An investigation into IS-enabled sustained improved competitive positioning

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An Investigation Into IS-Enabled Sustained Improved

Competitive Positioning

By

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ABSTRACT

It has long been argued that organisations have struggled to achieve business benefits, and in particular sustained competitive advantage, from their information system (IS) investments. Recently, calls have been made to apply resource based theory to the field of IS research, to better understand how improved competitive positioning can be derived from information systems in general, and through the application of information systems capabilities in particular. However, such research is predicated upon finding effective ways to actually measure improved competitive positioning, an issue that has caused a significant amount of debate within the literature. This study attempts to fill these gaps by constructing an IS-enabled sustainability framework. The framework is used to explore the relationship between the application of IS capabilities, during the introduction of an IS-enhancement, and the extent to which an improvement in competitive positioning is attained and sustained, as measured at the process level. Moreover, the framework is used to investigate how the resultant levels of improved competitive positioning might be influenced by the extent to which the improved competitive positioning is directly or indirectly derived from an IS-enhancement's introduction.

The study adopted a mixed method approach, combining the complementary features of quantitative and qualitative data collection. A total of 839 questionnaires were successfully mailed to practicing managers via email, and 109 valid responses were ultimately received. Based upon a thorough statistical analysis of this data, it was possible to empirically explore all of the key elements of the IS-enabled sustainability framework. The survey was followed by 36 in-depth interviews with respondents who had previously completed the electronic questionnaire. The interviews allowed the provisional relationships established from the statistical analyses to be further validated, and explored more deeply, to provide important new insights into their meaning and implications.

The research presents important new empirical evidence that the attainment of improved competitive positioning, and especially sustained improved competitive positioning, from the implementation of information systems, is predicated upon the host organisation's ability to effectively apply a portfolio of IS capabilities throughout the development process. Furthermore, the study demonstrates that the sustainability of improved competitive positioning is most common in instances where the competitive advantage has been derived indirectly through the interaction of the information system with complementary organisational resources and capabilities. It is envisaged that by providing a clearer explanation of the mechanism by which improved competitive positioning is attained and then sustained, organisations should be far better placed to realise value from their IS investments.

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Introduction

1.1 Background Research Problem

The field of strategic management has long sought to better understand the sources of sustained competitive advantage and there is a significant body of research focused on this objective (e.g. Porter, 1980, 1985; Reed and DeFillippi, 1990; Barney, 1991; Oliver, 1997; Hoffman, 2000; Rasoava et al. 2003). A variety of factors is shown to have an impact on the ability of firms to obtain sustained competitive advantage, including the relative cost position of a firm (Porter, 1980), a firm's ability to differentiate its products (Caves and Williamson, 1985; Porter, 1980), and the ability of firms to cooperate in strategic alliances (Kogut, 1988). However, as the field of strategic management has expanded, strategy researchers and practitioners have shown an increasing interest in the role that information systems (IS) can play in creating, and then sustaining, a competitive advantage and sustained competitive advantages (e.g. Clemons, 1986; Clemons and Row, 1987, 1991; Feeny and Ives, 1990; Sabherwal and King, 1991; Barney, 1991; Kettinger et al. 1994; Mata et al. 1995; Powell and Dent-Micallef, 1997; Atkins, 1998; Hidding, 2001; Dehing and Stratopoulos, 2003; Griffiths and Finlay, 2004; Peppard and Ward, 2004). Although a significant amount of work has been conducted, a great deal of interest still remains among academics and practitioners as to how individual organisations can enhance their investment in IS to gain a competitive advantage, and in particular a sustained competitive advantage.

Much of the recent research investigating how firms can enhance their investments in IS to gain sustainable competitive advantage has focused on the resource-based view (c.f. Bharadwaj, 2000; Feeny and Willcocks, 1998; Powell and Dent-Micallef, 1997). Adopted from the strategic management literature, the resource-based view posits that firms compete on the basis of heterogeneously distributed, *'unique'* resources that are

valuable, rare, difficult to imitate, and non-substitutable by other resources. It is this heterogeneity that is perceived to be responsible for the observed variability in financial returns across firms (Barney, 1991; Mahoney and Pandian, 1992; Peteraf, 1993). However, in adopting a resource-based view of information systems, researchers have argued that as it is relatively easy for competitors to understand and copy each others' information systems, then it is unlikely that such investments will, *per se*, deliver any advantage that is sustainable. Rather, it has been suggested that it is through the application of unique IS capabilities that organisations are able to make their IS investments more likely to deliver a sustainable competitive advantage (Feeny and Willcocks, 1998). Indeed, there is a growing recognition (Wade and Hulland, 2004) that a sustainable competitive advantage might be derived through the introduction of IS that have been developed, or enhanced, through the application of valuable and/or rare capabilities. Although IS capabilities have already been much discussed within the IS literature, a disproportionate share of this existing work has focused primarily or exclusively on inwardly facing capabilities. Moreover, although these studies (e.g. Bharadwaj et al. 1998) have examined how IS capabilities can potentially create competitive advantages for firms, very few studies have explicitly looked at how any resultant advantage can be sustained over time, and very few studies have been of an empirical nature (Willcocks et al., 1997; Wade and Hulland, 2004).

It is also recognised that IS don't always act directly in creating or sustaining competitive advantage (Clemons and Row, 1991; Powell and Dent-Micallef, 1997), as they can also act in conjunction with other organisational resources/capabilities to provide strategic benefits (Ravichandran and Lertwongsatien, 2002). This is often referred to as resource complementarity. Although resource complementarity has been recognised within the field of IS research, few empirical findings have been forthcoming to inform the debate as to whether the sustainability of a competitive advantage is primarily derived directly from the enhanced IS, or indirectly through complementary firm resources/capabilities. Thus, further empirical research in this increasingly important domain, is clearly warranted (Wade and Hulland 2004).

The dependent variable in IS research has also been a point of significant debate (e.g. Delone and McLean, 1992; Seddon, 1997). Many dependent variables are used in IS

research and it is often difficult to relate one set of findings to another. Different dependent variables have been used to measure the competitive impacts of IS, most of which have been at an organisational level (e.g. Huselid et al., 1997; Barnet et al. 1994; Markides and Williamson, 1994; Robins and Wiersema, 1995; Bharadwaj, 2000). These approaches however have focused on what are in fact highly aggregated dependent variables which can lead to very misleading conclusions with regard to resource-based theory (Ray et al. 2004) and may be overly restrictive, particularly in the case of IS that affect the organisation at many levels. It is recognised that organisational performance is affected by a multitude of factors; thus, the use of a single organisational-level dependent variable may not capture the broader context (Ray et al. 2001). For example, an organisation may have generated a competitive advantage in some business processes, but various stakeholders may have appropriated the profits from that competitive advantage before it can affect the organisation's overall performance. Alternatively, a business may experience an improved competitive position in one process that is offset by an increased competitive disadvantage in another process, with organisational performance remaining unchanged. For this reason any further research focusing upon competitive positioning and sustained improved competitive positioning must seek to find more effective and reliable ways of measuring the impacts of IS.

Based on the above discussion, a framework that identifies potential avenues to derive improved competitive positioning from an IS investment is clearly warranted. Using Wade and Hulland's (2004) typology, this study attempts to investigate the potential of a range of IS capabilities to confer both improved competitive positioning and sustained improved competitive positioning. Furthermore, this study compares and contrasts the direct impacts of the IS-enhancement with the indirect impacts of the IS-enhancement through complementary organisational resources/capabilities. This work thus contributes to the debate as to whether the sustainability of a competitive advantage is derived directly from the enhanced IS or indirectly through complementary firm resources/capabilities. Finally, a business process typology, to facilitate the measurement of improved competitive positioning and sustained improved competitive positioning is developed, to avoid the problems associated with measuring competitive impacts at the organisational level.

1.2 Objective of The Study

The primary motivation for conducting this study is to provide important new empirical insights with respect to how a wide range of IS capabilities, when applied within the enactment of systems development, might facilitate the attainment, and sustainment, of improved competitive positioning. A thorough review of the existing literature enabled this one broad objective to be decomposed into the following six, distinct research propositions:

- **Proposition 1:** The greater the degree to which the success of the host organisation's IS-enhancement is dependent upon IS capabilities, the greater will be the resulting degree of improved competitive position.

- **Proposition 2:** Outside-in and spanning IS capabilities will have a greater impact on improved competitive positioning than inside-out IS capabilities.

- **Proposition 3:** The greater the degree to which the success of the host organisation's IS-enhancement is dependent upon IS capabilities that are non-transparent and non-replicable, the greater will be their resulting degree of sustained improved competitive positioning.

- **Proposition 4:** Outside-in and spanning IS capabilities will have a greater impact on sustained improved competitive positioning than inside-out IS capabilities.

- **Proposition 5:** The degree of improvement in competitive positioning will be greatest in those instances where the indirect contribution of the IS-enhancement is greater than the direct contribution.

- **Proposition 6:** The degree of sustained improved competitive positioning will be greatest in those instances where the indirect contribution of the IS-enhancement is greater than the direct contribution.

1.3   Significance of the Study

Two longstanding concerns within the information literature relate to the unacceptably high levels of IT failures (Kettinger et al. 1994; Clegg et al. 1997), and the extent to which, and how, information systems can deliver value (Brynjolfsson and Hitt, 1996; Kohli and Devaraj, 2003; Melville et al. 2004). Consequently, there is a pressing need for any research that provides new insights into how the systems development process can be made more effective and reliable. It was envisaged that this study would make a number of significant contributions to the literature, as discussed, by empirically exploring the role of IS capabilities in facilitating the delivery of improved competitive positioning from IS investments.

One of the distinctive contributions of this study to the field of IS research applying resource based theory is the development of the IS-enabled sustainability framework. Few attempts have been made to construct a framework that identifies opportunities both for improved competitive positioning and sustained improved competitive positioning from an IS investment. By constructing the IS-enabled sustainability framework this study fills this gap within the literature.

Secondly, the study has expanded on previous work, representing a first empirical attempt to investigate the IS capability typology presented by Wade and Hulland (2004). In so doing, this study attempts to provide a more balanced review of IS capabilities, as previous work has tended to focus upon inwardly facing IS capabilities.

Thirdly, although numerous studies have focused on the competitive advantage implications of IS capabilities, few studies have focused on their potential to sustain these advantages over time. There is a clear need to focus more on the sustainability of IS capabilities (Willcocks et al. 1997; Wade and Hulland, 2004). More specifically, this study has applied sustainability attributes, namely non-transparency and non-replicability to IS capabilities, and explored how these might facilitate the sustainability of an improved competitive positioning.

Fourthly, many previous researches have either studied the direct impacts of IS-enhancements (Feeny and Willcocks, 1998) or the indirect impacts of IS-enhancements through complementary organisational resources/capabilities (Clemons and Row, 1991; Henderson and Venkatraman, 1993) for their ability to confer sustained competitive positioning. However, debate still remains as to the primary sources of sustained improved competitive positioning (Wade and Hulland, 2004). This study represents a first attempt to compare and contrast the direct impacts of IS-enhancements with the indirect impacts of IS-enhancements to further our understanding of the sustainability of improved competitive positioning from an IS investment.

Fifthly, many different dependent variables have been used in previous studies to measure the competitive impacts of IS, most of which have been at the organisational level. However, concerns have been raised about using organisational level measures of competitive advantage as they focus on what are in fact highly aggregated dependent variables. Consequently, this study makes an important contribution by developing and validating a set of process-level measures of improved competitive positioning.

1.4   Organisation of the Study

The content of this thesis is organised into ten chapters, as discussed below, and presented graphically, in figure 1.1:

Chapter 1 gives an overview of the thesis, the identification of the research problems, the reasons for undertaking this research and the significance of the study.

Chapter 2 reviews and highlights the gaps within the literature relating to: information systems and sustained competitive advantage, the application of the resource-based theory to IS research, complementarity and measures of competitive advantage.

Chapter 3 investigates these major gaps and identifies how they can be filled. It introduces and defines the research variables, the research propositions and the conceptual framework.

Chapter 4 outlines the research method used in collecting data for analysis, namely the combination of quantitative questionnaires and qualitative interviews. Further, the sampling process and the potential errors that may occur in the study are explored and the strategies used to guard against them are discussed.

Chapter 5 discusses and justifies the content of the questionnaire as well as its refinement through pilot testing.

Chapter 6 provides a descriptive analysis of all the variables about which data has been collected, through the questionnaire.

Chapter 7 discusses the need for summated measures, before reviewing the process by which they have been derived. An in-depth discussion is offered for each of the summated measures ultimately used in the study.

Chapter 8 uses statistical analyses, to provide evidence to help prove or disprove each of the propositions. Moreover, areas of research to be investigated more thoroughly, through the follow up interviews, are also highlighted.

Chapter 9 discusses the process used to compile the interview data, before presenting a qualitative analysis of the qualitative data, which is used to provide validation of, and richer insights into the quantitative findings, as previously identified in chapter 8.

Finally, chapter 10 summarises the study's findings, outlines implications for both research and practice, and qualifies the results within the frame of theoretical and statistical limitations. The study concludes with suggestions for future avenues of research and final thoughts regarding the study.

Chapter 1 Introduction

- Context of the study
- Significance of the study

Chapter 2 Literature review

- The concept of resource based theory
- Key terminology
- Measuring competitive positioning

Chapter 3 Research Framework

- Research objectives
- Research variables
- Research framework

Chapter 4 Research design

- Quantitative survey
- Qualitative survey
- Sampling process

Chapter 5 Questionnaire design and delivery

- Structure of the questionnaire
- Operationalisation of variables
- Pre-test
- Pilot test
- Main survey

Chapter 6 Descriptive profile of responses

- Descriptive profile of the sample

Chapter 7 Derivation and validation of summated measures

- Quantitative survey
- Creation of new measures

Chapter 8 Testing of the propositions through quantitative analysis

- Using quantitative data to test the research propositions
- Identifying further areas of research to be investigate through the qualitative interviews

Chapter 9 Revisiting the propositions through qualitative review

- Conducting interviews
- An interpretation of the research propositions in light of the qualitative data

Chapter 10 Conclusions

- Reviewing research propositions in light of both quantitative and qualitative findings
- Implications for research and practice
- Limitations and avenues for further research

Figure 1.1: Overview of the research process and corresponding chapters

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Chapter 2

Literature Review

2.1 Introduction

It has long been argued that organisations have struggled to achieve business benefits, and in particular sustained competitive advantage over rivals, from their information system (IS) investments (Clemons and Row, 1991; Galliers et al. 1994; Powell and Dent-Micallef, 1997; Wade and Hulland, 2004). This has resulted in a growing demand for more studies that explicitly explore the nature of competitive advantage from or associated with IS, and how these can be best attained (Wade and Hulland, 2004; Melville et al. 2004).

The first part of this chapter reviews the literature on IS and competitive advantage, concluding that IS in and of themselves are unlikely to be the sole source of sustained competitive advantage (Clemons and Row, 1991; Kettinger et al. 1994; Powell and Dent-Micallef, 1997; Peppard and Ward, 2004). Based on this, it is shown that the resource-based view (RBV) provides an ideal theoretical position from which to investigate the sustainability of any competitive advantage that might be realised from IS. The chapter then moves onto discuss the principles behind the RBV and critically reviews how the theory has been applied within the field of IS research, and in so doing highlights areas that warrant further exploration. Finally, the chapter critically reviews the dependent variables used within IS research, highlighting the fact that researchers must be prepared to look beyond conventional measurements of competitive advantage.

2.2   IS enabled sustained competitive advantage

The meaning of competitive advantage and sustained competitive advantage as they have been adopted within the field of IS research, from the strategic management literature, should be reviewed before proceeding to look at the ways in which IS can enable[1] competitive advantage and sustained competitive advantage. Competitive advantage has been defined a number of ways within the IS and strategic management literature, for example:

- *'Potential superiority based on some combination of differentiation, cost superiority, or operating in a particular niche'* (Day, 1984);

- *'Ability to earn returns on investment persistently above the average for the industry'* (Porter, 1985);

- *'Anything that one business does appreciably better than another may be the source of competitive advantage if the business finds some way to base a competitive strategy on its comparative advantage and if customers value the difference offered by this strategy and seek it out'* (Clemons and Kimbrough, 1987);

- When a firm is *'implementing a strategy not simultaneously implemented by many competing firms'* (Mata et al. 1995).

Although the definition of competitive advantage as offered Porter (1985) is more financially oriented than the definitions offered by Day (1984), Clemons and Kimbrough (1987) and Mata et al. (1995), they all share the common underlying theme that competitive advantage refers to some superiority that one business has over its competitors.

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[1] For the purpose of this research the definition of 'enable' as offered by the Oxford English Dictionary *'give means to do something'* is adopted. Thus, when referring to IS enabled, it is looking at how an IS has given the means to attain competitive advantage or sustainable competitive advantage.

