.04	-0.45
Enrichment	0.03	0.31	-0.37	-3.72***
Incentives	0.22	2.34**	-0.62	-7.09***
Trust	0.17	1.80*	0.18	2.07**
Metaroutine*Incentives			0.08	5.20***
Metaroutine*Trust			-0.05	-2.87***
Enrichment*Incentives			0.09	6.87***
Enrichment*Trust			0.04	2.33**
Turnover	0.04	0.42	0.14	1.55
Branches	0.03	0.24	-0.05	-0.54
Employees	-0.25	-2.67***	-0.30	-3.45***

Note: significance *p<0.10, **p<0.05, ***p<0.01

Therefore, hypotheses 2a and 2b are supported.

By introducing the interaction terms into the second model, we intended to find out how service agility can be linked to the coordination between structural mechanisms and contextual mechanisms. From Table 5.7, we noticed that all the interaction terms are significantly connected to service agility. As hypothesized in H3, based on the surveyed companies, incentive systems can be used with metaroutines and job enrichment to improve service agility. Trust and job enrichment can also work together to help companies achieve higher service agility. Our results

may suggest that contextual mechanisms are able to mitigate the "stiffness" in operations brought about by structural mechanisms and help companies to find the balance between standardization and autonomy (Adler et al. 1999). Specifically, an effective incentive system that rewards both routinized efficiency and non-routine innovation may help employees avoid falling into "goal displacement" towards standardization due to the metaroutine. At the same time, employees with a proper incentive system are less likely to "over-use" the accountability that job enrichment brings to them to sacrifice conformance and efficiency. Therefore, good incentive systems may enable companies to enjoy the operational benefits metaroutines and job enrichment can bring without the associated baggage. Employees who work in companies with a strong sense of trust tend to engage in teamwork and are less likely to fall into the proficiency trap caused by the misunderstanding of job discretion associated with job enrichment. Also, trust can decrease the opportunistic behaviours that may lead to operational inefficiency and high cost. So, trust can be used with job enrichment to boost service agility.

The interaction term between metaroutines and trust, however, exhibits a negative connection with service agility. This indicates that the high level of trust and team spirit may make employees feel very comfortable following predefined procedures aggregated so as to reinforce the routinization tendency due to the metaroutine mechanism. We also noticed that the main effect of trust remains positive, indicating that, with the interaction effects, trust can still work as a service agility facilitator by itself. Job enrichment becomes significant due to the quasi-moderating factors of an incentive system and trust mechanisms. However, the main effects of both job enrichment and an incentive system are negative, suggesting that companies should

make full use of the synergy between these two mechanisms to improve their agility level should they decide to implement both mechanisms simultaneously.

In order to gain further support, we also tested the path models including the link between service agility and business performance—profit margin. The results are shown in Table 5.8. First of all, service agility is significantly connected with both performance measures (at the 0.01 level), as previous literature has suggested (Menor et al. 2001; Miller and Roth 1994; Rosenzweig and Roth 2004). By introducing the performance link, organizational mechanisms' main effects and their interactive effects on service agility still stay the same, as we discussed above.

Table 5.8 Service Agility, Organizational Mechanisms, and Profit Margin (n=59)

Outcome	**Predictor**	**Main Effect Model**		**Structural and Contextual Interaction Model**	
		Estimate	C.R.	Estimate	C.R.
Profit Margin	Service Agility	0.40	3.39***	0.40	5.82***
	Turnover	-0.46	-5.36***	-0.47	-5.34***
	Branches	0.03	0.25	0.02	0.24
	Employees	0.52	5.67***	0.52	5.83***
Service Agility	Metaroutine	0.11	1.17	-0.03	-0.36
	Enrichment	0.03	0.31	-0.37	-3.72***
	Incentives	0.22	2.39**	-0.62	-7.10***
	Trust	0.17	1.83*	0.20	2.27**
	Metaroutine*Incentives			0.08	5.03***
	Metaroutine*Trust			-0.05	-2.83**
	Enrichment*Incentives			0.10	7.13***
	Enrichment*Trust			0.03	2.12**
	Turnover	0.04	0.39	0.13	1.53
	Branches	0.02	0.21	-0.06	-0.56
	Employees	-0.24	-2.59***	-0.30	-3.37***

Note: significance *p<0.10, **p<0.05, ***p<0.01

5.5 Conclusion and Discussion

This study seeks to examine empirically the connections between structural and contextual organizational mechanisms, as well as their interactions, and service agility. We argue that, in contrast to the traditional trade-off view, even bureaucratic

organizations are able to make use of a set of structural and contextual mechanisms to shift the trade-offs and achieve business agility. Our results show that contextual mechanisms tend to have more influence on service agility than structural mechanisms when they are assessed individually. Companies can improve their agility levels by implementing effective incentive systems and building organizational trust. If companies apply both structural and contextual mechanisms simultaneously, our results indicate that these two types of mechanisms interact with each other to affect service agility. Specifically, an incentive system can be used together with metaroutines and job enrichment to mitigate the potential side effects of the structural mechanisms and help companies to achieve agility. Trust can also interact with job enrichment to influence service agility positively. Trust, however, seems to reinforce the potential operational stiffness associated with metaroutines to affect service agility negatively.