As with competitive advantage, a number of definitions of sustained competitive advantage have also been offered within the field of IS and strategic management research, for example:

- A sustained competitive advantage is one that *'continues to exist after efforts to duplicate that advantage have ceased'* (Barney, 1991);

- A firm is said to have a sustainable competitive advantage when it is *'implementing a strategy not simultaneously implemented by many competing firms and where these other firms face significant disadvantages in acquiring the resources necessary to implement this strategy'* (Mata et al. 1995);

- A sustainable competitive advantage is a competitive advantage that endures for a longer period of calendar time (e.g. Jacobsen, 1988; Porter, 1985).

Although the above definitions of sustainable competitive advantage are all different, they all share the common underlying theme that sustainable competitive advantage refers to any superiority that one business has over its competitors that cannot easily be eroded over time.

Most of the research in this area has been done under the banner of competitive advantage and sustained competitive advantage (Clemons and Row, 1991; Dehning and Stratopoulos, 2003; Santhanam and Hartono, 2003; Bharadwaj, 2000; Peppard and Ward, 2004), and therefore previous studies only take into consideration those situations where an organisation gains a clear competitive advantage through being a leader. This study seeks to have a wider currency, by identifying terminology that is applicable to those situations where organisations: narrow the competitive gap with competitors through catching up; go from competitively disadvantaged to competitively advantaged; or increase an already existing competitive advantage. However, whilst in practice the introduction of new IS are likely to change the host organisation's competitive positioning, hopefully for the better, rarely does it confer a clear and outright competitive advantage (Kettinger et al. 1994; Nolan, 1994; Strassman, 1997).

2.3   IS as the source of competitive and sustained advantage

IS were first introduced into business generally to increase efficiency and to reduce costs, through automation of clerical and repetitive tasks, often referred to as the data processing (DP) era (Applegate and Elam, 1992). The early conceptual work (e.g. Benjamin et al. 1984; Cash and Konsynski, 1985; Porter, 1985; Clemons, 1986) argued that if IS are applied in a sophisticated and innovative manner, then they have the potential to alter a wide range of strategic and industry structure variables. With the identification that IS could add value to the firm, a proactive search began in the early 1980's to use IS to alter the basis of competition, with the aim of gaining competitive advantage and sustained competitive advantage (McFarlan, 1984; Porter and Miller, 1985). For example, the case evidence suggests that American Airlines significantly altered industry structure by creating switching costs among reservation agents and erecting IS-based entry barriers. This is now often termed the strategic information systems (SIS) era. In order for a system to be called strategic, it must significantly change business performance through, for example, the means a business employs to attain a strategic goal, the way a corporation does business, the way it competes, or the way is deals with customers or suppliers (Ernst and Chen, 1994).

Theoretical and empirical evidence supports the view that companies implementing an IS are able to gain a competitive advantage over their direct competitors (Bharadwaj, 2000; Stratopoulos and Dehning, 2000; Feeny and Ives, 1990; Mata et al. 1995; McFarlan, 1984; Porter and Miller, 1985), even if that competitive advantage gained is merely through the organisation adopting a new system quicker than their competitors. However, with the notion that most competitive advantage, resulting directly from an IS, is probably only sustainable for a short period of time (Neumann 1994) until competitors can implement similar systems, the following have been suggested as ways of sustaining competitive advantage gained from an IS:

- **Perpetual innovation:** involves continually (incrementally) reinventing IS advantages through continuous, leading-edge IS innovation. By perpetually reinventing IS advantages competitors are always trying to catch up, resulting in a continuous competitive advantage. (Cragg and Finlay, 1991; Powell and Dent-

Micallef, 1997). An example of perpetual innovation can be seen with Tesco's continual development and implementation of innovative IS that outperform the competition; their online shopping and online price check systems are examples.

- **Barriers to imitation**: involve erecting barriers to protect the system from imitation. One such method is to keep the system proprietary through patents or secrecy (Bain, 1956; Porter, 1980). Clearly, if a firm possesses valuable proprietary technology that is giving the organisation an advantage and it can keep it secret, then that firm will obtain a sustained competitive advantage. For example, in 1982, Merrill Lynch received a patent on its CMA, a system designed to improve securities brokerage/cash management activities involving an investor brokerage account, money market or comparable funds, and credit/debit media and/or checking accounts. The importance attributed to the CMA patent by Merrill Lynch is emphasized by the fact that Merrill Lynch took active measures to protect its investment. In 1983, Merrill Lynch won a $1 million settlement from Dean Witter after charging that Dean Witter had infringed the CMA patent (Merrill Lynch, 1983).

- **Create-capture-keep:** (Clemons and Kimbrough, 1986; Clemons and Row, 1987, 1991; Feeny and Ives, 1990). This line of reasoning is predicated upon the principle that switching costs are created when customers make investments that are specific to their suppliers of IS[2]. These investments might include the costs of training employees to use a proprietary technology and the management experience needed to exploit their use (Clemons, 1986; Clemons and Row, 1987). Once these switching costs are created, suppliers can increase the price, reduce the level of service, or in other ways extract value out of their relationships with their *"captured"* customers. As long as the cost of customers switching suppliers is less than the extra value that is being extracted from the relationship by a supplier, customers will continue using the IS from that supplier. An example of this can be seen with United's Apollo computerised reservation system; United captured and

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[2] It must be recognised that although the method of create-capture-keep can enable sustained competitive advantage from an IS, it only applies to organisation that supply IS to their customers.

kept the travel intermediaries locked into their computerised reservation system as the costs of changing to another system outweighed the benefits.

Although in theory the above methods of perpetual innovation, barriers to imitation and create-capture-keep have been proposed as potential ways in which competitive advantage enabled by an IS can be sustained, research has cast doubt on the ability of IS to sustain advantages for their companies. More specifically the idea that perpetual innovation may hypothetically provide sustained advantage has been challenged theoretically on the grounds that:

- Advantages vanish if information either ceases or stumbles;

- It is difficult to keep improving an idea faster than competitors not tied to an older technology;

- Every-shortening IT development life cycles also hinders this theory in reality (Powell and Dent-Micallef, 1997);

- IS can change very rapidly, with the effect that newer, more powerful and cheaper developments might be achieved by followers than by innovators (Clemons, 1986; Cecil and Goldstein, 1990; Senn, 1992).

It has been identified that propriety technology can be protected through patents or secrecy (Porter, 1980), however, IS applications are difficult to patent (Jakes and Yoches, 1989). Moreover, even if they could be patented, there's evidence that patents provide little protection against imitation (Mansfield, 1985), thus indicating it is unlikely that proprietary technology will be a source of sustained competitive advantage (Clemons and Row, 1987; Mata et al. 1995). For example, even if the technology is protected through patents or secrecy the disadvantaged firm can:

- Hire away one or more of the individuals who developed the advantaged firm's application;

- Purchase the application and discover its characteristics through reverse engineering;

- Discover the nature of the application through informal discussions with developers or users;

- Read published reports about the nature of the propriety application and duplicate it.

Finally Klein et al. (1978), supported by Kettinger et al. (1994) identified 3 reasons why the *'create-capture-keep'* approach is unlikely to result in a sustainable competitive advantage from IS:

1. Customers will usually be able to anticipate the risk of being captured by an IS supplier if investments specific to that supplier are made;

2. IS suppliers that do exploit their customer's switching costs often gain a reputation for being untrustworthy;

3. The number of options for customers to obtain IS has increased over time.

For these reasons, some authors have concluded, *'companies that try to lock-in customers may lose them instead'* (Malone et al. 1989; p. 166) and *'it is increasingly difficult, if not downright impossible, for (IT) to bind customers to products'* (Hopper, 1990; p. 123).

As a result the notion that it is becoming increasingly difficult to generate sustainable performance advantages from IS *per se* has received increasing support over the years and has produced a perspective known as the *'strategic necessity hypothesis'* (Floyd and Wooldridge, 1990; Kettinger et al. 1994; Powell and Dent-Micallef, 1997). Powell and Dent-Micallef (1997) view this hypothesis as containing two propositions: *'(1) IT's provide value to the firm by increasing internal and external coordinating efficiencies, and firms that do not adopt them will have higher cost structures and*

therefore competitive disadvantages; and (2) notwithstanding (1), firms cannot expect ITs to produce sustainable advantages because most ITs are readily available to all firms-competitors, buyers, suppliers, and potential new entrants-in competitive factor markets'. Indeed more often than not, the introduction of IS may be a *'strategic necessity'*, to maintain an organisation's current competitive position (Clemons, 1986), or to avoid competitive decline (Powell and Dent-Micallef, 1997).

Although this notion of *'strategic necessity'* is somewhat bleaker than earlier perspectives in its estimate of the sustainability of performance advantages to be derived from IS, the field of IS research has been slow to adopt the resource-based view (RBV) as widely used in the field of strategic management. The resource-based view within the field of IS research adopts the view that in the search for IS-based sources of sustainable competitive advantage, organisations must focus less on *IS per se* and more on the resources/capabilities needed to organise and managing information systems within the firm (Mata et al. 1995; Dehning and Stratopoulos, 2003). The next section explains the principles behind the RBV, followed by a discussion of how it has been applied within the field of IS research.

2.4 The resource based view and sustainable competitive advantage

The origins of the resource-based view lie in the seminal works of Coase, (1937), Penrose, (1959) and Wrigley, (1979). Penrose (1959; p.7) noted that a firm can be viewed as *'a collection of human and physical resources bound together in an administrative framework, the boundaries of which are determined by the area of administrative coordination and authoritative communication'.* However, with the publication of Porter's book, *'Competitive Strategy'* (1985), much of the literature shifted towards external, industry-based competitive issues as a means of competitive advantage. Although Wernerfelt's (1984) seminal article *'A Resource Based View of the Firm'* highlighted that *'both strategy scholars and managers often failed to recognize that a bundle of assets, rather than a particular product market combination chosen for its deployment, lies at the heart of their firm's competitive position'*, it was not until the early nineties that this view began to gain solid support.

The resource-based view (RBV) adopts the position that resources are distributed heterogeneously across organisations whether by history, accident or design (Barney, 1991). Firms that were once thought of as being homogenous are now seen to be differentiated through their possession of difficult-to-imitate resources (Rumelt, 1984). It is this heterogeneous distribution of the resources needed to conceive, choose, and implement strategies that is perceived to be responsible for the observed variability in financial returns and performance across firms (Barney, 1991; Mahoney and Pandian, 1992; Peteraf, 1993). Although firms posses many resources, only a few of them will have the potential to lead the firm to a position of competitive advantage and even fewer to a position of sustained competitive advantage. In order to explore the usefulness of the RBV it is necessary to explore the characteristics that separate regular resources from those that confer a competitive advantage and a sustainable competitive advantage. RBV theorists have approached this question by identifying sets of resource attributes that help the firm attain competitive advantage and those that help attain sustained competitive advantage (e.g. Barney, 1991; Piccoli et al. 2002; Priem and Butler, 2001; Wade and Hulland, 2004). Borrowing from the terminology used by Peteraf (1993) and Wade and Hulland (2004) those resource attributes that help a firm attain competitive advantage are termed '*ex ante*' limits to competition and those that help sustain competitive advantage are termed '*ex post*' limits to competition. Although most previous research using the RBV has blurred these two phases, for the purpose of this research, they will be reviewed separately.

2.4.1 *Ex ante* limits to competition

Ex ante limits to competition can be seen as characteristics that resources must posses in order for them to realise a competitive advantage. Barney (1991) argues that in order for a resource to provide a degree of competitive advantage it must be valuable and rare. Barney (1991) defines resources as valuable when they '*enable a firm to conceive of, or implement strategies that improve its efficiency and effectiveness and when they exploit or neutralize threats in a firm's environment*'. If a resource has little or no value there is a limited possibility of it conferring any competitive advantage to the possessing firm. To take the extreme example as offered by Wade and Hulland (2004) '*the use of a new, innovative paper clip design may set one firm apart from*

others, but it is unlikely the paper clip design would be valuable from a competitive advantage standpoint'. A resource must also be rare, for if it is in plentiful supply it cannot be a source of competitive advantage. Rarity refers to the condition where the resource is not simultaneously available to a large number of firms (Amit and Schoemaker, 1993). For example, an ATM network might have significant value to a bank, but since it is not rare, it is unlikely to confer a strategic benefit. If a firm has valuable and rare resources they can use these resources to implement *'a value creating strategy not simultaneously being implemented by any current or potential competitors'* (Barney, 1991 p; 102).

Wade and Hulland (2004) share Barney's (1991) view that resources must be valuable and rare to create competitive advantage but add in a third factor, the appropriability of a resource's rent-earning-potential. They argue that the advantage created by a rare and valuable resource or by a combination of resources may not be a major benefit if the firm is unable to appropriate the returns accruing from that advantage. An example, offered by Wade and Hulland (2004) is how benefits can be appropriated with technical skills. The potential additional benefits to a firm from hiring employees with rare and valuable technical skills may be appropriated away by the employees through higher than normal wage demands.

2.4.2 *Ex post* limits to competition

Ex post limits to competition mean that subsequent to a firm gaining a superior position and earning rents, there must be forces that limit competition for those rents (Hidding, 2001; Peteraf, 1993). Barney (1991) identified that in order to sustain a competitive advantage, firms must be able to defend that advantage against imitation. For example, the advantage accruing from newly developed features of computer hardware, are typically short-lived since competitors are able to quickly duplicate the technology (Mata et al. 1995). Rumelt (1984) identified that valuable and scarce resources may survive competitive imitation if protected by imitation barriers or isolating mechanisms and he offers the following as a non-exhaustive list of such mechanisms:

(a) Time compression economies – a resource may require accumulation over time through learning, experience, firm specific knowledge or trained proficiency in a skill;

(b) Historical Uniqueness (First mover advantages) – some resources are inherently unique or were originally acquired under non replicable conditions, such as a distinctive location, the co-optation of a slow raw material source, or first-mover advantages such a reputation, brand loyalty, or the power to establish industry standards;

(c) Embeddedness of resources – the value of a resource may be inextricably linked to the presence of another complementary or cospecialized resource. For example, it is claimed that in university departments, research and teaching are inextricably lined: that teaching can't be excellent without research. Thus, a department that seeks to be excellent at teaching will have to undertake research;

(d) Causal ambiguity – the connection between a firm's resource portfolio and its performance may be unclear, such as when a firm's success results from cultural or social phenomena too complex for those outside the organisation to understand or manage. (Dierickx and Cool, 1989; Barney, 1991; Finlay, 2000).

Barney (1991) also identified that a resource must not be substitutable (i.e. other resources cannot fulfil the same function). A resource has low substitutability if there are few, if any, strategically equivalent resources that must themselves be rare and inimitable (Amit and Schoemaker, 1993; Black and Baol, 1994; Collis and Montgomery, 1995). For example, excellence in IS product development may be a resource that can give competitive advantage but if it can be achieved through a number of paths then it is unlikely to be a source of sustained competitive advantage.

Barney (1991) further identified that resources should also be non-transferable if competitive advantage is to be sustained (i.e. they cannot be purchased in resource markets (Dierickx and Cool, 1989)). Competitors will likely try to amass comparable resources once a firm establishes a competitive advantage in order to share in or

nullify that advantage. If firms are able to acquire the resources necessary to imitate a rival's competitive advantage in resource markets, the rival's advantage will be short lived.

Other typologies have been proposed by Amit and Schoemaker (1993), Black and Boal (1994), Collis and Montgomery (1995) and Grant (1991). However, these typologies will not be reviewed individually as although the terms are somewhat different, all attempt to link the heterogeneous, imperfectly mobile and firm-specific resource sets to sustained competitive advantage.

2.4.3 Key terminology used within the resource-based view

Although the RBV stems back to the work of Coase (1937), Penrose (1959) and Wrigley (1970), it has only come to prominence in the last 20 years (Peppard and Ward, 2004). This immaturity has resulted in a lack of precision in the usage of the terms and concepts surrounding the RBV. As Rugman and Verbeke (2002) observe, the exact definitions of key concepts such as *'resources'* and *'capabilities'* have not been agreed upon and are ambiguous and controversial. Priem and Butler (2001) note *'this proliferation of definitions and classifications has been problematic for research using the RBV, as it is often unclear what researchers mean by key terminology'*. For this reason, a review of the definitions used for *'resources'* and *'capabilities'* within the literature, is presented below.

Resources: One of the key challenges RBV theorists have faced is to define what is meant by a *'resource'*. Researchers and practitioners interested in the RBV have used a variety of different terms to talk about firm resources. Resources have been viewed as *'anything, which could be thought of as a strength or weakness of a firm'* (Wernerfelt, 1984). *'Anything'* may include physical resources, human resources and organisational resources; examples of a few of the terms used to talk about resources are skills (Grant, 1991), strategic assets (Amit and Schoemaker, 1993), assets (Ross et al. 1996) and stocks (Capron and Hulland, 1999). With this *'anything'* definition resources are used as a collective term, which also includes capabilities. For example, this view has been adopted by Barney (1991) who identified resources as *'all assets,*

capabilities, organisational processes, firm attributes, information, knowledge, etc controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness'. More recently, Wade and Hulland (2004) defined resources as *'assets and capabilities that are available and useful in detecting and responding to market opportunities or threats'.*

Resources have also been described as *'stocks of available factors that are owned or controlled by the firm'* (Amit and Schoemaker, 1993), *'inputs into the production process'* (Grant, 1991) and 'the organisational capital, physical, and human inputs into the production process' (Beard and Sumner, 2004). In this view, resources are viewed more as the physical assets, and a clear distinction is drawn between capabilities and resources. The following section reviews the definitions used for capabilities by authors adopting this view of resources.