Overall, our findings suggest that organizational mechanisms are indeed able to help companies in building their service agility. Companies should make full use of these mechanisms to break through the trade-off constraints and gain multiple competitive capabilities simultaneously. This study may shed some light on what mechanisms will be selected with the objective of becoming agile.

The contributions of this study are twofold. First of all, through empirically investigating how companies can apply structural and contextual mechanisms to enact agility, this study sheds light on the ostensive-performative view of routines set forth by Feldman and Pentland (2003). The ostensive-performative view of routines argues that routines can help organizations not only to improve efficiency and stability, but also to achieve flexibility and adaptability through involving human agency in the operational processes (Howard-Grenville 2005). Structural and

contextual mechanisms are the instruments organizations can use to introduce human agency into the processes of routine creation, maintenance, and modification (Adler et al. 1999; Feldman 2000; Gersick and Hackman 1990). Our results have shown that structural and contextual mechanisms are indeed able to help companies to excel in quality, delivery, cost, and flexibility and become agile.

The second contribution is that this study enriches the organization theory by providing a further understanding of how organizations can shift the trade-offs and achieve agility. Specifically, we systematically examine the effectiveness of a set of structural mechanisms and contextual mechanisms in helping organizations build their routines to gain multiple competitive advantages. Furthermore, this study generates great insights into the synergies of the structural approach and contextual approach by investigating interactive effects between the two types of mechanisms (Adler et al. 1999).

There are a number of limitations to this study. First, our analysis was based on self-reported survey items that are potentially subject to response bias. In particular, common method bias is a general concern with regard to this type of survey data.

Secondly, this study is based on survey in one country, which limits the generalizability of its findings. The small sample size also limits the statistical power and precludes the examination of more complex causal models, as well as restricts the study's generalizability.

Another limitation is the static nature of the survey data. We did not collect longitudinal data to capture how companies can utilize organizational mechanisms to affect business performance over time.

CHAPTER 6 – CONCLUSION

Building on the literature on operations strategy, combinative capabilities and organization theories, this doctoral study outlined the areas for research and developed three studies to contribute to the current literature conceptually and contextually. Specifically, empirical analysis in Chapters 3, 4 and 5 investigated the impact of combinative capability choices for service companies in building effective service operations strategy, the impact of acquiring additional capability, specifically volume flexibility, on companies' existing capabilities, and the influence of organizational mechanisms on service operations strategy, service agility strategy in particular. This final chapter draws on the findings from the three chapters to present the overall contribution and limitations of the study, as well as suggestions for future research.

6.1 Contributions to the service operations strategy literature

This doctoral study addressed the "SOM research agenda" proposed by Roth and Menor (2003) and sought to contribute to the literature on service operations strategy relating to strategic choices with combinative capabilities and the design choices of service operations strategy. This section will summarize the most significant contributions.

6.1.1 Combinative Capabilities and Service Operations Strategy

An increasing number of studies have suggested that companies have to excel in multiple capabilities in order to gain competitive edge (Flynn et al. 1995; Ward and Duray 2000; Ward et al. 1995). The essay in Chapter 3 investigated strategic choices characterized by various sets of combinative capabilities and the influence of these choices on business performance. There are three specific contributions to the

literature. Firstly, building upon previous literature that advocates the service agility strategy associated with all four combinative capabilities – quality, delivery, cost and flexibility (Menor et al. 2001; Rosenzweig and Roth 2004) – this study examined the various sets of capability choices service companies may choose for their operations strategy from the perspective of combinative capabilities. The findings suggest that various strategic choices with different numbers of combinative capabilities positively influence business performance. Companies are able to choose capabilities that are aligned with their resource profile to build their service operations strategy and drive business performance.

Secondly, the investigation contributes to the existing literature by examining the connection between the number of combinative capabilities with which the service operations strategy is associated and the impact on business performance. Organization learning theories have suggested that the ability to absorb new knowledge is based on an organization's stock of prior knowledge – the more existing knowledge an organization has, the easier it is to obtain new knowledge (Cohen and Levinthal 1990; Lane et al. 2006; Tsai 2001). Capability acquisition is a learning process to accrue operational know-how and reduce operational variability (Rosenzweig and Roth 2004). The more capabilities an organization builds, the more operational knowledge it can obtain, and therefore the higher operational efficiency and performance it can achieve. The findings indicate that, whilst service operations strategies with different combinative capabilities positively influence business performance, strategic choices with more combinative capabilities demonstrate higher impacts than those with less combinative capabilities. This is in line with the competitive progression theory (CPT) in that the process of multi-capability

acquisition is associated with operational know-how and reduction in process variation to influence business performance.

The third contribution is to identify the significant impact of customer preference on service operations strategy. The findings suggest that, in contrast to manufacturing operations strategy, service operations strategy is mainly shaped by the sensitivities of customers along key competitive priorities, rather than the predictability or volatility of the business environment.