Capabilities: The following examples provide a flavour of the variety of definitions used:

- *'A firm's capacity to deploy resources, usually in combination, using organisational processes, to effect a desired end'* (Amit and Schoemaker, 1993);

- *'Ability to mobilize and deploy IT-based resources in combination or co-present with other resources and capabilities'* (Bharadwaj, 2000);

- *'Ability of an organization to perform a coordinated set of tasks, utilizing organisational resources, for the purpose of achieving a particular end result'* (Helfat and Peteraf, 2003).

The definitions as offered by Amit and Schoemaker (1993), Bharadwaj (2000) and Helfat and Peteraf (2003) all share the underlying theme that capabilities are formed through the ability to deploy and/or combine resources to achieve a particular result.

Makadok (2001) identified two key features that distinguish *'capabilities'* from *'resources'*. Firstly a *'capability'* is *'firm specific since it is embedded in the*

organisation and its processes' meaning if an organisation was dissolved its capabilities would no longer exist, but most of its resources would. Secondly, '*the primary purpose of a capability is to enhance the productivity of the other resources the firm possesses*'. A competitive advantage determined by capabilities thereby differs from a competitive advantage determined by resources, in terms of its imbeddedness within the firm (Henderson and Cockburn, 1994). The process for replication or substitution in competitive firms would also differ in that resources are more likely to be procurable and separable from the firm, while capabilities are more likely to be developed within the firm.

Terminology for resources and capabilities have often been used interchangeably, so until exact definitions of '*resources*' and '*capabilities*' are defined, for the purpose of this chapter, the combined term resource/capability will be used as a generic term which can mean either, or, or both. With an understanding of the key concept surrounding the RBV gained, the next section reviews the literature relating to how the RBV has been applied within the field of IS research.

2.5 The application of the resource based view to IS research

The RBV focuses on firm specific resources e.g. entrepreneurship (Rumelt 1987); culture (Barney 1986) and organisational routines (Nelson and Winter, 1982), to try and identify which firm specific resources have competitive advantage implications. The RBV is also useful in the context of IS research, to provide a robust framework for how effective IS can be developed and sustained. From a conceptual analysis of IS and competitive advantage by Mata et al. (1995), empirically supported by Dehning and Stratopoulos (2003), it was suggested that in search for IS-enabled sources of sustainable competitive advantage, organisations must focus less on IS per se, and more on the process of organising and managing information systems and technology within the firm. Further support for this position is provided by Dvorak et al. (1997) who noted that what distinguishes organisations with high performance IS is not technical wizardry but the way they manage their IS activities. As with the RBV in the strategic management literature, it is recognised that if IS resources/capabilities needed to organise and manage IS are valuable, rare, appropriable and have low

inimitability, substitutability or mobility then they can be sources of both competitive advantage and sustained competitive advantage (Wade and Hulland, 2004). Much of the work attempting to identify IS resources/capabilities needed to manage IS have either focused on a single IS resource/capability or a set of IS resources/capabilities. For example:

- Ross et al. (1996) divided IS into three IT assets, which together with IT processes would contribute to business value. These three IT assets were labelled human assets (e.g. technical skills, business understanding and problem solving orientation), technology assets (e.g. physical assets, technical platforms, databases, architectures, standards) and relationship assets (e.g. partnerships with other divisions, client relationships, top management sponsorship, shared risk and responsibility). IT processes were defined as planning ability, cost effective operations and support, and fast delivery.

- Feeny and Willcocks (1998) identified 9 core IS capabilities within the IS function that need to be developed in order to enable an organisation to acquire, deploy and leverage IS initiatives over time as a basis for sustainable survival and competitive success. These 9 core IS capabilities were organised into four overlapping areas, namely, business and IT vision (integration between IT and other parts of the firm), design of IT architectures (IT development skills), delivery of IS services (implementation, dealing with vendors and customers), and a core set of capabilities which included IS leadership and informed buying.

- Bharadwaj et al. (1998) suggested and subsequently validated a measure of IS capability with the following six dimensions: IT/business partnerships, external IT linkages, business IT strategic thinking, IT business process integration, IT management and IT infrastructure.

The link between IS resources/capabilities and firm performance has been investigated by a number of researchers. Important contributions include:

- Mata et al. (1995) used resource-based arguments to suggest that five key IS drivers: customer switching costs, access to capital, proprietary technology, technical IT skills and management IT skills lead to sustained competitive advantage. Although Mata et al. (1995) concluded that only IT management skills may lead to sustained competitive advantage, they acknowledge that *'there may be other attributes of IT whose competitive implications have not been fully evaluated'* (p 500).

- Powell and Dent-Micallef (1997) divided information systems resources into three categories: human resources, business resources and technology resources. In a study of the U.S. retail industry, they found that only human resources in concert with IS contributed to improved performance. Among the business resources, only IS training positively affected performance, while no technology resource linked positively to performance.

- Bharadwaj (2000) divided IS capability into three areas: IT infrastructure, human IT resources and IT intangibles. From an empirical analysis she found a positive and significant relationship between superior IS capability and superior firm performance.

Although typologies of IS resources/capabilities have been identified, Wade and Hulland (2004) recognised a disproportionate share of existing work within the field has focused either primarily, or exclusively, on what they term inwardly facing resources/capabilities. Namely, IS technical skills, IS infrastructure, cost effective IS operations and IS development. Clearly, further research is required to investigate all types of IS capabilities, prompting Wade and Hulland (2004) to use a typology suggested by Day (1994) to categorise the full range of previously identified IS resources/capabilities into the following three distinct groups:

1. **Inside-out:** internally focused IS resources/capabilities derived from IT infrastructure, technical skills, development and operations.

2. **Outside-in**: external or market focused IS resources/capabilities namely market responsiveness and managing external relationships.

3. **Spanning**: IS resources/capabilities needed to integrate the organisations inside-out and outside-in IS resources/capabilities, namely managing IS business partnerships and IS planning and change management.

Although Wade and Hulland (2004) proposed the IS resource/capability typology in response to Santhanam and Hartono's (2003) recent call to develop theoretical-based multi-dimensional measures of *'IT capability'*, the validity of their typology has not been empirically investigated. More specifically there is a pressing need for empirical studies that compare and contrast the potential of IS capabilities to confer competitive advantage. Furthermore, Willcocks et al. (1997) and Wade and Hulland (2004) recognise that although previous studies have investigated the competitive advantage implication of IS capabilities, very little work has looked at sustaining that advantage over time. Clearly, there is need to test a wide ranging set of IS capabilities for the ability to confer both improved competitive positioning and sustained improved competitive positioning.

2.6 Complementary organisational resources/capabilities

The discussion thus far, has assumed that if information systems are developed and managed through the application of IS resources/capabilities, which are valuable and/or rare with appropriable returns which have low inimitability, substitutability or mobility, they can directly impact competitive advantage and sustainable competitive advantage. However, as currently conceived within this study, the RBV fails to consider the indirect impacts that complementary organisational resources/capabilities have on the ability of IS to confer sustainable competitive advantage. For example, consider the introduction of an IS into a mature industry. If this IS increases scale economies available in the industry, then established customer-base or market-share can be an important complementary resource, which may enable those organisations enjoying them to extract more value from their IS than their competitors. A number of authors have championed this theory of resource complementarity, for example:

- Clemons and Row (1991) argue differences that competitors have in access to complementary strategic resources needed to exploit an IS innovation are important in explaining and predicting the division of benefits from the innovation and ultimately the creation of competitive advantage;

- Wade and Hulland (2004) adopt the view that '*IT resources exert their influence on firms through complementary relationships with other firm resources*';

- Ravichandran and Lertwongsatien (2002) adopt the view that IS resources in almost all cases act in conjunction with other firm resources to provide strategic benefits;

- Jarvenpaa and Leidner (1998) note that '*IT can generate competitive value only if deployed so that it leverages pre-existing business and human resources in the firm via co-presence or complementarity*';

- Benjamin and Levinson (1993) conclude that '*performance depends on how IT/IS are integrated with organisational, technical and business resources*'.

A number of organisational resources/capabilities have been identified with which to complement IS to confer competitive advantage and sustained competitive advantage. For example, Clemons and Row (1991) and Henderson and Venkatraman (1993) conclude that companies must use IS to leverage or exploit firm-specific, intangible resources such as organisational leadership, culture and business processes to confer competitive advantage. Keen (1993) divided resources into human, business and technology and developed a '*fusion*' framework that strongly parallels resource-based theory arguing that the key to IS success lies in the capability of organisations to fuse IS with latent, difficult-to-imitate firm specific advantages embodied in existing human and business resources. Other organisational resources/capabilities that have been identified within the strategic management literature include, know-how (Teece, 1998), corporate culture (Barney 1991), corporate reputation, (Vergin and Qoronfleh, 1998), environmental orientation (Russo and Fouts, 1997), product quality, customer service, market orientation, knowledge assets, organisational memory, organisational

learning, synergy, etc (c.f. Quinn and Baily, 1994). Although it has been identified that both IS resources/capabilities and organisational resources/capabilities impact the ability of an IS to confer competitive advantage and sustainable competitive advantage, for the purpose of this research only an IS resource/capability typology will be developed. It is felt identifying both an IS resource/capability typology and an organisational resource/capability typology would be beyond the scope of this research. It has been recognised that a disproportionate share of existing work within the field of IS research looking at the link between IS resources/capabilities and firm performance or competitive advantage have focused either primarily or exclusively on resources/capabilities such as, IS infrastructure, IS technical skills, IS development and cost effective IS operation. Thus, it was deemed more important to investigate a wide range of IS resources/capabilities and their impact on competitive advantage, than investigate both an IS resource/capability typology and an organisational resource/capability typology but only at a very abstract level. This it not to say the indirect impacts of IS through complementary organisational resources/capabilities, will not be investigated, it mearly points out that this research does not set out to identify individual organisational resources/capabilities with which to complement IS.

Based on the previous discussion, it is recognised that IS can directly impact both competitive advantage and sustained competitive advantage if supported by IS capabilities which are valuable and/or rare with appropriable returns which have low inimitability, substitutability or mobility (Wade and Hulland, 2004). Furthermore, it is recognised the IS can indirectly impact competitive advantage and sustained competitive advantage through complementary organisational resources/capabilities (Clemons and Row, 1991) or organisational change (Melville et al. 2004). Clearly further research is required to identify which of these potential sources of improved competitive positioning and sustained improved competitive positioning is most dominant.

Although the notion of organisational resource/capability complementarity has been widely recognised within the field of IS research, the process by which IS interact with other firm resources is poorly understood (Wade and Hulland, 2004; Ravichandran and Lertwongsatien, 2002). Thus the next section reviews the process by which complementary organisational resource/capabilities interact with IS.

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2.6.1 Defining resource/capability complementarity

The concept of organisational resource/capability complementarity has been used widely within the field of IS research investigating the RBV (Clemons and Row, 1991; Powell and Dent-Micallef, 1997, Melville et al. 2004), however is has been operationalised very differently, as indicated by the following examples:

- The term 'complementarity' refers to how resources may influence one another, and how the relationships between them affects competitive positioning and performance (Teece, 1986);

- Under complementarity the combined value of the firms resources and capabilities may be higher than the cost of developing or deploying each asset individually (Amit and Schoemaker, 1993);

- 'Complementarity' refers to enhanced resource value that arises when one resource produces greater returns in the presence of another resource than it does alone (Powell and Dent-Micallef, 1997);

- Although it is possible to apply IS for improved organisational performance with few organisational changes, successful application of IS is often accompanied by significant organisational change. When synergy exists between IS and other firm resources/capabilities, we call the later complementary organisational resources (Melville et al. 2004).

Although the above definitions of complementarity all seem very similar they have been operationalised very differently. Powell and Dent-Micallef's (1997) definition of the term '*complementarity*' is based on one resource leveraging or exploiting another resource; one resource magnifies the impact of another. The underlying assumption behind this view is that an IS can generate sustained competitive advantage if deployed so that it leverages or exploits pre-existing organisational resources/capabilities within the firm (Clemons, 1986; Clemons and Row, 1991; Ross et al. 1996; Powell and Dent-Micallef; 1997). Melville et al's (2004) definition of

'*complementarity*' takes into consideration that although it is possible to apply IS for improved organisational performance, successful application of IS is often accompanied by significant organisational change (Brynjolfsson and Hitt, 2000; Brynjolfsson et al. 2002; Cooper et al. 2000), including policies and rules, organisational structure, workplace practices and organisational culture. It is this synergy between IS and changes to organisational resources that are termed resource complementarity. The assumption behind this perspective is that business benefits are generally derived from the organisational changes that complement the introduction of the IS, rather than from the IS itself (Ward et al. 1996; Strassman, 1990).

A review of the literature on complementarity identifies that IS can primarily interact with organisational resources/capabilities in one of the following three ways:

1. *The IS enhancement can exploit existing organisational resources/capabilities*: The mere presence of an existing organisational resource/capability will contribute to the realization of improved competitive positioning from the introduction of an IS. For example, an electronic data interchange (EDI) system might only provide marginal performance improvements, under ordinary conditions, but may produce sustainable advantages when combined with pre-existing supplier trust.

2. *The IS can leverage existing organisational resources/ capabilities*: The introduction of an IS will increase the effectiveness of an existing organisational resource/capability, and in so doing will contribute to the realization of improved competitive positioning. For example, a CAD system might leverage the creative thinking and design skills of employees.

3. *The IS can be complemented by a change to an organisational resource/capability*: A complementary change to the design of an existing organisational resource/capability will contribute to the realization of improved competitive positioning from the introduction of an IS. For example, a company investing in computer integrated manufacturing systems would also have to change obsolete work practises if they are to maximise the full potential of the IS.

As previously identified, the issue of complementarity is an important one and although the literature identifies various ways through which IS complement organisational resources/capabilities, few empirical studies have combined the notion of leveraging, exploiting and modification in their definition of complementarity, resulting in the notion of organisational resource/capability complementarity being empirically underdeveloped within the field of IS research (Ravichandran and Lertwongsatien, 2002; Amit and Schoemaker, 1993; Dierickx and Cool, 1989; Teece, 1986; Wade and Hulland, 2004). Clearly if further research is to be conducted surrounding organisations' resource/capability complementarity, the means by which IS interact with organisational resources/capabilities must be clear.

Having identified that complementary organisational resources/capabilities can affect the ability of an IS to confer competitive advantage and sustained competitive advantage, the next section seeks to review the literature to identify how to measure competitive advantage and sustained competitive advantage.

2.7 Measures of competitive advantage and sustained competitive advantage

From reviewing the ways that competitive advantage and sustained competitive advantage have been measured within the literature, it becomes apparent that some studies have used firm level measures whilst others have used intermediate level measures. The firm level measures and intermediate level measures are reviewed below.

2.7.1 Firm level measures

Ray et al. (2004) have observed that a number of studies adopting the RBV conceptualise a firm's capabilities and resources as the independent variable, which can then be correlated with some measure of firm performance, as the dependent variable (c.f. Huselid et al. 1997; Barnet et al. 1994; Markides and Williamson, 1994; Bharadwaj, 2000). Firm level measures of competitive advantage and sustained competitive advantage used in these studies have included:

- **Return on investment (ROI):** Porter's (1980) well-known definition of competitive advantage was stated as the '*ability for an organisation to earn returns on investment persistently above the average for the industry*'. All ROI methods are based on the proposition that an investment must yield now to deliver a positive return over some period of time in the future. ROI methods rely on the calculation of cash flows and therefore are based on data, which satisfy accounting criteria. Consequently it is difficult for intangible benefits to be dealt with this way. ROI methods are commonly used and tend to be attractive to organisations with strict financial controls and disciplines.

- **Return on Assets (ROA):** ROA tells you what earnings were generated from invested capital (assets). ROA for public companies can vary substantially and will be highly dependent on the industry. This is why when using ROA as a comparative measure, it is best to compare it against a company's previous ROA numbers or the ROA of a similar company.

- **Return on sales (ROS):** Chakravarth (1966) notes that ROS provides a more distinguishable criterion than other profitability measures in determining firm performance. Clemons (1986) argues that return on sales is an important economic indicator of strategic system effectiveness. In Kettinger et al.'s (1994) study, relative profitability was calculated by taking the average ROS of the firm, in a given stage, and dividing it by its respective industry average. The volatility in earnings suggests the use of industry average as a relative base to provide a more accurate view of firm profitability position within an industry.