6.1.2 The "Sand Cone" Model and Operational Capabilities

The essay in Chapter 4 revisited the literature on the "sand cone" model that suggests that companies are able to achieve multiple competitive advantages via developing capabilities in a pre-specified sequence, and examined the relationship between the development of volume flexibility and the quality, delivery, and cost performance of service organizations. This essay develops three specific contributions to the literature. Firstly, this study indicates that trade-offs between capabilities do exist during the cumulative establishment of capability. The increase of operational know-how and the reduction in process variation associated with the process of acquiring capabilities enables companies to build multiple capabilities along the sequence suggested in the "sand cone" model. However, acquisition of new capabilities may divert scarce critical resources from the set of established capabilities and undermine them even though capabilities are built in accordance with the "sand cone" model. The findings indicate that the development of volume flexibility does affect the levels of established capabilities. However, the magnitude of the influence depends on the distance between volume flexibility and the established capabilities along the pyramid suggested in the "sand cone" model.

Specifically, acquiring volume flexibility has greater impact on cost than delivery, whilst quality is almost unaffected.

Secondly, this study contributes to the literature by supporting the sequence of capability acquisition suggested in the "sand cone" model. The "sand cone" model and CPT suggest that companies are able to gain operational know-how and achieve multiple capabilities when they build competitive capabilities in an orderly fashion. The findings indicate that the negative influence of magnitude of building volume flexibility on other capabilities diminishes along the progressive sequence suggested in the "sand cone" model from cost to delivery and quality. In line with the essay in Chapter 3, this also indicates that quality is the foundation of competitive strength.

The third contribution is to follow the call for the empirical studies with objective data. This study used longitudinal data, which can be readily available in most service companies, from a major vehicle repair company in the UK. Our analysis complements the findings from previous studies relying on perceptual measures and suggests an approach with objective quantitative data for future studies.

6.1.3 Organizational Mechanisms and Service Agility

Based on the literature on service operations strategy and organization theories, the essay in Chapter 5 investigates the linkage between organizational mechanisms and service agility –the ability to achieve low cost, high quality, speedy and flexible services simultaneously. Specific contributions to the literature are twofold. Firstly, it adds to the literature on service system architecture proposed by Menor et al. (2001) and systematically examines the connection between strategic design choices and agile service strategy. The findings indicate that a company's strategic design choices in terms of organizational mechanisms have a significant impact on its

service operations strategy. Specifically, job enrichment, incentive system and organizational trust directly link to the improvement in service agility. The interactions between structural mechanisms (metaroutines and job enrichment), and contextual mechanisms (incentive system and organizational trust), are positively connected with service agility. The results provide empirical evidence concerning utilizing organizational mechanisms to enact agile organizations.

This study also contributes to the organization theory by shedding light on how organizations could shift from trade-off to agility and the ostensive-performative view of routines set forth by Feldman and Pentland (2003). The findings suggest that companies are able to become both efficient and adaptive by initiating human agency into routines via structural and contextual mechanisms. This is aligned with the organization ambidexterity theory in that organizations can develop a supportive organization context that encourages individuals to achieve conflicting objectives.

6.1.4 Broad Contributions to Service Operations Strategy

This doctoral study seeks to investigate service strategic choices, process and key decision areas. The three essays in this dissertation explicitly combine the literature on combinative capabilities, service operations strategy and organization theory and combine to make broad contributions to the literature. Roth and Menor (2003) proposed an architecture for service operations management by bridging the strategic design choices and strategy execution tactics. By bringing in organizational theories, this study empirically analysed the impacts of key structural and infrastructure choices in service delivery systems. Besides strategic decision choices, this study built on the combinative capability literature and examined the execution of service delivery systems through the set of competitive capability choices. The strategic design choices can be considered as a function of the set of competitive capabilities

companies select, which decides the performance of service delivery system. The findings of this study provide insights into connections among the strategic design choices and competitive capabilities and shed light on the architecture of service delivery systems.

By explicitly focusing on the key competitive capabilities – quality, delivery, cost and flexibility – a second broad contribution of this study is a more profound understanding of service agility. The empirical analyses have identified the significant positive influence of agile strategy on business performance. The findings provide insights on the potential impact of volume flexibility on other established capabilities for companies aiming to build service agility along the sequence suggested in the "sand cone" model. In addition, this study identified the organizational mechanisms that link to service agility to shed light on the improvement of agility.

6.2 Managerial Implication

Whilst focused or "all-round" operations strategies have been the emphasis of previous studies, a further understanding of all potential strategic choices may be required to provide insights for companies to implement service operations strategy in line with their resource profiles. Based upon the individual investigations, this study provides the following managerial implications for service companies.

Firstly, service companies have more strategic choices than being focused or agile in driving business performance. The findings indicate that strategies with two or three capabilities are positively related to business performance. This suggests that service companies are able to choose strategies that require the assets and deployment aligned with companies' resource situations. This is by no means to

suggest, however, that service companies should stick to their resource limitations without striving for the improvement of other capabilities.

Secondly, it is important for operations managers in service companies to be aware of the potential impact of acquiring additional capability on the established capabilities even though they follow the sequence suggested by the "sand cone" model. The analyses suggest that the establishment of volume flexibility does affect service levels of cost and delivery due to the resource limitation. Service companies, therefore, should monitor and assess the negative influence on their existing capabilities while building new capability to avoid unintended consequences.

Thirdly, various organizational mechanisms may be used by service companies to improve their agility levels. Apart from better utilizing and deploying resources to improve competitive capabilities, service companies can rely on establishing structural mechanisms, such as metaroutine and job enrichment, and contextual mechanisms, such as organizational trust and incentive systems, to become more agile.

6.3 Limitation and Suggestion for Future Research

Whilst this study makes contributions to the existing literature, there are important limitations with regards to which this study has managed to achieve in terms of exploring service operations strategy from the perspectives of combinative capabilities. For example, the literature has suggested that some competitive capabilities, such as flexibility, are multi-dimensional. Although we used multiple items to measure capabilities in the survey, we did not identify each sub-dimension of capabilities and examine the associated strategic choices.

The nature of the empirical methodologies carried out in this study helps the generalizability of the findings. However, methodological limitations are inherent in the survey data. Firstly, the potential respondent bias may be introduced with single respondents and self-reporting survey data, even though the objective measure for the dependent variable, profit margin, can reduce the magnitude of the bias. Secondly, single country and industry research context, as well as the relatively small sample size, limit the statistical power and the generalizability. Thirdly, the snapshot survey based studies do not allow us to examine the dynamic relationships among organizational mechanisms, service operations strategy and business performance.

Many opportunities remain for investigating service operations strategy. This study examined service operations strategy from a combinative capability perspective. Since the accumulation of multiple capabilities is an organizational learning process associated with increasing operational know-how and reducing operational variability, future research may explore this area in a longitudinal way to discover the learning process and service operations strategy with dynamic competitive capabilities.

A second direction for future research is to examine service operations strategy for different types of service companies. Although there are commonalities in the service sector, the literature has suggested that service companies can be classified into various groups based on dimensions such as the degree of customer contact level and labour intensity. Different types of service companies may face different expectations from their customers, and therefore, require different focus in their service operations strategies. Research on service operations strategy for each type of service companies can provide rich insights and implications for service theories and practice.

Finally, this study investigated the strategic design choices in terms of structural and infrastructural decisions. Future studies may explore the integration decisions as suggested in the service delivery systems architecture (Roth and Menor 2003), in particular, the integration with upstream and downstream service users along the service supply chain. The fit between internal and external strategic choices and knowledge transfer along the service supply chain remain interesting areas to explore.

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APPENDICES

APPENDIX 1

THE "AGILITY IN UK SERVICES" SURVEY

The main objectives of the research are to understand how agile organisations are in the UK, what conditions favour or hinder the ability to be agile and what mechanisms and practices help organisations to become more agile.

YOUR CONTACT DETAILS

1. Your name (optional):
2. Job title:
3. Address:
4. e-mail:

GENERAL CHARACTERISTICS OF YOUR ORGANISATION AND OF ITS MARKET

5. Organisation Name:
6. Industry sector:
7. Location of headquarters (country):
8. Main geographical markets (country/region):
9. Number of branches/offices/sites: ☐<10 ☐10-50 ☐51-100 ☐101-500 ☐>500
10. Number of employees: ☐<100 ☐100-500 ☐501-1,000 ☐1,001-5,000 ☐>5,000
11. Turnover (million £): ☐<10 ☐10–50 ☐51–100 ☐101–500 ☐>500
12. If your organisation is a subsidiary of a larger organisation, are you answering this questionnaire as a representative of: ☐ The subsidiary ☐ The parent organisation

PLEASE DESCRIBE THE CHARACTERISTICS OF YOUR BUSINESS ENVIRONMENT BY SELECTING THE CLOSEST SCORE FOR THE FOLLOWING STATEMENTS

13. To what extent do you agree with the following statements:

	Strongly agree 1	2	3	4	5	6	7 Strongly disagree
Demand for our products/services is highly predictable	☐	☐	☐	☐	☐	☐	☐
Upswings and downswings of demand change very rapidly	☐	☐	☐	☐	☐	☐	☐
Rate of product/service innovation in our sector is highly predictable	☐	☐	☐	☐	☐	☐	☐
Rate of product/service innovation in our sector is very rapid	☐	☐	☐	☐	☐	☐	☐
Rate of innovation in operating processes/systems in our sector is highly predictable	☐	☐	☐	☐	☐	☐	☐
Rate of innovation in operating processes/systems in our sector is very rapid	☐	☐	☐	☐	☐	☐	☐
Change of the tastes and preferences of customers in our sector is predictable	☐	☐	☐	☐	☐	☐	☐
Change of the tastes and preferences of customers in our sector is very rapid	☐	☐	☐	☐	☐	☐	☐