The two ratios of return on assets (ROA) and return on sales (ROS) have been widely used within the field of IS research (e.g. Dehning and Richardson, 2002; Kohli and Devaraj, 2003).

- **Market share and new customers:** It has been argued that competitive advantage can also be measured not only in financial terms but also in terms of market share and new customers (Wiseman, 1988). Clearly, the primary intent of high profile systems such as American Airlines SABRE and Marrill Lynch's CMA is

enhancing market share by offering a unique service or process to customers through IS (Clemons, 1986; Weill and Broadbent, 1996).

- **Balanced Scorecard**: In the strategic management literature a widely accepted framework for measuring business success is the balanced scorecard (Kaplan and Norton, 1992). This considers 4 major perspectives of organisational concern - two external and two internal. The two external perspectives focus on how well the organisation is doing when looked at from the financial perspective, and the customers' point of view. The internal perspectives are concerned with current business processes, and with how the organisation is developing itself for the future. The scorecard is considered balanced because it balances the financial with the non-financial, the external with the internal, and the short and longer terms.

- **Subjective measures:** A number of research studies (e.g. Lawrence and Lorsch, 1967; Dess, 1987; Powell, 1992) have used subjective measure for evaluating and justifying IS. They have been preferred to financial statement data since organisations adopt different accounting conventions and comparisons between large and medium sized organisations, Strategic Business Units and conglomerates can be problematic. Dess and Robinson (1984) stated that subjective measures of performance correlate strongly with objective measures and recommended the use of subjective measures, especially when obtaining non-financial data.

Although a number of measures and ratios have been identified for measuring competitive advantage and sustained competitive advantage, Cavaye and Cragg (1993) criticised many IS research findings due to the limitations of the measurement variables and small sample size. They state that few studies measure the dependent variable adequately. According to Cavaye and Cragg (1993):

'Competitiveness derived from IS is hard to quantify ...... it is hard to attribute a definite proportion (or amount of profitability and competitive strength) to a particular IS'.

They further claim that much research has relied upon dubious quantitative figures to ascertain the extent of competitive advantage. For these reasons researchers have looked towards using intermediate measures for competitive advantage and sustainable competitive advantage resulting from IS initiatives.

2.7.2 Intermediate measures of competitive advantage and sustainable competitive advantage

Although a number of organisational level measures have been identified, concerns have been raised within the field of IS research that these approaches have focused on what are in fact highly aggregated dependent variables, which can lead to very misleading conclusions with regard to resource-based theory (Ray et al. 2004). For example, the concern is that organisational performance is affected by a multiple of factors; thus use of a single organisational level dependent variable may not capture the broader context of IS related advantages. For this reason, the resource based theory literature within the field of IS research has suggested an indirect role for IS on competitive positioning, raising the idea that IS researchers should look at the impact from an IS at an intermediate level. For example, Barua et al. (1995) examined the effect of IS on *'intermediate-level variables'* such as capacity utilization, inventory turnover, relative quality, relative price and new products and then related these intermediate variables to financial performance variables such as market share and ROA. Ray et al. (2004) proposed using the effectiveness of business processes as the dependent variable instead of using firm performance, for example, as used by Henderson and Cockburn (1994) and Schroeder et al. (2002).

Whereas most current IS research surrounding competitive advantage appears to address the question *'what value do IT investments provide'* the research may not yet be adequately addressing the related set of questions *'why, where, when, how and to whom'* do these investments provide value (Chan, 2000). *'The closer one examines the data behind the studies of IT performance the more it looks like mismeasurment could be at the core of the productivity paradox'* (Brynjolfsson, 1993). For example, a firm may have generated a competitive advantage in some business processes but various stakeholders may have appropriated the profits from that competitive

advantage before it can affect a firm's overall performance. Alternatively, an organisation may experience an improved competitive advantage in one process, which is offset by an increased competitive disadvantage in another process, with organisational performance remaining unchanged. The literature highlights how difficult and perhaps inappropriate it would be to try to translate the benefits of IS usage into quantifiable productivity measures of output at the firm level (Brynjolfsson, 1993). Therefore, researchers must be prepared to look beyond conventional measurements of competitive advantage and sustainable competitive advantage. An appropriate level at which competitive advantage and sustainable competitive advantage can be measured must be identified.

2.8 Summary

This chapter has identified three areas within the field of IS-research applying resource based theory that clearly warrant further research, namely:

1. **IS resources/capabilities**: A disproportionate share of existing empirical work investigating the link between IS resources/capabilities and competitive advantage, has focused either primarily or exclusively on inwardly facing resources/capabilities. Although an IS capability typology that includes all types of IS resources/capabilities has been identified by Wade and Hulland (2004) the IS resources/capabilities within have not been empirically tested against one another for their potential to confer competitive advantage or sustainable competitive advantage. Clearly the resources/capabilities within the typology need to be empirically tested to compare and contrast their ability to confer competitive advantage and sustained competitive advantage.

2. **Direct and indirect impacts of IS-enhancements**: Research to date, within the field of IS research and the RBV have either investigated the direct impacts of IS-enhancements or the indirect impacts of IS-enhancements, through complementary organisational resources. Clearly, further empirical research is needed to compare and contrast the direct impacts of IS-enhancements with the indirect impacts of the IS-enhancements, namely complementary organisations resources/capabilities, to

identify which has the greatest impact on both competitive advantage and sustained competitive advantage.

3. **Measures of competitive advantage and sustainable competitive advantage:** Many different dependent variables have been used to measure the competitive impacts of IS, most of which have been at the organisational level. However, concerns have been raised about using organisational level measures of competitive advantage and sustained competitive advantage as they focus on what are in fact highly aggregated dependent variables. It is recognised that organisational performance is affected by multiple factors; thus use of a single dependent variable may not capture the broader context of IS related advantages. For this reason researchers must be prepared to look beyond organisational level measurements of competitive advantage and sustainable competitive advantage. An appropriate level at which competitive advantage and sustainable competitive advantage can be measured must be identified.

Having critically reviewed the appropriate body of literature, and identified the gaps in this literature, the next chapter presents the research framework that has been derived to address these gaps.

Chapter 3

Research Framework

3.1   Introduction

The previous chapter thoroughly reviewed the relevant literature regarding information systems and sustained competitive advantage. It included a review of the resource-based view; how the resource-based view has been applied within the field of IS research, complementarity, and what measures have been used for the competitive impacts of IS. Having reviewed the relevant literature surrounding IS research applying the resource-based view; it was possible to identify major gaps within the literature. This chapter seeks to investigate how these gaps can best be filled. More specifically six important research propositions are identified and discussed, which have been incorporated into the IS-enabled sustainability framework, providing a graphic representation of these relationships. However, before any propositions or conceptual frameworks can be presented, it is important to establish the definitions of all the key terms.

3.2   Definitions to be used for the purpose of this research

As discussed in chapter two, a plethora of definitions have been offered for key terms relating to the resource-based view. For this reason, before any development of the IS-enabled sustainability framework can be undertaken, it is essential to define the key terms of IS-enhancement, resource, capability, complementarity, improved competitive positioning and sustained improved competitive positioning. For the purpose of this research these key items will be defined as:

- **IS-enhancement:** The definition of an IS, as offered by Buckingham et al. (1987) '*a system which assembles, stores, processes and delivers information relevant to an organisation (or to society) in such a way that the information is accessible and useful to those who wish to use it*', has been adopted for the purpose of this research, as it encapsulates what is referred to by others as both IT and IS. The term '*enhancement*' is added to include either a modification to an existing IS or the implementation of a new IS. The choice of term '*enhancement*' is also appropriate in the context of RBV theory as the term has been used by Wade and Hulland (2004) to signify that once the IS is operational, it will also inherently have bundled in the IS capabilities that were used to develop, install and operate it.

- **Resource:** The definition of a resource as offered by Amit and Schoemaker (1993), '*stocks of available factors that are owned or controlled by the firm*', has been subscribed to for the purpose of this research, as it supports a view that emphasises their physicality and tangibility. Furthermore, it enables a clear distinction to be made between resources and the closely related concepts of capabilities, as defined below. Moreover, this definition is also appropriate for both IS resources and organisational resources[3]. For example, IS resources will include such things as information, systems (hardware and software) and technology owned or available to the organisation, whilst organisational resources will include things such as machinery, stock and finance.

- **Capability:** The definition of a capability as offered by Helfat and Peteraf (2003) '*the ability of an organisation to perform a coordinated set of tasks, utilizing organisational resources, for the purpose of achieving a particular end result*' has been adopted. This definition has been adopted because it also supports the distinction between the concepts of resources and capabilities and it can be applied to both organisational capabilities and IS capabilities[4]. IS capabilities will include things such as IS planning and change management, IS technical skills

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[3] Although it can be argued that organisational resources encompass IS resources, for the purposes of this research the term organisational resource is used to describe all resources other than IS resources.

[4] As with resources, the term organisational capability is used to describe all capabilities other than IS capabilities.

and IS development, whilst organisational capabilities will include such things as culture, organisational flexibility and know-how.

These last two definitions have been adopted, at least in part, because they reflect the important distinction that Makadoks (2001) makes between resources and capabilities: a capability is *'firm specific since it is embedded in the organisation and its processes'*. Consequently, if an organisation were to be dissolved, its resources would be salvageable but its capabilities would no longer exist. Moreover, Makadoks (2001) clarifies the important relationship between resources and capabilities: *'the primary purpose of a capability is to enhance the productivity of the other resources the firm possesses'*.

This study focuses primarily on capabilities, rather than resources, as they are more likely to be the source of sustained improved competitive positioning. Moreover, a capability is *'firm specific since it is embedded in the organisation and its processes'* (Makadok, 2001), consequently there is less chance of it leaving the organisation or being bought on the open market.

Other important definitions include:

- *Complementarity:* Powell and Dent-Micallef's (1997) and Melville et al.'s (2004) definitions of complementarity, as presented in section 2.6.1, have been combined to include both the situations where organisational capabilities and changes to organisational capabilities complement the IS-enhancement. The definitions have been combined to give a complete picture of how IS-enhancements can be complemented by organisational resources/capabilities, namely through leveraging or changing existing organisational resources/capabilities. Thus, the definition of complementarity to be used for this research is: *'the increased advantage from an IS-enhancement that arises when it produces greater returns in the presence of existing, or changes to, organisational resources/capabilities than it does alone'*.

- *Improved competitive positioning:* Most of the research investigating the competitive impacts of IS has been done under the banner of competitive advantage and sustainable competitive advantage (Clemons and Row, 1991; Dehning and Stratopoulos, 2003; Santhanam and Hartono, 2003; Bharadwaj, 2000; Peppard and Ward, 2004). However, a better term would appear to be '*improved competitive positioning*' rather than simply '*competitive advantage*'. This then easily accommodates both the situation where an organisation narrows the competitive gap with competition, through catching up, as well as widening it through being a leader. The preferred definition of improved competitive positioning is: '*improvements a business experiences compared to competitors, including those improvements that reduce competitive disadvantage and those that increase competitive advantage*'.

- *Sustained improved competitive positioning:* For the purpose of this research sustained improved competitive positioning is defined as '*the duration for which a business experiences a degree of improvements compared to competitors*', a view also supported by Porter (1985) and Jacobson (1988). This definition of sustained improved competitive positioning has been adopted, as other definitions, for example, Barney's (1991; p. 102) definition that a sustainable competitive advantage is one '*that continues to exist after efforts to duplicate that advantage have ceased*', have proven to be '*virtually impossible to operationalize quantitatively*' (Wiggins and Ruefli, 2002; p. 84). Wade and Hulland (2004) identify that an initial period of improved competitive position will typically be short in duration (e.g. 6 months to 1 year), representing the time required for competitors to imitate or acquire the necessary resources. If these resources can be quickly attained or duplicated, then competitive advantage will prove to be fleeting, representing little more than a first-mover advantage. It is important to note this research does not set out to identify what duration of calendar time constitutes a competitive advantage or a sustainable competitive advantage. It mearly seeks to identify opportunities for increasing the degree of both improved competitive positioning and sustained improved competitive positioning resulting from IS-enhancements.

Having identified the key definitions that will be used within this research, the next sections seek to draw on these definitions by identifying the key constructs to be used in this study and demonstrate how these will be used to fill the gaps in the literature, as identified in chapter 2.

3.3   Measuring the competitive effects of IS

As noted in chapter 2, the literature highlights how difficult and perhaps inappropriate it would be to try and translate the benefits of IS usage, and in particular competitive benefits, into quantifiable measures of organisational output (Brynjolfsson, 1993; Ray et al. 2004). Consequently, it is deemed inappropriate to measure improved competitive positioning and sustained improved competitive positioning at an organisational level. Instead, the view that IS-enhancements will have a direct impact on business processes, (Henderson and Cockburn, 1994; Bakos 1987; Schroeder et al. 2002; Wade and Hulland, 2004; Ray et al. 2004) shown diagrammatically in figure 3.1 has been adopted.
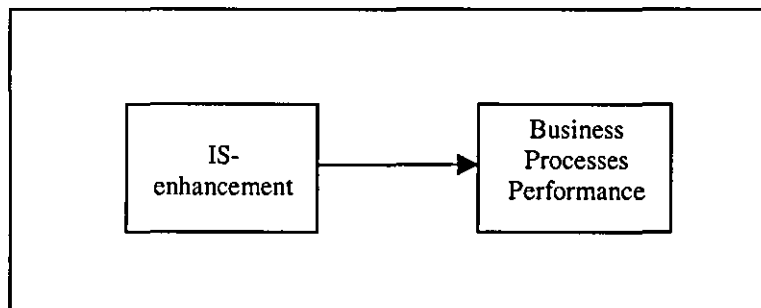
Figure 3.1 The impacts of IS-enhancements

Furthermore, Porter and Miller (1985) also argue that firms execute numerous business processes to achieve strategic objectives, thereby providing a range of opportunities for the application of information systems to improve processes. Consequently, business processes will be used as the focus for measuring the dependent variable, namely improved competitive positioning and sustained improved competitive positioning, and figure 3.1 will form the basis of the IS-enabled sustainability framework as depicted in figure 3.8.

Business processes have been defined in a number of ways; for example, Davenport (1993; p.5) defines a process as *'the specific ordering of work activities across time and space, with a beginning, an end, and clearly identified inputs and outputs'*. Hammer and Champy (1993) define a process as a *'collection of activities that take one or more kinds of input and creates an output that is of value to the customer'*. Christensen and Overdorf (2000) define a process as the *'patterns of interaction, coordination communication and decision making employees use to transform resources into products or services of greater worth'*. As all of these definitions are very similar in key ways, for the purpose of this research Davenport's (1993) definition of a process has been adopted, due to its simplicity, clarity and common usage in the literature.

3.3.1 Defining a generic set of business processes

Having decided to operationalise the dependent variables (improved competitive positioning and sustained improved competitive positioning) at the level of the business processes, the next step is to identify a generic set of business processes universally applicable to all businesses.

Bititci and Muir (1997) questioned whether a universally applicable set of generic business processes could ever be identified. However, Childe et al. (1995) argue that by comparing sets of processes that have been adopted by organisations when undertakening re-engineering projects, a set of generic processes can be derived. This suggests that a set of standard business processes may evolve in the same way that a roughly standardized set of functional divisions (manufacturing, design, sales and marketing, finance etc.) develop. Childe et al. (1995) and Harvey (1994) propose that generic business processes used by companies and consultants are leading to the conclusion that, at an abstract level, some consensus may be achieved over a generic set of business processes. However, it is also evident that as the level of detail increases, disagreements begin to surface. This raises the question of *'what is the*

appropriate abstract level[5] for which a set of generic business processes should be identified?'

When large and high profile organisations have developed their own process typology they have tended to identify between 10 and 20 generic business processes. For example, BT identified 15 processes, Xerox came up with 11 processes, and IBM devised a set of 10 processes (Davenport, 1993). At a higher level of abstraction, similarities may be seen between key processes of different companies. However as the detail of the analysis increases, the similarities between the processes of companies are more difficult to identify (Maull et al. 1995). Consequently, as argued by Davenport (1993), this study identifies an appropriate abstract level at which to identify a set of generic business processes is between 10 and 20. This reflects the trade off between managing process interdependency and ensuring that process scope is measurable. For this reason the next section critically reviews existing sets of generic business processes in order to identify a generic set of between 10 and 20 processes that can be used for the purpose of this research.

3.3.2 Existing sets of generic business processes

From reviewing the literature it becomes clear that very few studies have produced a set of generic business processes that are applicable to all organisations. Generic sets of business processes that have been provided include those of Pandya et al. (1997), Flower (1998) and the APQC process classification framework (2004). Each of these process classifications are reviewed in turn below to assess their applicability for the purpose of this research.

Pandya et al. (1997) identify 12 processes, which are divided into management processes, operating processes and support processes (see table 3.1). Although these processes have been empirically validated, they are only generic to manufacturing organisations, thus failing to meet the criteria of being universally applicable to all organisations.