14. To what extent do you agree with the following statements:

	Strongly agree 1	2	3	4	5	6	7 Strongly disagree
Our customers are sensitive to product/services quality	☐	☐	☐	☐	☐	☐	☐
Our customers are sensitive to products/services delivery	☐	☐	☐	☐	☐	☐	☐
Our customers are sensitive to products/services cost (price)	☐	☐	☐	☐	☐	☐	☐
Our customers are sensitive to products/service flexibility	☐	☐	☐	☐	☐	☐	☐

PLEASE DESCRIBE THE PERFORMANCE OF YOUR ORGANISATION BY SELECTING THE CLOSEST SCORE FOR THE FOLLOWING STATEMENTS

15. Please indicate your current position on the following relative to your closest competitor/peer organisations:

	Significantly lower	1	2	3	4	5	6	7	Significantly higher
Customer satisfaction		☐	☐	☐	☐	☐	☐	☐	

16. What was your organisation's profit margin (before taxes) for the most recent fiscal year?

☐ <-15% ☐ [-15%, -5%] ☐ [-5%, 5%] ☐ [5%, 15%] ☐ >15%

PLEASE DESCRIBE THE PRACTICE OF YOUR ORGANISATION BY SELECTING THE CLOSEST SCORE FOR THE FOLLOWING STATEMENTS

17. Please rate your organisation's current competitive strengths relative to its competitor/peer organisations on:

	Very weak	1	2	3	4	5	6	7	Very strong
Courteous service		☐	☐	☐	☐	☐	☐	☐	
Consistency (reliability)		☐	☐	☐	☐	☐	☐	☐	
Customer perceived quality		☐	☐	☐	☐	☐	☐	☐	
Accurate information (credibility)		☐	☐	☐	☐	☐	☐	☐	
Empathy		☐	☐	☐	☐	☐	☐	☐	
Timely information (customer responsiveness)		☐	☐	☐	☐	☐	☐	☐	
Conformance		☐	☐	☐	☐	☐	☐	☐	
Delivery speed		☐	☐	☐	☐	☐	☐	☐	
Convenient services		☐	☐	☐	☐	☐	☐	☐	
On-time delivery		☐	☐	☐	☐	☐	☐	☐	
Handling customer complaints		☐	☐	☐	☐	☐	☐	☐	
Cost		☐	☐	☐	☐	☐	☐	☐	
Production/service system responsiveness		☐	☐	☐	☐	☐	☐	☐	
New service/product introduction speed		☐	☐	☐	☐	☐	☐	☐	
Rapid staffing changes		☐	☐	☐	☐	☐	☐	☐	
Customisation of products/services		☐	☐	☐	☐	☐	☐	☐	

PLEASE DESCRIBE THE CHARACTERISTICS OF YOUR ORGANISATION BY SELECTING THE CLOSEST SCORE FOR THE FOLLOWING STATEMENTS

18. How would you compare the following descriptions with the situation in your organisation:

	Exactly the same	1	2	3	4	5	6	7	Exactly the opposite
Any change on existing practices has to follow predefined and standardised procedures		☐	☐	☐	☐	☐	☐	☐	
Any establishment of new practices has to follow predefined and standardised procedures		☐	☐	☐	☐	☐	☐	☐	
Problem-solving process is standardised into sequential procedures		☐	☐	☐	☐	☐	☐	☐	

19. To what extent do you agree with the following statements:

	Strongly agree	1	2	3	4	5	6	7	Strongly disagree
Employees have many opportunities to use various and complex skills		☐	☐	☐	☐	☐	☐	☐	
It is up to employees how the problems should be solved		☐	☐	☐	☐	☐	☐	☐	

20. How would you rate the reward system used in your organisation:

	Not at all	1	2	3	4	5	6	7	Very effectively
It engages all or most of the members		☐	☐	☐	☐	☐	☐	☐	
It pays out only when the improvement occurs		☐	☐	☐	☐	☐	☐	☐	
Its effectiveness is measurable		☐	☐	☐	☐	☐	☐	☐	
It is dynamic in that it changes as business needs change		☐	☐	☐	☐	☐	☐	☐	

21. To what extent do you agree with the following statements:

	Strongly agree	1	2	3	4	5	6	7	Strongly disagree
Supervisors and employees have a sharing relationship, they freely share ideas, feelings, and hopes about the work they do		☐	☐	☐	☐	☐	☐	☐	
If employees share their problems with their supervisors, they know their supervisors would respond constructively and caringly		☐	☐	☐	☐	☐	☐	☐	
Both employees and supervisors would feel a sense of loss if they could no longer work together		☐	☐	☐	☐	☐	☐	☐	
Supervisors and employees made considerable emotional investments in their working relationship		☐	☐	☐	☐	☐	☐	☐	

APPENDIX 2

DETAILED MODEL RESULTS OF CHAPTER 3

Table 3.8 Q–D–C–F Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.65*	1.95	6.15***	17.06	6.00***	17.50
Q–D–C–F			0.47***	3.14			0.48***	3.11
Turnover	-0.48**	-2.50	-0.47**	-2.60	-0.02	-0.10	-0.01	-0.05
Branches	0.01	0.09	0.03	0.20	-0.18	-1.12	-0.18	-1.18
Employees	0.49**	2.56	0.53***	2.96	-0.10	-0.48	-0.06	-0.34
F value	2.50		4.63		2.10		4.33	
Pr>F	0.07		0.00		0.11		0.00	
R^2	0.12		0.26		0.10		0.25	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.9 Q–D–C Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.67**	2.04	6.15***	17.06	5.99***	17.64
Q–D–C			0.47***	3.19			0.48***	3.10
Turnover	-0.48**	-2.50	-0.48***	-2.70	-0.02	-0.10	-0.02	-0.11
Branches	0.01	0.09	0.02	0.14	-0.18	-1.12	-0.18	-1.17
Employees	0.49**	2.56	0.54***	3.04	-0.10	-0.48	-0.04	-0.24
F value	2.50		4.73		2.10		4.23	
Pr>F	0.07		0.00		0.11		0.00	
R^2	0.12		0.26		0.10		0.24	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.10 Q–D–F Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.65*	1.96	6.15***	17.06	6.00***	17.61
Q–D–F			0.48***	3.20			0.49***	3.22
Turnover	-0.48**	-2.50	-0.46**	-2.59	-0.02	-0.10	-0.004	-0.03
Branches	0.01	0.09	0.03	0.21	-0.18	-1.12	-0.18	-1.18
Employees	0.49**	2.56	0.52***	2.94	-0.10	-0.48	-0.07	-0.37
F value	2.50		4.73		2.10		4.53	
Pr>F	0.07		0.00		0.11		0.00	
R^2	0.12		0.26		0.10		0.25	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.11 Q–C–F Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.65*	1.95	6.15***	17.06	6.00***	17.44
Q–C–F			0.47***	3.07			0.48***	3.02
Turnover	-0.48**	-2.50	-0.46**	-2.55	-0.02	-0.10	-0.0002	0.00
Branches	0.01	0.09	0.04	0.24	-0.18	-1.12	-0.18	-1.13
Employees	0.49**	2.56	0.51***	2.87	-0.10	-0.48	-0.08	-0.42
F value	2.50		4.51		2.10		4.18	
Pr>F	0.07		0.00		0.11		0.01	
R^2	0.12		0.25		0.10		0.24	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.12 D–C–F Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.65*	1.90	6.15***	17.06	6.00***	17.00
D–C–F			0.42**	2.58			0.44**	2.59
Turnover	-0.48**	-2.50	-0.48**	-2.61	-0.02	-0.10	-0.02	-0.12
Branches	0.01	0.09	0.01	0.04	-0.18	-1.12	-0.21	-1.31
Employees	0.49**	2.56	0.56***	3.02	-0.10	-0.48	-0.03	-0.17
F value	2.50		3.71		2.10		3.49	
Pr>F	0.07		0.01		0.11		0.01	
R^2	0.12		0.22		0.10		0.21	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.13 Q–D Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.67**	2.03	6.15***	17.06	5.99***	17.52
Q–D			0.43***	2.88			0.46***	2.99
Turnover	-0.48**	-2.50	-0.49**	-2.75	-0.02	-0.10	-0.04	-0.21
Branches	0.01	0.09	0.01	-0.04	-0.18	-1.12	-0.21	-1.34
Employees	0.49**	2.56	0.57***	3.15	-0.10	-0.48	-0.01	-0.03
F value	2.50		4.20		2.10		4.03	
Pr>F	0.07		0.01		0.11		0.01	
R^2	0.12		0.24		0.10		0.23	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.14 Q–C Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.71**	2.09	6.15***	17.06	6.08***	16.76
Q–C			0.42**	2.38			0.23	1.25
Turnover	-0.48**	-2.50	-0.50***	-2.71	-0.02	-0.10	-0.03	-0.16
Branches	0.01	0.09	0.05	-0.33	-0.18	-1.12	-0.16	-0.99
Employees	0.49**	2.56	0.52***	2.85	-0.10	-0.48	-0.08	-0.39
F value	2.50		3.45		2.10		1.98	
Pr>F	0.07		0.01		0.11		0.11	
R^2	0.12		0.20		0.10		0.13	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.15 Q–F Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.67*	1.92	6.15***	17.06	5.99***	16.93
Q–F			0.33**	2.04			0.43**	2.59
Turnover	-0.48**	-2.50	-0.44**	-2.32	-0.02	-0.10	0.03	0.16
Branches	0.01	0.09	0.01	-0.07	-0.18	-1.12	-0.21	-1.30
Employees	0.49**	2.56	0.50***	2.70	-0.10	-0.48	-0.08	-0.44
F value	2.50		3.01		2.10		3.51	
Pr>F	0.07		0.03		0.11		0.01	
R^2	0.12		0.18		0.10		0.21	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.16 D–C Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.71**	2.07	6.15***	17.06	6.09***	16.70
D–C			0.39**	2.20			0.22	1.15
Turnover	-0.48**	-2.50	-0.51***	-2.74	-0.02	-0.10	-0.04	-0.19
Branches	0.01	0.09	0.03	-0.22	-0.18	-1.12	-0.17	-1.06
Employees	0.49**	2.56	0.54***	2.94	-0.10	-0.48	-0.06	-0.32
F value	2.50		3.22		2.10		1.19	
Pr>F	0.07		0.02		0.11		0.12	
R^2	0.12		0.19		0.10		0.12	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.17 D–F Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.66*	1.90	6.15***	17.06	5.98***	16.92
D–F			0.36**	2.09			0.45	2.65
Turnover	-0.48**	-2.50	-0.45**	-2.39	-0.02	-0.10	0.02	0.09
Branches	0.01	0.09	0.001	0.01	-0.18	-1.12	-0.22	-1.37
Employees	0.49**	2.56	0.52***	2.80	-0.10	-0.48	-0.06	-0.31
F value	2.50		3.07		2.10		3.58	
Pr>F	0.07		0.02		0.11		0.01	
R^2	0.12		0.19		0.10		0.21	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.18 C–F Strategy and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.70*	1.97	6.15***	17.06	6.08***	16.43
C–F			0.32	1.65			0.25	1.24
Turnover	-0.48**	-2.50	-0.47**	-2.46	-0.02	-0.10	-0.01	-0.06
Branches	0.01	0.09	0.03	0.17	-0.18	-1.12	-0.19	-1.13
Employees	0.49**	2.56	0.51***	2.71	-0.10	-0.48	-0.08	-0.42
F value	2.50		2.60		2.10		2.05	
Pr>F	0.07		0.05		0.11		0.10	
R^2	0.12		0.16		0.10		0.13	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.19 Quality and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	-1.33*	-1.82	6.15***	17.06	3.93***	5.20
Quality			0.39***	3.29			0.40***	3.27
Turnover	-0.48**	-2.50	-0.46**	-2.62	-0.02	-0.10	-0.003	-0.02
Branches	0.01	0.09	0.03	0.23	-0.18	-1.12	-0.16	-1.08
Employees	0.49**	2.56	0.51***	2.89	-0.10	-0.48	-0.08	-0.42
F value	2.50		4.92		2.10		4.53	
Pr>F	0.07		0.002		0.11		0.003	
R^2	0.12		0.27		0.10		0.25	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.20 Delivery and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	-1.01	-1.39	6.15***	17.06	4.18***	5.60
Delivery			0.33***	2.84			0.35***	2.95
Turnover	-0.48**	-2.50	-0.50***	-2.75	-0.02	-0.10	-0.04	-0.22
Branches	0.01	0.09	-0.01	-0.05	-0.18	-1.12	-0.21	-1.35
Employees	0.49**	2.56	0.57***	3.16	-0.10	-0.48	-0.003	-0.02
F value	2.50		4.13		2.10		3.98	
Pr>F	0.07		0.01		0.11		0.01	
R^2	0.12		0.23		0.10		0.23	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.21 Cost and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	0.14	0.23	6.15***	17.06	4.29***	9.60
Cost			0.14	1.23			-0.03	-0.26
Turnover	-0.48**	-2.50	-0.50**	-2.62	-0.02	-0.10	-0.02	-0.08
Branches	0.01	0.09	0.04	0.25	-0.18	-1.12	-0.19	-1.13
Employees	0.49**	2.56	0.51***	2.69	-0.10	-0.48	-0.10	-0.05
F value	2.50		2.34		2.10		1.56	
Pr>F	0.07		0.07		0.11		0.20	
R^2	0.12		0.15		0.10		0.10	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.22 Flexibility and Business Performance (n=59)