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[5] *'Abstract level'* refers to how broadly or narrowly generic business processes should be defined.

Table 3.1 Pandya et al.'s (1997) set of generic business processes

Management processes	Operate processes	Support processes
Direction setting	Obtain order	Technology management
Business planning	Product & service development	Marketing
Direct business	Order fulfilment	Financial management
	Support fulfilment	Human resource management
		Information management

A second set of generic business processes is that proposed by Flower (1998), see table 3.2. Flower (1998) identifies 11 business processes which are divided into core business-wide processes and support processes. It can be argued that this set of generic business processes is applicable to all organisations seeking to gain an improved competitive position, as the processes actually extend across an entire spectrum, starting with customer interest/arousal and running through to customer satisfaction. However, it must be noted that Flower's (1998) set of business processes have not been empirically validated and if this typology is to be adopted, further validation is required.

Table 3.2 Flower's (1998) set of generic business processes

Generic core business-wide processes	Generic support processes
Product delivery (production)	Financial management
Product/service innovation and development	Human resource (HR) acquisition, development and retention
Customer acquisition, retention and development	Information systems management
Order fulfilment	Operations support and administration
Supply chain management	
Strategy formulation	
Decision making	

The final set of generic business processes reviewed, is that of the Process Classification Framework (PCF) (2004) developed by the American Productivity and Quality Centre (APQC) and member companies. The APQC PCF (2004) is intended as an open standard to facilitate process management and benchmarking regardless of industry, size, or geography, thus meeting the criteria of being generic to all organisations. The APQC PCF (2004) organises operating and management processes

into 12 enterprise-level categories (presented in table 3.3), 62 process groups and over 1500 processes and associated activities. Although the APQC PCF (2004) meets all of the criteria set out for a generic set of business processes, it does however lack any robust grounding within the academic literature. To date the APQC PCF (2004) has been used widely within industry, however academic literature has been slow to adopt it.

Table 3.3 APQC process classification framework

Operating processes	Management and support processes
Develop vision and strategy	Develop and manage human capital
Design and develop products and services	Manage information technology and knowledge
Market and sell products and services	Manage financial resources
Deliver products and services	Acquire, construct and manage property
Manage customer service	Manage environmental health and safety
	Manage external relationships
	Manage improvement and change

From reviewing the above typologies of business processes, it became evident that Pandya et al.'s (1997) typology is inappropriate as it is only applicable to manufacturing organisations. Moreover, whilst both Flower's (1998) and the APQC PCF's typologies are generic to all organisations, both have significant flaws: Flower's (1998) typology lacks any empirical validation, whilst the APQC PCF (2004) lacks any rigorous grounding within academic literature. For this reason, it was decided to create a new typology one, which was firmly grounded within the three existing typologies. The first stage in this process was to cross-reference the three typologies to identify which processes have cross-classification support. The results of this exercise are presented in table 3.4:

Table 3.4 Process cross classification

APQC	Flower	Pandya et al.
Operating processes	**Operating processes**	**Operating processes**
Develop vision and strategy	Strategy formulation Decision making	Direction setting Business planning Direct business
Design and develop products and services	Product/service innovation and development	Product and Service development
Market and sell products and services	Customer acquisition, retention and development	Marketing obtain order
Deliver products and services	Product delivery (production) Order fulfilment Supply chain management	Order fulfilment
Manage customer service		Support fulfilment
Management and support processes	**Management and support processes**	**Management and support processes**
Develop and manage human capital	Human resource acquisition, development and retention	Human resource management
Manage information technology and knowledge	Information support and administration	Technology management
Manage financial resources	Financial management	Financial management
Acquire, construct and manage property		
Manage environmental health and safety		
Manage external relationships		
Manage improvements and change		
Processes missed	Operations support and administration	

The first thing that becomes apparent from table 3.4 is that the typologies can all be split into what the APQC PCF (2004) defines as operating processes, and management and support processes. The second thing that becomes apparent are those processes that have cross-classification support between the three typologies. The processes with cross-classification support are presented below in table 3.5.

Table 3.5 Processes with cross classification support

Operating Processes	Management and support processes
Develop vision and strategy	Develop and manage human capital
Market and sell products or services	Manage information technology and knowledge
Design develop products and services	Manage financial resources
Manage customer service	Manage external relationships

Although the processes identified in table 3.5 have cross classification support, table 3.4 identifies inconsistency over the APQC PCF (2004) process of *'deliver products and services'*, Flowers (1997) processes of *'product delivery (production)'*, *'order fulfilment'* and *'supply chain management'* and Pandya et al's. (1997) process of *'order fulfilment'*. Clearly Flower (1997) has split what the APQC PCF (2004) and Pandya et al. (1997) identify as one process into three processes. For the purpose of this research, it is felt the level of aggregation offered by the APQC PCF (2004) and Pandya et al. (1997) surrounding this process is too high, as it might cause confusion when common processes such as managing logistics and warehousing, the production of products or service and the delivery of products and services are not easily identifiable. Thus, for the purpose of this research, the APQC PCF (2004) process *'deliver products and services'* and the Pandya et al. (1997) process *'order fulfilment'* has been split into the three processes of *'acquiring and storing inputs required for products or services'*, *'transforming acquired inputs into a product and service'* and *'delivering products or services'*. The inclusion of these three processes, with the previous eight outlined in table 3.5, leads to the development of the eleven generic business processes to be used for the purpose of this research, as listed in table 3.6. To further justify the use of the 11 business processes, table 3.6 also provides references to supporting literature of where these processes have been identified and/or used.

Table 3.6 Generic set of business processes to be used

Set of generic business processes to be used in this thesis	Supporting literature
Operating processes	
The process of developing vision and strategy	Develop vision and strategy, Define the business concept and long term vision, Develop business strategy (APQC 2004) Direction setting, Business planning, Direct business (Pandya et al. 1997) Strategy formulation, Decision making (Flower 1998) Vision setting (Lipton 1996) Vision setting (Larwood et al. 1995) Developing strategy (Swamidass 2001)
The process of designing and developing products or services	Design and develop products or services, Design products and services, Generate new products and services and evaluate and refine existing products and services (APQC 2004) Design (Malone et al. 1999) Product and service development (Pandya et al. 1997) Develop new product or service (Presley et al. 2001) Product/service innovation and development (Flower 1998) Product development (Brache and Webb 2000) Product development (Ulrich and Eppinger 2000)
The process of acquiring and storing inputs required for products or services	Plan for and acquire necessary resources, manage logistics and warehousing (APQC 2004) Inbound logistics (Malone et al. 1999)
The process of transforming acquired inputs into a product and service	Produce manufacture products (APQC 2004) Order fulfilment (Pandya et al. 1997) Order fulfilment (Flower 1998)
The process of marketing and selling products or services	Market and sell products or services, manage advertising, pricing and promotional activities, enter, processes and track orders (APQC 2004) Marketing, obtain order (Pandya et al. 1997) Sales and marketing (Miner 2002) Marketing and sales (Brache and Webb 2000) Order (Ananth 2004)
The process of delivering products or services	Deliver products and services, Deliver products and services to the customer (APQC 2004) Outbound logistics (Malone et al. 1999) Product delivery (Flower 1998) Service delivery (Napoleon 2004)
The process of customer service	Manage customer service, Develop and manage customer profiles, perform account management (i.e. service the relationship) (APQC 2004) Support Fulfilment (Pandya et al. 1997) Customer service (Ray et al. 2004) Customer service (Brache and Webb 2000)

Management and support processes	
The process of developing and managing human capital	Develop and manage human capital, Recruit, source and select employees, Manage employee information (APQC 2004) Human resource management (Pandya et al. 1997) Identify and fill needs for human resources, Appraise improve and maintain human resources (Presley et al. 2001) Human resource acquisition development and retention (Flower 1998)
The process of managing information technology and knowledge	Manage information and technology, enable collaborative work, Manage IT infrastructure/data centre operations (APQC 2004) Technology management, Information management (Pandya et al. 1997) Information systems management (Flower 1998) Knowledge management (Hatch and Dyer 2004)
The process of managing financial resources	Manage financial resources, Perform general accounting and reporting, Process payroll, Manage taxes (APQC 2004) Financial management (Pandya et al. 1997) Financial management (Flower 1998) Financial management (Keen 1997)
The process of managing external relationships	Manage external relationships, Build investor relationships, Manage government and industry relationships, Manage public relations program (APQC 2004) Relationship with secondary stakeholders, Relationship with allies, Relationship with the parent (Finlay 2000)

Having constructed a typology of processes, upon which improved competitive positioning could be assessed, the next stage was to determine the affect IS capabilities have on improved competitive positioning.

3.4   The role of IS capabilities in enabling improved competitive positioning

A number of IS capability typologies, which have been identified within the field of IS research, have already been reviewed in chapter 2. Of these, the typology suggested by Wade and Hulland (2004) has been adopted for the purpose of this research because: it is up to date with existing literature, having only been published in 2004; it is based upon a very thorough review of the literature; and includes inwardly and outwardly facing IS capabilities. Furthermore, they are mid-level

constructs meaning they are reasonably specific while also permitting an acceptable level of generalisability across studies. Finally, Wade and Hulland (2004) have also highlighted the need to empirically compare and contrast these capabilities with one another, for their ability to confer both improved competitive positioning and sustained improved competitive positioning.

Wade and Hulland (2004) identify eight IS capabilities, which can impact the success of an IS and argue that they can be split into three types: inside-out, outside-in and spanning capabilities, as depicted in table 3.7.

3.7 Wade and Hulland's IS capability typology

Outside-in IS capabilities	Spanning IS capabilities	Inside-out capabilities
• External relationship management • Market responsiveness	• IS-business partnerships • IS planning and change management	• IS infrastructure • IS technical skills • IS development • Cost effective IS operations

Wade and Hulland (2004) identify inside-out capabilities as being deployed from inside the firm in response to market requirements and opportunities, and tend to be internally focused (e.g. technology development and cost controls). In contrast, outside-in capabilities are externally orientated, placing an emphasis on anticipating market requirements, creating durable customer relationships and understanding competitors (e.g. market responsiveness and managing external relationships). Finally spanning capabilities, which involve both external and internal analysis, are needed to integrate the firm's inside-out and outside-in capabilities (e.g. managing IS/ business partnerships, IS management and planning). Each of the eight IS capabilities are now discussed in turn:

- **Outside-in capabilities**

External relationship management capability: External relationship management involves the organisations ability to manage linkages between the IS function and stakeholders outside the firm (Wade and Hulland, 2004). It can manifest itself as an ability to work with suppliers to develop appropriate systems and infrastructure requirements for the firm (Feeny and Willcocks, 1998), to manage relationships with outsourcing partners (Benjamin and Levinson, 1993; Feeny and Willcocks, 1998), or to manage customer relationships by providing solutions, support, and/or customer service (Bharadwaj, 2000; Bharadwaj et al. 1998). Many large IS departments rely on external partners for a significant portion of their work. The ability to work with and manage these relationships is an important organisational capability.

Market responsiveness capability: Market responsiveness involves the organisation's ability to collect information from sources external to the firm as well as the dissemination of an organisation's market intelligence across departments and the organisation's response to that learning (Day, 1994; Kohli and Jaworski, 1990). It includes the abilities to develop and manage projects rapidly (Ross et al. 1996) and to react quickly to changes in market conditions (Bharadwaj, 2000; Feeny and Ives, 1990; Zaheer and Zaheer, 1997). A key aspect of market responsiveness is strategic flexibility, which allows the organisation to undertake strategic change when necessary (Bharadwaj, 2000; Jarvenpaa and Leidner, 1998; Powell and Dent-Micallef, 1997).

- **Spanning capabilities**

IS business partnership capability: This process represents the ability of the firm to integrate and align the IS function and other functional areas or departments of the firm. The importance of IS alignment, particularly with business strategy, has been well documented (e.g. Chan et al. 1997; Reich and Benbasat, 1996). This ability has variously been referred to as synergy (Bharadwaj, 2000; Jarvenpaa and Leidner, 1999), assimilation (Armstrong and Sambamurthy, 1999), and partnerships (Bharadwaj et al. 1998; Ross et al. 1996). All of these studies recognise the

importance of building relationships internally within the firm between the IS function and other areas or departments. Such relationships help to span the traditional gaps that exist between functions and departments.

IS planning and change management capability: IS planning involves the ability to anticipate future changes and growth and to choose platforms (including hardware, network and software standards) that can accommodate this change (Feeny and Willcocks, 1998; Ross et al. 1996). It also includes the ability of IS managers to: understand how technologies can and should be used, identify training needs[6]; and motivate and manage IS personnel, to ensure the change process is successfully navigated.

- ## Inside-out capabilities

IS infrastructure capability: represents the ability of an organisation to effectively acquire, deploy and manage computer and communication technologies and shareable technological platforms (Ross et al. 1996; Weill et al. 1996). These computer and communication technologies and shareable technological platforms are used to share information throughout the organisation and can be looked at in terms of their reach (the locations to which it can access and to which it can link) and range (the kind of information that can be seamlessly and automatically shared) (Keen, 1991). It is likely that this capability would be manifested through the availability and effective operation of technologies such as: database management systems, servers, and network architectures.

IS technical skills capability: is the ability of IS staff to keep up-to-date knowledge and deploy, use, and manage that knowledge to use the organisation's IS platforms and operating procedures in order to meet the needs of the organisation (Peppard and Ward, 2004). Thus, this study is focused on technical skills that are advanced, complex and therefore difficult to imitate such as corporate-level knowledge (Bharadwaj, 2000) and technology integration skills (Feeny and Willcocks, 1998).

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[6] It is important to recognise that within the IS capability of "IS planning and change management"; training only applies to IS personnel. User training does not feature in any of the IS capabilities and for the purpose of this research it would be thought of as an organisational capability.

IS development capability: Since turbulent business environments are posing new imperatives for IS development activities, there is a growing need for organisations to be able to rapidly deliver and implement IS applications that facilitate agile responses to changing markets and competitive rivalries (Clark et al. 1997). This capability encapsulates the ability to rapidly develop and implement IS solutions that satisfy business needs (Peppard and Ward, 2004). For example, the ability to merge or at least make compatible the IS of two organisations that have merged their operations.

Cost effective IS operations capability: Cost effective IS operations encompass the ability to provide efficient and effective IS operations on an ongoing basis (Wade and Hulland, 2004). Firms with greater efficiency can develop a long-term competitive advantage by using this capability to reduce costs and develop a cost leadership position in their industry (Barney, 1991; Porter, 1985). In the context of IS operations, the ability to avoid large, persistent cost overruns, unnecessary down time, and system failure is likely to be an important precursor for superior firm performance (Ross et al. 1996).

Although the IS capabilities within the typology outlined above can be treated independently when measuring their impact on competitive positioning, it has also been argued that firm performance is not necessarily attributable to any single IS capability in isolation but to how firms integrate and combine their IS capabilities (Mata et al. 1995). This view has been supported by Ross et al. (1996) who argued combining IS human assets, IS relationship assets and technology assets will create value when strategically aligned with business activities. Similarly, Ravichandran and Lertwongsatien (2000) report that IS-related skills when combined with IS infrastructure, support for IS operations, and rapport with business units and IS vendors, lead to greater alignment between IS and business competencies, which in turn leads to greater organisational performance. The realisation that performance might not necessarily be attributable to any single IS capability in isolation, but how firms integrate and combine their IS capabilities, leads to the development of the following proposition:

Proposition 1: The greater the degree to which the success of the host organisations IS-enhancement is dependent upon IS capabilities, the greater will be their resulting degree of improved competitive position. (This proposition is shown diagrammatically in Figure 3.2)

Figure 3.2 Relationship between IS capabilities and improved competitive positioning

Proposition 1 is very general and it is felt that more specific propositions can be made for different types of IS capabilities with regard to their impacts on improved competitive positioning. More specifically Wade and Hulland (2004) suggest that outside-in and spanning capabilities tend to have similar capability attributes, in terms of their rarity and value, when compared with inside-out IS capabilities[7]. The following discussion demonstrates why Wade and Hulland (2004) recognise different types of capability might exhibit different levels of rarity and value, as also presented in table 3.8:

- **Value:** Studies by Bharadwaj (2000), Feeny and Willcocks (1998), Lopes and Galletta (1997), and Marchand et al. (2000) have all shown that IS capabilities have the potential to deliver value to their organisation (albeit not always realised). However, it is recognised that outside-in and spanning capabilities will have a higher degree of value than inside-out capabilities, as the two former sets of capabilities, if valuable, must be based on a continued understanding of the changing business environment, while inside-out

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[7] It should be noted that Wade and Hulland (2004) also identified appropriability as an attribute of IS capabilities that might impact upon competitive positioning. However, it has not been considered in this study, as it's concerned with how the results of the improved competitive position are distributed rather than how they were achieved in the first place.

resources can lead to greater efficiency and/or effectiveness at any particular point in time.