Variables	Profit Margin				Customer Satisfaction			
	Base Model		Main Effect Model		Base Model		Main Effect Model	
	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.	Coeff.	t-stats.
Intercept	0.83**	2.38	-0.19	-0.25	6.15***	17.06	4.68***	6.21
Flexibility			0.20	1.50			0.29**	2.20
Turnover	-0.48**	-2.50	-0.44**	-2.30	-0.02	-0.10	0.03	0.16
Branches	0.01	0.09	0.01	0.04	-0.18	-1.12	-2.21	-1.32
Employees	0.49**	2.56	0.50**	2.63	-0.10	-0.48	-0.09	-0.45
F value	2.50		2.46		2.10		2.98	
Pr>F	0.07		0.06		0.11		0.03	
R^2	0.12		0.16		0.10		0.18	

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.24 Q–D–C–F Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
Q–D–C–F	Predictability	-0.05	-0.36	-0.04	-0.34
	Volatility	-0.15	-1.25	-0.14	-1.23
	Customer	0.23**	2.08	0.23**	2.09
Performance	Q–D–C–F	0.39***	3.35	0.41***	3.34
	Turnover	-0.46***	-5.36	-0.01	-0.07
	Branches	0.03	0.28	-0.17*	-1.67
	Employees	0.52***	5.89	-0.06	-0.71