- **Rarity:** In general, all key IS capabilities described here are likely to be relatively rare. However, as was the case for the value attribute, outside-in and spanning capabilities are more likely to be associated with a higher degree of rarity than are inside-out capabilities. The rational being that the available labour markets allow firms lacking key IS technology, operational efficiency skills, and IS development personnel capabilities to acquire them by offering superior wages or through business arrangements with external consultants. Similarly IS infrastructure can be acquired or copied relatively easy once it has been in existence even for a comparatively short period of time, although it may be very rare initially. In contrast, spanning and outside-in capabilities tend to be socially complex and can not be easily acquired in factor markets, and must instead be developed through on-going, organisational-specific investments or through mergers and/or acquisitions of other companies.

Table 3.8 The comparative value and rarity of IS capabilities (After Wade and Hulland, 2004).

	Value	Rarity
Outside-In		
External relationship management	H	M-H
Market responsiveness	H	M-H
Spanning		
IS-business partnerships	H	M-H
IS management/ Planning	H	M-H
Inside-out		
IS infrastructure	M-H	L-M
IS technical skills	M-H	L-M
IS development	M-H	M
Cost effective IS operations	M-H	L-M

H = High, M = Medium, L = Low

Focusing on the value and rarity attributes suggests that firms possessing superior external relations, market responsiveness, IS-business partnership, and IS planning/management capabilities are likely to have a greater degree of improved competitive positioning than those organisations that rely more on IS capabilities that

are internally focused (e.g. IS infrastructure, technology skills, IS development and cost efficient operations). For this reason the following proposition has been developed:

Proposition 2: Outside-in and spanning IS capabilities will have a greater impact on improved competitive positioning than inside-out IS capabilities (This proposition is shown diagrammatically in Figure 3.3)

Figure 3.3 Relationship between type of IS capability and improved competitive positioning

3.5 The role of IS capabilities in enabling sustained improved competitive positioning

The extent to which an IS-enabled improved competitive position is sustainable may well depend on the attributes of the IS capabilities that were facilitating its achievement. Consequently, the sustainability attributes of IS capabilities must be investigated.

As noted in chapter 2, the resource-based theory suggests that resources/capabilities can be split into 'ex ante' and 'ex post' limits to competition. More specifically, value, rarity and appropriability have been recognised as 'ex ante' limits, whilst inimitability, non-substitutability and immobility are viewed as 'ex post' limits to competition (Wade and Hulland, 2004). A competitive advantage can only be sustained if the appropriate 'ex post' limits are in place. However, it was felt that Wade and Hulland's (2004) three 'ex post' limits to competition were rather too complex, and that the framework would be simpler and more effective if a two limit approach, based upon Grant's (1991) work, was adopted. Grant (1991) argued that a firm's ability to sustain a competitive advantage depends upon the speed with which

firms can imitate their strategy. Moreover, imitation requires that a competitor overcome two problems. First is the information problem: what is the competitive advantage of the successful rival, and how is it being achieved (transparency)? Second is the strategy duplication problem: can the would-be competitor amass the resources and capabilities required to replicate the successful strategy of the rival (replicability)? Thus, if an organisation wishes to imitate the strategy of a rival, it must first identify the capabilities, which underline the rival's competitive advantage and then it must be able to acquire them (Grant 1991). Consequently for the purpose of this research, the ability of an IS capability to confer sustained improved competitive positioning will be measured in terms of transparency and replicability. Whilst the study has adopted a two measure approach, based upon the work of Grant (1991), it should be noted that these measures comfortably accommodate Wade & Hulland's (2004) alternative classification, as discussed below.

Transparency

For the purpose of this research transparency is defined as *'the ease with which competitors can understand how a rival's capabilities operate and contribute to its improved competitive positioning'*. This definition has been adopted as it incorporates the casual ambiguity[8] and social complexity[9] aspects of what Wade and Hulland (2004) define as *'imitability'*. Moreover, it aligns well with Grant's (1991) notion of *'transparency'*: in order to imitate a competing firms strategy you must firstly understand the nature of a successful rival's competitive advantage, and then discern how this advantage is being achieved. For example, even if a competitor could make educated guesses about the key features of Wal-Mart's logistics management system, its sheer scale and complexity would make a thorough understanding unlikely, and therefore the chances of a rival deploying a close replica are slim (Wade & Hulland, 2004).

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[8] Casual ambiguity exists when the link between a resource and the competitive advantage it confers is poorly understood (Wade and Hulland, 2004).

[9] Complexity is concerned with the multifarious relationships within the firm and between the firm and key stakeholders such as shareholders, suppliers and customers (Wade and Hulland, 2004).

Replicability

For the purposes of this research replicability is defined as *'the ease with which competitors can copy the required capabilities, to imitate the strategy of a rival organisation'*. This definition has been adopted as it combines both what Grant (1991) defines as *'transferability'*[10] and *'replicability'*[11]. Grant's (1991) definitions of transparency and replicability have been combined for the purpose of this research, as they are both concerned with the ability of a would-be competitor to assemble the capabilities required to imitate the successful strategy of a rival. Furthermore, this definition of replicability has been subscribed to as it subsumes Wade and Hulland's (2004) definitions of *'substitutability'*[12] and *'mobility'*[13].

Although individual capabilities can enable competitive advantage, it is suggested that competitive advantage, which is the consequence of superior capability in relation to a single performance variable, is easier to identify and comprehend (more transparent) than a competitive advantage that is based upon multiple, interacting capabilities conferring superior performance across several variables. For example, Grant (1991) suggests that Cray Research's success in the computer industry rests primarily upon its technical capability in relation to large, ultra-powerful computers making it a lot easier to identify how their superior performance has been derived than say IBM's superior performance which is multidimensional and more difficult to understand. It would be extremely difficult to distinguish and appraise the relative contributions to IBM's success of research capacity, scale economies in product development and manufacturing and sales service and technical support. Furthermore, a capability, which requires a complex pattern of coordination between large numbers of diverse resources, is more difficult to replicate than a capability, which rests upon the exploitation of a single dominant resource. This theory can also be applied to an improved competitive position that requires a complex pattern and coordination of

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[10] Transferability is concerned with the ability or an organisation to buy in the means to imitate success (Grant, 1991).

[11] Replicability is concerned with the ease with which capabilities can be imitated through internal investment (Grant 1991).

[12] A resource has low substitutability if there are few, if any, strategically equivalent resources that are, themselves, rare and imitable (Wade and Hulland, 2004; Amit and Schoemaker 1993).

[13] Imperfect mobility requires that firms are not able to acquire the capabilities required to imitate a rival's competitive advantage through open markets (Wade and Hulland, 2004).

capabilities instead of an improved competitive position that relies upon the exploitation of a single dominant capability. For example two of the simplest and best-known Japanese manufacturing practices are just-in-time scheduling and quality circles. Despite the fact that neither require sophisticated knowledge or complex operating systems, the cooperation and attitudinal changes required for their effective operation are such that few American and European firms have introduced either with the same degree of success of the Japanese companies. Based upon these arguments, the following proposition is proposed:

Proposition 3: The greater the degree to which the success of the host organisation's IS-enhancement is dependent upon IS capabilities, which are non-transparent and non-replicable, the greater will be their resulting degree of sustained improved competitive positioning. (This proposition is shown diagrammatically in figure 3.4)
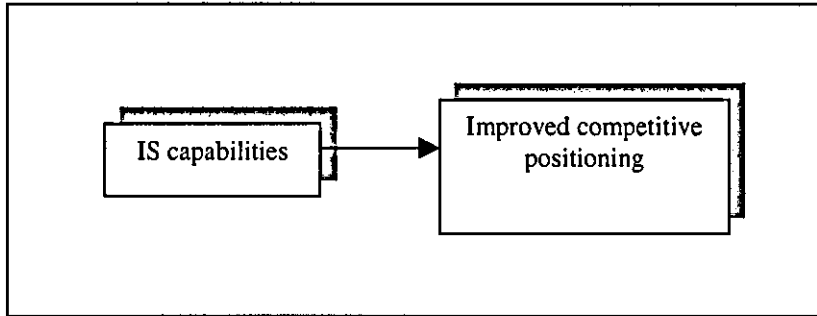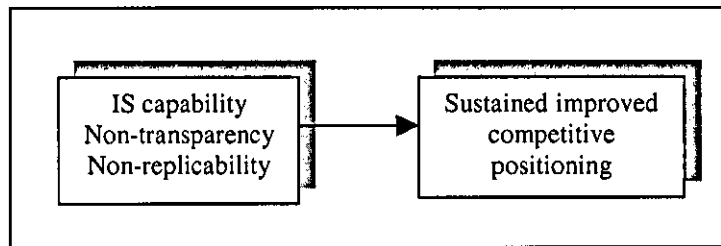

Figure 3.4 Relationship between IS capability non-transparency and non-replicability and sustained improved competitive positioning

As with proposition 1, proposition 3 is very general and it is felt more specific propositions can be made for different types of IS capabilities with regard to their impacts on sustained improved competitive positioning. It is proposed that the key drivers of long term competitive positioning are more likely to be the result of superior outside-in and spanning capabilities, than inside-out IS capabilities, as they tend to have a higher degree on non-transparency and non-replicability as presented in table 3.9 and discussed further below:

- **Non-transparency**[14]: It is recognised that outside-in and spanning capabilities will have a higher degree on non-transparency than inside-out IS capabilities because both of the later sets of capabilities will develop and evolve uniquely for each firm. Moreover, these capabilities are likely to be socially complex (Makadok, 2001; Henderson and Cockburn, 1994).

- **Non-replicability:** It is recognised that outside-in and spanning capabilities will have a higher degree of non-replicability than inside-out IS capabilities because the later two are less mobile. Mobility captures the extent to which the underlying capabilities can be acquired through factor markets. IS infrastructure, once established, is easily disseminated to other organisations and is thus highly mobile. Technology skills, as well as the IS development and cost efficiency capabilities can all be acquired via the market; thus they are also relatively mobile. In contrast, external relationship management, market responsiveness, IS planning/management and IS-business partnership capabilities are generally not readily available in factor markets. Therefore, the mobility of these later four capabilities is expected to be low.

Table 3.9 The comparative non-transparency and non-replicability of IS capabilities (After Wade and Hulland 2004)[15]

	Non-transparency	Non-replicability
Outside-In		
External relationship management	H	H
Market responsiveness	H	H
Spanning		
IS-business partnerships	H	H
IS management/ Planning	M-H	M
Inside-out		
IS infrastructure	M	L
IS technical skills	M	L-M
IS development	M	M
Cost effective IS operations	M-H	M

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[14] This research is concerned with sustaining improved competitive positioning, hence it is concerned with the non-transparency and non-replicability of an organization's IS capabilities. Consequently these terms will be used when investigating the sustainability attributes of IS capabilities.

[15] Although Wade and Hulland (2004) do not use the terms non-transparency and non-replicability, non-transparency is effectively what they term imitability and non-replicability is what they term mobility.

Focusing on these attributes would suggest that firms possessing superior external relations, market responsiveness, IS-business partnership, and IS management/ planning capabilities are likely to have a longer duration of sustained improved competitive positioning of business process performance than competitors that rely more on capabilities that are internally focused (e.g. IS infrastructure, technology skills, IS development and cost efficient operations). For this reason the following proposition has been derived:

Proposition 4: Outside-in and spanning IS capabilities will have a greater impact on sustained improved competitive positioning than inside-out IS capabilities. (This proposition is show diagrammatically in figure 3.5).
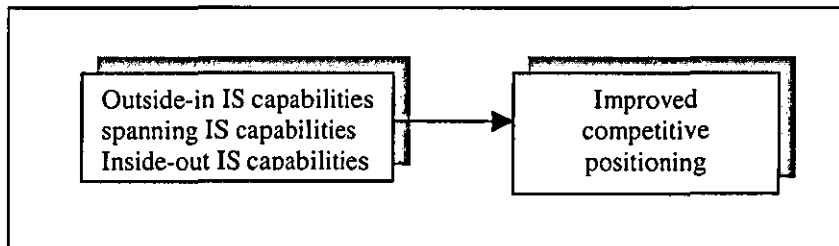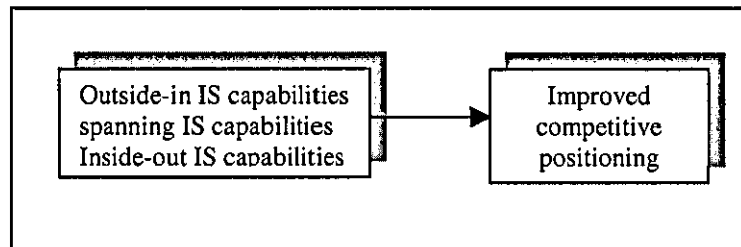

Figure 3.5 Relationship between type of IS capability and sustained improved competitive positioning

Although empirical studies have found a positive association between IS capabilities and organisational performance using the RBV (Bharadwaj et al. 1998; Santhanam and Hartono, 2003), very little work has looked at sustaining the advantages over time. By focusing on the non-transparency and non-replicability elements of IS capabilities, it enables this research to incorporate a sustainability element answering the call by Willcocks et al. (1997) and Wade and Hulland (2004) for a greater focus on sustainability.

3.6   Direct verses indirect impact of IS-enhancements on competitive positioning

With the identification of resource complementarity (see chapter 2) it can be surmised that IS-enhancements can contribute to improved competitive position and sustained improved competitive positioning either directly or indirectly (Wade and Hulland, 2004):

3.6.1 Direct IS-enhancement impacts on competitive positioning

As previous definitions of the term *'direct'* impact on improved competitive positioning have been rare, for the purpose of this study, Powell and Dent-Micallef's definition of 'direct', *'in and of themselves'* has been adapted to define the direct impacts of an IS-enhancement as *'the effects an IS-enhancement, in and of itself, has on improved and sustained improved competitive positioning'*. A good example of the direct effect of an IS-enhancement was witnessed at Chrysler, where cost savings of $5 per document were realised through the implementation of an EDI system. Chrysler manufactured 2.2 million vehicles and had 17 million EDI transactions with its suppliers. As a result, simply through the implementation of an EDI system the savings from electronic document presentation and transmission for Chrysler amounted to about $38 per vehicle.

3.6.2 Indirect IS-enhancement impacts on competitive positioning

It is thought that for an organisation to gain an improved competitive position, when competing organisations are likely to experience similar direct effects from an IS-enhancement, they have to complement[16] the IS-enhancement with organisational resources/capabilities. Thus, the indirect impacts of an IS-enhancement will be looked at in terms of the increased value that arises from an IS-enhancement when it is leveraged by existing organisational resources/capabilities or when it is supported by

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[16] The increased advantage from an IS-enhancement that arises when it produces greater returns in the presence of existing, or changes to, organisational resources/capabilities than it does alone.

changes to organisational resources/capabilities, as the following discussion makes clear:

- *Leveraging existing organisational resources/capabilities:* Powell and Dent-Micallef (1997) offer the view that IS can create advantage by leveraging or exploiting pre-existing organisational resources/capabilities. Although Powell and Dent-Micallef (1997) use the terms *'leverage'* and *'exploit'*, no clear distinction is made between the two and they have been used interchangeably (Powell and Dent-Micallef, 1997). Thus, for the purposes of this research the term *'leveraging'* will be used to cover both, as it is the prevailing term used throughout the literature. Using the example of an EDI system once more it is recognised that once implemented, most organisations should be able to realise the same direct impacts from such a system. However, if an organisation uses its pre-existing capabilities to leverage the EDI system, then it can result in increased value being realised. For example, when an EDI implementation is complemented by existing supplier trust, the host organisation can generate improved competitive positioning, above competitive parity, even if their competitors have a similar EDI system. The EDI system will directly enable you to enhance supplier relationships, while the pre-existing supplier relationship will maximise the EDI system's inherent information-sharing capabilities.

- *IS enabled organisational change:* an IS-enhancement can also be leveraged by investing in organisational capabilities that increase its value. Companies using IS to change the way they conduct business often say that their investment in IS complements change in other aspects of the organisation. These complementarities have a number of implications for understanding the value of IS investments. For example, producing simple, standardised products is an efficient way to utilise inflexible, scale-intensive manufacturing technology. However, as the cost of automated information processing has fallen it is unlikely that the same work practices of the previous era will also best lever the value of cheap information and flexible production. An example of an organisation that had to invest in organisational capabilities to leverage

the value of an IS enhancement is Macro Med (Brynjolfsson et al. 1997). In a desire to provide greater product customization and variety, Macro Med made a large investment in computer integrated manufacturing. However, the new system initially fell well short of management expectations for greater flexibility and responsiveness. Investigation revealed that line workers still retained many elements of the now-obsolete old work practices, not from any conscious effort to undermine the change effort, but simply as an inherited pattern of behaviour. Thus, before any improved competitive positioning could be derived from the system the old obsolete work practices had to be changed and the employees retrained. The resulting productivity improvements were significant enough that management ordered all the factory windows painted black to prevent potential competitors from seeing the new system in action. While other firms could readily buy similar computer controlled equipment, they would still have to make the larger investment in organisational learning before fully benefiting from them and the exact recipe for achieving these benefits was not trivial to invent.

It has been suggested that IS-enhancements can either directly or indirectly impact competitive positioning. As currently conceptualised three competing arguments can be recognised:

1. The degree of improved competitive positioning will be greater in those instances where the direct IS-enhancement contribution to improved competitive positioning is more dominant than the indirect IS-enhancement contribution.

2. The degree of improved competitive positioning is not dependent upon the degree to which the IS-enhancement directly or indirectly contributes to improved competitive positioning.

3. The degree of improved competitive positioning will be greater in those instances where the indirect IS-enhancement contribution to improved competitive positioning is more dominant than the direct IS-enhancement contribution.

To date, no empirical work has compared and contrasted both the direct and indirect impacts of IS-enhancements to identify which confers the greatest degree of improved competitive positioning. Hence, it is not possible to draw any clear hypothesis about which of these three propositions is most likely to be correct. However, there is a growing body of literature which suggests that improved competitive positioning is generally derived from organisational changes that complement the introduction of an IS rather than the IS itself (Ward et al. 1996; Strassman, 1990). By inference, the value delivered from IS investment are facilitated through organisational change that accompanies the system. For this reason the following has been proposed:

Proposition 5: The degree of improvement in competitive positioning will be greatest ,in those instances where the indirect contribution of the IS-enhancement is greater than the direct contribution. (This proposition is represented diagrammatically in figure 3.6).
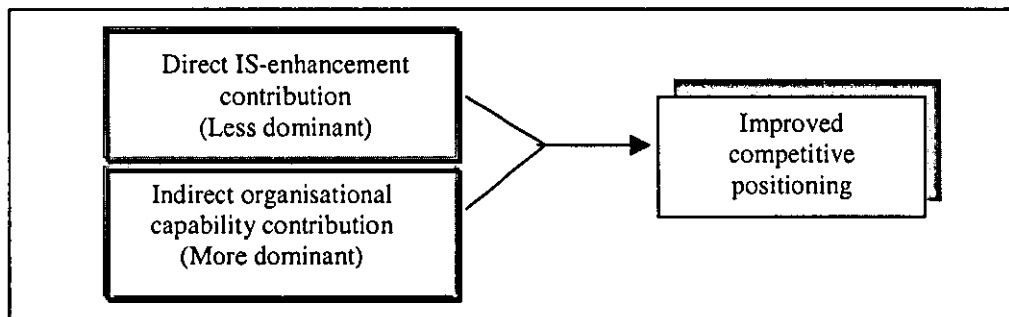
Figure 3.6 Relationship between direct and indirect impacts on
improved competitive positioning

As with the direct and indirect impacts of an IS-enhancement on improved competitive positioning, debate still remains surrounding the direct and indirect impacts of an IS-enhancement on sustained improved competitive positioning. Once again three competing arguments can be made:

1. The degree of sustained improved competitive positioning will be greater in those instances where the direct IS-enhancement contribution to sustained improved competitive positioning is more dominant than the indirect IS-enhancement contribution.

2. The degree of sustained improved competitive positioning is not dependent upon the degree to which the IS-enhancement directly or indirectly contributes to sustained improved competitive positioning.

3. The degree of sustained improved competitive positioning will be greater in those instances where the indirect IS-enhancement contribution to sustained improved competitive positioning is more dominant than the direct IS-enhancement contribution.

No empirical work to date has compared and contrasted both the direct and indirect impacts of IS-enhancements to identify which confers the greatest degree of sustained improved competitive positioning. However, based on the fact that IS can change very rapidly (Clemons, 1986; Cecil and Goldstein, 1990; Senn, 1992) and IS development life cycles are ever shortening, the sustained improved competitive positioning derived directly from the IS-enhancement will not be as great as the sustained improved competitive positioning derived indirectly through complementary organisational resources/capabilities. Moreover, it is argued that complementary organisational resources/capabilities, for example, culture is difficult to articulate (Reed and DeFillippi, 1990; Fiol, 1991), select manufacturing processes are difficult to change and require many stops and starts to evolve toward a successful system (Brynjolfsson et al. 1997) and hence require years to imitate. Therefore, the following is proposed:

Proposition 6: The degree of sustained improved competitive positioning will be greatest in those instances where the indirect contribution of the IS-enhancement is greater than the direct contribution. (This proposition is represented diagrammatically in figure 3.7).
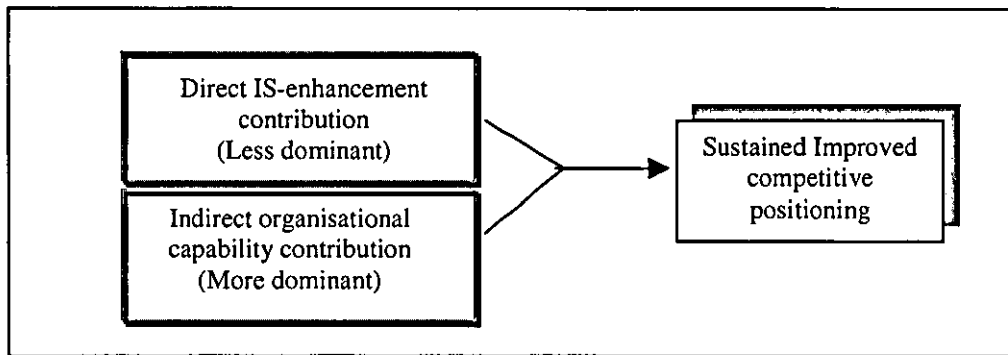
Figure 3.7 Relationship between direct and indirect impacts on
Sustained improved competitive positioning

3.7   Summary

This chapter has shown the development of the research propositions. Based on these research propositions, and on figures 3.1 through to 3.7, a conceptual framework has been developed to identify how the implementation of an IS-enhancement can enable improved competitive positioning and sustained improved competitive positioning (see figure 3.8). Moreover, the chapter identified a typology of IS capabilities that contribute to the success of the IS-enhancement and that the success of the IS-enhancement will be measured at the business process level. Consequently, a generic set of business processes that are universally acceptable to all businesses has been developed. The next chapter will demonstrate how the research carried out in this study was designed to investigate the research propositions discussed in this chapter.

IS-enabled sustainability framework

Figure 3.8
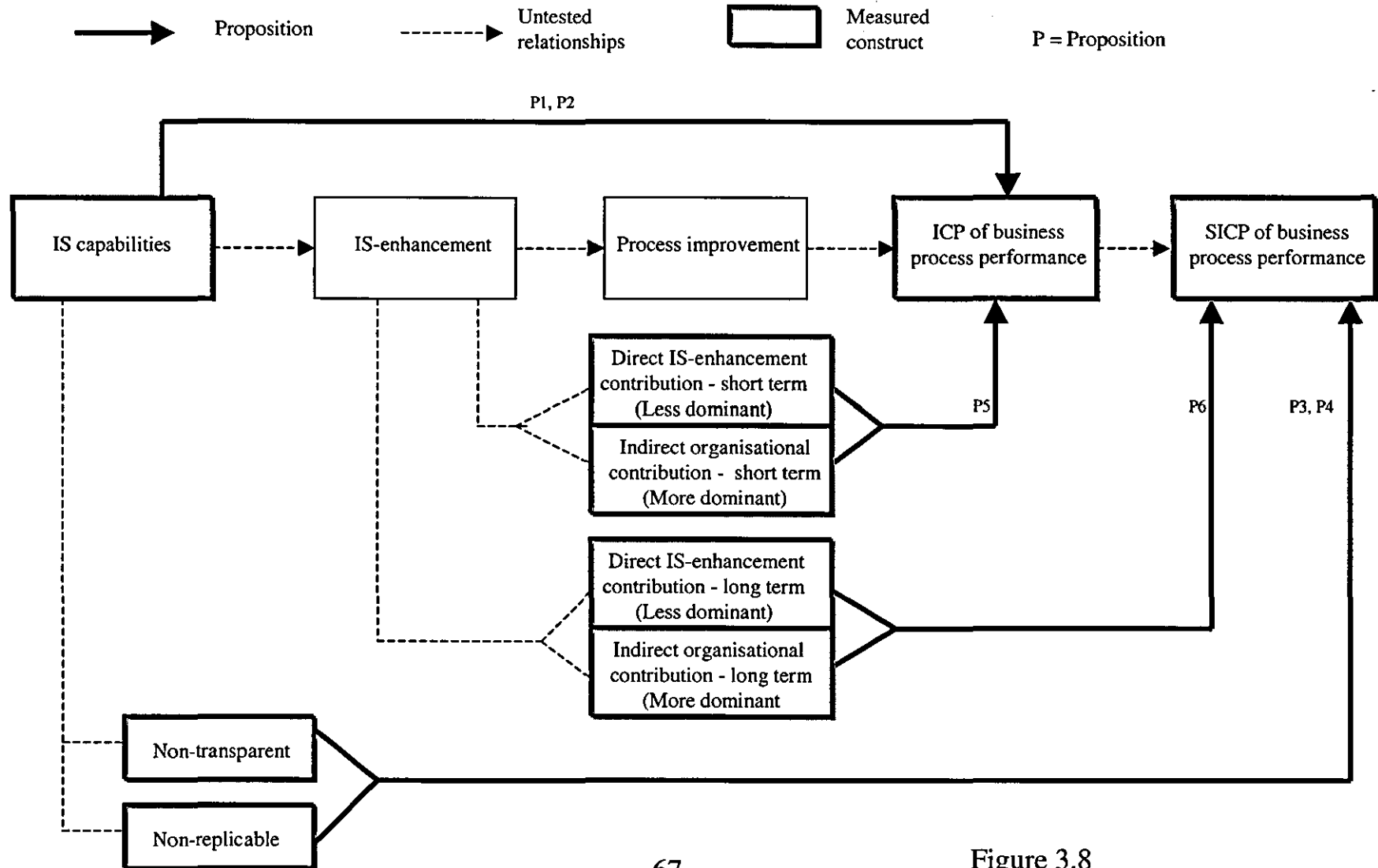
Chapter 4

Research Design

4.1   Introduction

In the previous chapter, the theoretical framework was developed on which to base this research and address the research propositions. The next stage is to identify the appropriate research methods. This chapter commences with a critical review of the major research strategies that have been used within the field of IS research before presenting and justifying the particular strategies chosen for this study - a mixed method strategy combining quantitative and qualitative data collection methods. More specifically, an Internet-mediated survey is coupled with detailed follow-up interviews; it was felt this would be the most effective way to ensure that a rich, comprehensive and well-validated data set would be created. The sampling process is then discussed and the chapter concludes with a review of the potential errors that may occur within the research and the approaches that have been adopted to minimise them.

4.2   Research Strategies

No single research strategy is always necessarily superior, it all depends on what we need to find out and on the type of question to which we seek an answer (Oppenheim, 1992). Subsequently, some of the most commonly used research strategies in the field of IS, as identified by Galliers (1992) will be critically reviewed.

Laboratory Experiments: The key feature of a laboratory experiment is the identification of the precise relationship between variables in a setting especially created by the researcher for the investigation of the phenomenon. The advantages of the laboratory approach is that the researcher has the ability to isolate and control a

small number of variables by holding other relevant factors constant. These variables can then be intensively studied. The limitation of the laboratory experiment is the extent to which identified relationships exist in the real world.

Field Experiments: Field experiments are an extension of laboratory experiments into a real world environment such as business organisations. The main element of this approach is to construct an experiment in a more realistic environment than in an artificial situation of a laboratory. Again the advantages of this approach as with laboratory experiments is the possibility of isolating and controlling a small number of variables that can then be intensively studied. The disadvantages of this approach, unlike laboratory experiments, is the difficulty in finding an organisation prepared to be experimented on. Furthermore, replication is problematic in that it is extremely difficult to achieve sufficient control to enable the replication of the experiment to other organisations with only the study variables being altered.

Simulation: Simulation is a *'method used to solve problems which are difficult or impossible to solve analytically by copying the behaviour of the system by generating appropriate random variables'* (Chatfield, 1988 quoted in Galliers, 1992: p. 156). Its major limitation as with laboratory and field experiments relates to the difficulties associated with devising a simulation that accurately reflects the real world situation it is supposed to replicate.

Forecasting and Futures Research: This approach is the systematic exploration of what might come to be. Its major advantage is to provide an early prediction about problems that might lie ahead and this can increase the probability of avoiding these problems. However, these insights are dependent on the precision of past data or the experience of the scenario builder. Another limitation is that validation criteria do not exist.

Case Studies: involve a small number of samples or *'cases'* and are commonly used in the study of less understood issues. It involves in-depth analysis through interviews or group discussions of a number of cases from which conclusions can be drawn. It is best used in studies that require a deeper understanding of how things happen rather than studies looking at relationships (Gordon and Langmaid, 1988). The advantage of

this approach is that it enables the capture of reality in considerably greater detail than is possible with the survey approach. Its main weakness is that it is usually confined to a small number of organisations or events because it is very time consuming, and it is difficult to acquire similar data from a statistically meaningful number of organisations to make generalisations.

Action Research: The key feature of this approach is that of applied research, where there is an attempt to obtain results of particular value to groups with whom the research is allied, while at the same time adding to theoretical knowledge. The strengths of this approach include the very practical benefits that are likely to occur to client organisations as a result, and in addition, the researcher's biases are made overt in undertaking the research (White, 1985). The weaknesses of this approach, as with case studies, include the fact that its application is usually restricted to a single event/organisation, raising the difficulties associated with being able to acquire data from a statistically meaningful number of organisations to make generalisations.

Surveys: Survey research involves collecting a large amount of data from a sizable population by obtaining information directly from the participants by means of a questionnaire or interview (Leedy, 1974). The researcher has very clearly defined independent and dependent variables and a specific model of the expected relationships, which are tested against observations of the phenomenon. Surveys can be very effective in gathering data about individual preferences, expectations, past events and private behaviours. The advantages of the survey approach include the fact that results can be generalised to represent the views of the population because it involves a large number of respondents, representatative of the population. A potential limitation of the survey approach is that it requires a lot of time and effort to be spent in designing and piloting the questionnaire (Saunders et al. 1997).

Phenomenological Studies: According to Vogel and Watherbe (1984), phenomenological studies are based more on opinion and speculation than observations. According to Galliers (1992), this research strategy tends to be more of a free-flowing process (i.e. less structured) and is more likely to be an individual, rather than group activity. Its advantage lies in the creation of new ideas and insights and therefore is useful in building theory that can subsequently be tested by more

formal means. Its disadvantages lie in the unstructured, subjective nature of the research process.

The summary helps identify the choices available in the selection of an appropriate research strategy. However, before a particular research strategy is chosen for this research, it must be noted that researchers are not restricted to adopting a single research approach, as there is also the option of combining methods. In particular, there is much value in combining qualitative and quantitative research methodologies (Reichardt and Cook, 1989; Jick, 1979; Trend, 1989). Thus, before the identification of the research strategies adopted for this research, it is appropriate to review the option of combining both qualitative and quantitative research strategies.

4.3   Combining qualitative and quantitative research strategies

Although most researchers do either quantitative or qualitative research work, some researchers have suggested combining one or more research methods in one study (called triangulation) in order to build a wider picture of the phenomenon under investigation (Reichardt and Cook, 1989), increase the validity of findings (Jick, 1979) and to help explain diverging results (Trend, 1989). Identified in figure 4.1 are six possible research designs that employ both qualitative and quantitative measures as identified by Cavaye (1996) and Miles and Huberman (1994).

Cavaye (1996) argues that it is possible to collect both qualitative and quantitative data, one after the other from the same site. The first design presented in figure 4.1 initially involves qualitative observations to help develop a theoretical structure that underlines a quantitative survey. The second design involves firstly conducting a quantitative survey and then conducting qualitative probing, usually a survey to gain further understanding of the quantitative findings. The third design involves both quantitative and qualitative data being collected together at the same time. The fourth design employs a multi-wave survey, conducted in parallel with continuous fieldwork. The first wave may indicate specific areas of study to which the researcher should pay particular attention. The later fieldwork findings may then provide further revisions for the second wave. The fifth design alternates the two methods, one after the other;

the first stage involves exploratory qualitative data collection that leads to the development of a quantitative data instrument such as a questionnaire. The results from the questionnaire can be studied in more detail in a further round of qualitative research. Finally, the sixth design also uses an alternating style; first a survey is taken that points the researcher to a particular phenomenon. The researcher then employs qualitative research to develop a stronger conceptual underlying of how things work and a quantitative experiment is designed to test the resulting hypotheses.