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.25 Q–D–C Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
Q–D–C	Predictability	-0.05	-0.37	-0.05	-0.43
	Volatility	-0.17	-1.42	-0.18	-1.53
	Customer	0.22**	2.06	0.23**	2.12
Performance	Q–D–C	0.39***	3.34	0.39***	3.33
	Turnover	-0.46***	-5.34	0.003	0.03
	Branches	0.04	0.35	-0.16	-1.55
	Employees	0.50***	5.79	-0.09	-0.96

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.26 Q–D–F Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
Q–D–F	Predictability	-0.05	-0.37	-0.04	-0.36
	Volatility	-0.16	-1.35	-0.15	-1.27
	Customer	0.22**	2.07	0.23**	2.10
Performance	Q–D–F	0.39***	3.38	0.41***	3.41
	Turnover	-0.46***	-5.34	-0.004	-0.05
	Branches	0.03	0.76	-0.17*	-1.67
	Employees	0.51***	5.84	-0.07	-0.73

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.27 Q–C–F Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
Q–C–F	Predictability	-0.05	-0.36	-0.05	-0.36
	Volatility	-0.17	-1.42	-0.16	-1.40
	Customer	0.22**	2.02	0.22**	2.05
Performance	Q–C–F	0.39***	3.23	0.40***	3.20
	Turnover	-0.46***	-5.36	-0.003	-0.03
	Branches	-0.04	0.35	-0.16	-1.60
	Employees	0.51***	5.81	-0.08	-0.84

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.28 D–C–F Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
D–C–F	Predictability	-0.04	-0.32	-0.03	-0.27
	Volatility	-0.50	-0.41	-0.05	-0.44
	Customer	0.24**	2.11	0.25**	2.30
Performance	D–C–F	0.36***	2.58	0.39***	2.63
	Turnover	-0.47***	-5.28	-0.01	-0.08
	Branches	-0.002	-0.02	-0.20*	-1.91
	Employees	0.54***	6.01	-0.04	-0.44

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.29 Q–D Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
Q–D	Predictability	-0.05	-0.43	-0.06	-0.50
	Volatility	-0.20*	-1.83	-0.19	-1.69
	Customer	0.23**	2.17	0.23**	2.15
Performance	Q–D	0.31***	2.68	0.40***	2.79
	Turnover	-0.45***	-5.18	0.005	0.06
	Branches	0.06	0.60	-0.15	-1.41
	Employees	0.47***	5.38	-0.10	-1.11

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.30 Q–C Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
Q–C	Predictability	-0.07	-0.54	-0.16	-1.64
	Volatility	-0.16	-1.43	-0.08	-0.98
	Customer	0.23**	2.16	0.15*	1.79
Performance	Q–C	0.27*	1.79	0.02	0.12
	Turnover	-0.46***	-5.29	0.05	0.64
	Branches	0.03	0.29	-0.19**	-2.01
	Employees	0.51***	5.84	-0.10	-1.20

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.31 Q–F Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
Q–F	Predictability	-0.03	-0.26	-0.06	-0.53
	Volatility	-0.18	-1.50	-0.11	-0.98
	Customer	0.18*	1.68	0.29***	2.87
Performance	Q–F	0.36**	2.73	0.45***	2.96
	Turnover	-0.48***	-5.56	0.03	0.32
	Branches	0.05	0.46	-0.19*	-1.85
	Employees	0.51***	5.91	-0.08	-0.91

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.32 D–C Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
D–C	Predictability	-0.03	-0.23	-0.14	-1.31
	Volatility	-0.04	-0.27	0.05	0.48
	Customer	0.17	1.42	0.09	0.96
Performance	D–C	0.30*	1.69	0.01	0.05
	Turnover	-0.50***	-5.62	0.01	0.07
	Branches	-0.01	-0.12	-0.26***	-2.72
	Employees	0.57***	6.44	-0.02	-0.20

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.33 D–F Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
D–F	Predictability	-0.07	-0.87	-0.07	-0.86
	Volatility	-0.02	-0.32	-0.02	-0.30
	Customer	0.25**	2.23	0.27**	2.55
Performance	D–F	0.19	1.19	0.37***	2.17
	Turnover	-0.45***	-4.80	0.03	0.35
	Branches	0.01	0.07	-0.20*	-1.87
	Employees	0.49***	5.18	-0.09	-0.90

Note: significance *p<0.10, **p<0.05, ***p<0.01

Table 3.34 C–F Strategy and Environmental Variables (n=59)

		Profit Margin		Customer Satisfaction	
Outcomes	**Predictor**	**Parameter Estimates**	**C.R.**	**Parameter Estimates**	**C.R.**
C–F	Predictability	-0.04	-0.76	-0.02	-0.31
	Volatility	-0.01	-0.24	0.002	0.20
	Customer	0.12	1.03	0.03	0.32
Performance	C–F	0.27	1.21	0.55	1.25
	Turnover	-0.45***	-4.78	0.08	0.85
	Branches	0.004	0.04	-0.21**	-2.06
	Employees	0.50***	5.24	-0.10	-1.10

Note: significance *p<0.10, **p<0.05, ***p<0.01