Figure 4.1 Illustrative Designs linking Qualitative (Qual) and Quantitative (Quant) data
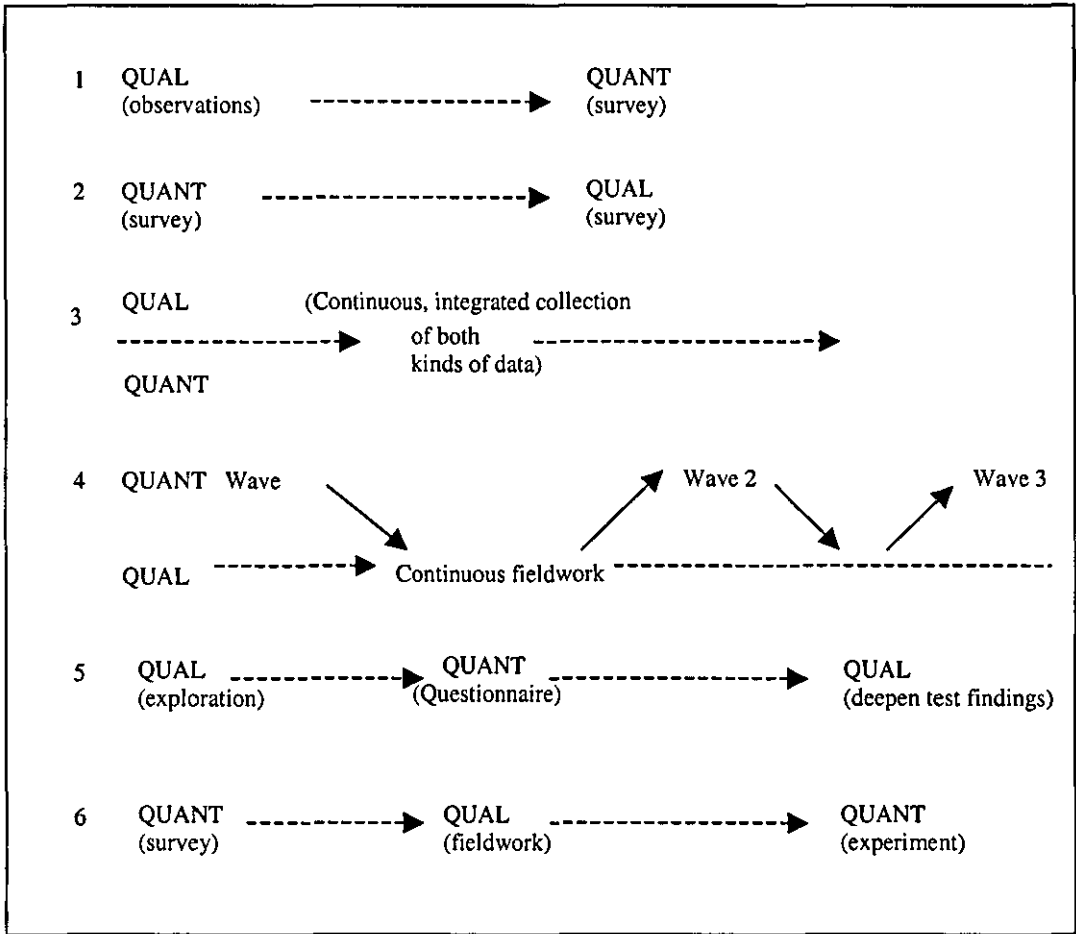
The previous sections have identified the choices available in the selection of an appropriate research strategy, the benefits and ways of combining both qualitative and quantitative research design methods. However, which research approach is most appropriate depends on the research requirements. The next section identifies the most appropriate research strategy for the purpose on this research.

4.4   Selection of Research Strategy

After reviewing the various types of research strategy and the option of combining both qualitative and quantitative methods, it was concluded that the survey approach would provide the most appropriate balance between the competing requirements associated with the research. The requirements of this research include accepting or rejecting the propositions outlined in chapter 3, gaining a richer understanding of why the propositions have been accepted or rejected and having the ability to generalise[17] the research in natural settings. Consequently, the experimental (laboratory and field) and forecasting strategies were put to one side, as they do not provide data from natural settings. Furthermore, the desire to provide generalisable results within a specific time scale that clearly identified cause and effect prohibited the use of action research or a phenomological approach. Moreover, although the research sought to gain a rich understanding for accepting or rejecting the research propositions, this could be done through focused questions rather than the more time consuming process of conducting very detailed case studies.

Consequently it was decided that the most effective research approach for this study was to combine a quantitative survey with a follow up qualitative survey, therefore adopting Cavaye's (1996) two stage mixed method design, set out in figure 4.1 (illustration 2). For the purposes of this research, Cavaye's (1996) two stage mixed method design was felt be more appropriate than any of the other five mixed method designs (illustrated in figure 4.1) as despite the paucity of empirical work in this domain, many theoretical contributions exist, from which sound research propositions can be derived. Consequently, there was no need for any prior in-depth qualitative exploration to conceptualise areas of interest, and to develop propositions for testing. Furthermore, by conducting the quantitative survey first it enabled the respondent to focus their attention on the specific areas of interest, which could then be explored more thoroughly, with the same respondent, through a qualitative, follow-up interview. This dual approach, ultimately produced findings that enabled a deeper understanding of specific areas of IS-enabled sustained improved competitive

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[17] 'Generalisability is best thought of as a matter of the 'fit' between the situation studies and others to which one might be interested in applying the concepts and conclusions of the study' (Schofield, 1989).

positioning, whilst also being generalisable to other organisations seeking to gain advantages through IS investments. The first stage of conducting the quantitative survey and the second stage of conducting the qualitative survey are discussed further below.

4.4.1 Step 1 quantitative survey

As the first step in the research strategy involves obtaining quantitative data from a large number of respondents in order to prove or disprove the research propositions, this study adopted a questionnaire survey. Now that it has been identified a questionnaire survey will be used to prove or disprove the research propositions, the next step is to identify how the questionnaire will be administrated. Methods of administrating a questionnaire include face-to-face, telephone, mail (Dillman, 1978; Frankfort-Nachmias and Nachmias, 1996, May, 1997) and more recently the Internet, via e-mail or the World Wide Web (Burton, 2000; Dillman, 2000) and are critically reviewed below:

- *Face-to-face:* administration of a questionnaire involves a very structured questioning approach with the wording of the questions and the order in which they are asked standardised for each respondent (Fielding, 1993). Respondents are expected to choose an answer from a series of alternatives given by the researcher. It provides information that is quantified, ensures comparability of questions across respondents and makes certain the main topics are covered. The advantage of administrating a questionnaire face-to-face is that questions can be clarified if they are not clearly understood. The major disadvantages are the geographical limitations that may be imposed on the survey and the considerable resources needed if such a survey is to be carried out nationally. It is both time consuming and costly.

- *Telephone:* administration of a quantitative questionnaire is very similar to face-to-face administration in that the questions will be very structured and the wording and ordering of the questions will be standardised across respondents. Although administrating a questionnaire by telephone will be quicker than administrating it

face-to-face it is still very time consuming and costly. Another disadvantage is that the respondent could unilaterally terminate the interview without warning or explanation by hanging up the phone.

- *Mail:* administration of a quantitative questionnaire will once again use structured questions. Its advantages are that a substantial amount of information can be obtained through structured questions from a geographically dispersed sample at minimal cost (Burton, 2000). However, Jobber (1991: p. 176) warned that the disadvantage of this method is that too many questions that require effort on the part of the respondents will result in non-response.

- *Internet:* administration of Internet questionnaires have very similar benefits to the mail questionnaire administration method in that a substantial amount of information can be obtained through structured questions from a geographically dispersed sample through structured questions at minimal cost. So far, it is possible to identify two main Internet based questionnaire administration techniques, (1) web-based questionnaires and (2) e-mail questionnaires. Both of these methods however do rely on e-mail to inform respondents about the questionnaire. In the case of e-mail, questionnaires can be e-mailed to the respondents either within the text of the e-mail or within an attached file, with responses returned by email. For web-based questionnaires, respondents are e-mailed an Internet link from which they access the questionnaire. Despite several advantages of these methods such as low costs, high speed and early recognition of valid addresses (Burton, 2000), research suggests that response rates, particularly to e-mail surveys, are not as high as mail surveys (Schaefar and Dillman, 1998).

After considering the various methods for administrating the qualitative questionnaire in the previous section, it was felt face-to-face and telephone administration should be discarded due to the time and costs involved. The two remaining methods of administration are by mail and Internet. As this research seeks to identify some quite complex constructs it was felt the best method of administration for the questionnaire would be web-based. A web-based method of administration was adopted over mail and e-mail, as web-based questionnaires have the advantage of being able to include

graphics, moving images and automatic filtering questions so the respondent is taken directly to the next question rather than find it themselves. According to Yun and Trumbo (2000) this *'lessens the respondents' cognitive load'* resulting in a smoother survey experience and more accurate data (Stanton, 1998). Selwyn and Robson (1998) conclude that the primary advantage of e-research methods are their friendliness to the respondent. As identified in chapter 3, this research will measure improved competitive positioning and sustained improved competitive positioning at the business process level. However, it is likely that only one or two of the business processes will have been improved as a result of the IS-enhancement. By using a web based questionnaire, questions can be filtered out that are not appropriate to the respondent, meaning the respondent will be able to identify which processes were improved and only see and answer the questions relevant to these processes. This is something that could not be done with mail or e-mail questionnaires as all questions would have to be shown regardless of their relevance to the respondent. By administrating a web-based questionnaire via the Internet it was possible to reduce the size of the questionnaire down from twelve pages, which would have been far too long and intimidating for the respondent, to just over two pages. Consequently improving the response rate to the questionnaire.

Other advantages of a web-based questionnaire over mail questionnaires are: reduced costs (no envelope or postage); elimination of the tedious mail process as it is possible to send the same e-mail to multiple addresses in one action, a large 'mail-shot' of subjects is relatively straightforward; questionnaires are quicker to turnaround as delivery and return can be instantaneous (Tse, 1998). Care must however be taken with a web-based questionnaire to ensure compatibility so that the questionnaire can be accessed using different software and operating systems (Yun and Trumbo, 2000). Programming errors can also create problems, for example, in Smith's (1997) web-based survey, programming errors prevented some respondents from accessing all of the pages in the survey and server errors also prevented respondents accessing the survey altogether. In light of the potential problems associated with administrating a web based questionnaire it is essential that it is properly pre-tested to ensure no programming errors have occurred that could affect the validity of the questionnaire.

4.4.2 Step 2 Qualitative Survey

Once the quantitative questionnaire had been conducted the next step was to conduct a qualitative survey with the same respondents who had initially completed the online questionnaire. This enabled their responses to be validated, whilst also allowing specific areas of interest, to be probed more deeply, thus deepening and enriching our understanding of IT-enabled sustained improved competitive positioning.

Qualitative research interviews are, according to Kvale, (1996) attempts to understand the world from the subject's point of view, to uncover their lived world prior to scientific exploration. The advantage of conducting interviews is that it enables the researcher to use a semi-structured interviewing technique. This involves the interviewer asking certain questions the same way each time, but having the freedom to alter their sequence and probe for more information. The interviewer is therefore able to exert some flexibility over the interview style tailoring it to the level of comprehension and articulacy of the respondent. It also allows the interviewer to respond to the possibility of informants, in responding to a question, providing answers to questions that are going to be asked at a later point (Fielding, 1993). These allow the broad focus of the investigation to be maintained but also provide the opportunity for the capture of wider issues that may help the researcher form a fuller understanding of the phenomena under investigation. They also allow the interview to be guided by the perceptions and interests of the respondent while maintaining a level of comparability between responses. Interviews are ordinarily quite direct and a great deal of information is generally obtained (Kerlinger, 1986).

The next step with an interview survey is to identify how the interviews will be administrated. The two most common ways of administrating interviews are either face-to-face or via the telephone. These two methods are critically reviewed below:

- *Face to face interview*: Conducting a face to face interview has very similar strengths and weaknesses to conducting a questionnaire face to face (significant resources are needed and it can be time consuming), except the researcher is able to conduct a semi-structured interview technique instead of a structured technique

enabling the researcher to adapt the questions asked as necessary and gain much richer information (Fielding, 1993).

- *Telephone interviews:* Again conducting interviews via telephone enable a semi-structured interview technique to be used enabling the researcher to adopt the questions asked as necessary and gain much richer information (Fielding, 1993). However although telephone interviews can be expensive they do not require as many resources as conducting interviews face to face but the respondent is able to terminate the interview without warning or explanation.

After considering the two methods of conducting qualitative interviews it was decided that both methods would be adopted. If the respondents were local, a face-to-face interview would be conducted. If not, then the interview would be conducted via telephone.

4.5   The sampling process

Now that the research objectives have been clearly identified (Chapter 3) and the appropriate research strategies have been chosen (Section 4.4), the next step is to identify the sampling frame. Sampling is the *'process of selecting a sufficient number of elements from the population so that in studying the sample, and understanding the properties or the characteristics of the sample subjects, we will be able to generalise the properties or the characteristics of the population elements'* (Sekaran, 1992: p.226-227). By studying a sample rather than the entire population is also likely to lead to more reliable results, mostly, because there will be less fatigue, and hence fewer errors in collecting data. (Churchill, 1995).

In order to identify a representative sample, a four-step process has been adopted (see figure 4.2); each of the four steps is now described briefly to show how it was adopted in this study.

Figure 4.2 The sampling process

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┌─────────────────────────────────┐
│           Step 1                │
│   Define the study population   │
└─────────────────────────────────┘
                 ▼
┌─────────────────────────────────┐
│           Step 2                │
│    Identify sampling frame      │
└─────────────────────────────────┘
                 ▼
┌─────────────────────────────────┐
│           Step 3                │
│   Select a sampling method      │
└─────────────────────────────────┘
                 ▼
┌─────────────────────────────────┐
│           Step 4                │
│   Determine the sample size     │
└─────────────────────────────────┘
```
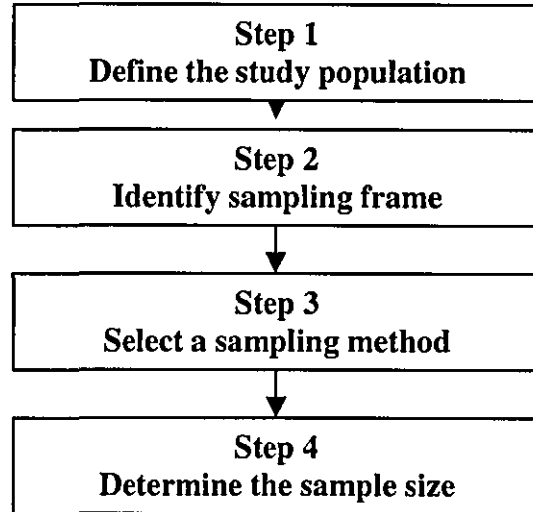
4.5.1 Step 1: Defining the study population

Churchill (1995: p.574) defined a study population as *'the totality of cases that conform to some designated specifications. The specifications define the elements that belong to that target group and those that are to be excluded'*. The population for this research was defined as practicing managers in large private sector organisations, for whom information systems play an important role in their working lives. It was envisaged that this type of population would be the most suitable for giving meaningful responses. More specifically, as this research is looking at the competitive impacts of information systems it was decided that it should be targeted at business managers, as they would be best placed to provide insights into any improvements in competitive positioning that could be realised from a specific IS-enhancement. Although the questionnaire contains questions concerning IS capabilities that contributed to the success of the IS-enhancement, it was felt with the increasing commitment and involvement of business managers towards IS investment (e.g. Dutta, 1996; Dvorak et al. 1997; Peppard et al. 2000) they should have the appropriate knowledge to be able to answer the questions. Furthermore, large organisations, which Gorton (1999) and O'Regan and Ghobadian (2004) identified as having 250 employees or more, have been targeted based on the premise that small organisations (less than 250 employees) have few, if any dedicated IT staff (Premkumar and King, 1992; Fulford and Doherty, 2002) and thus are unlikely to have the potential to posses

the IS capabilities under investigation. Private sector organisations were targeted because public sector organisations, for example a hospital is unlikely to think in terms of competitive positioning.

4.5.2 Step 2: Identifying the sample frame

The second step in the sample selection process is the identification of the sample frame; this involves listing the elements from which the actual sample will be drawn. In light of the sensitive subject matter, namely the source of sustained competitive advantage, an opportunistic approach has been considered in order to gain access to organisations. Whilst the potential weaknesses of this approach are well known (e.g. Sproull, 1995), Many researchers (e.g. Buchanan et al. 1988); Hoffman, 1980; Griffiths and Finlay, 2004) advocate the researcher exploiting professional and personal ties with individuals or organisations that satisfy the research criteria. Consequently the sampling frame will be shaped largely by constraints. The proffered sampling frame has been reworked around them, thus supporting Buchanan et al.'s (1988, p 54) remark that '*in the conflict between the desirable and the possible, the possible always wins*'.

In keeping with the opportunistic approach promoted by Buchanan et al. (1988) and Hoffman (1980), the sampling frame was constructed from professional and personal ties. The professional and personal ties consisted of the MBA students at Aston and Loughborough Universities, the managers of undergraduate students on their placement year from both the manufacturing department and the Business School at Loughborough University and finally members of the Alumni association at Loughborough University and Bromsgrove School. It wasn't considered likely that there would be any link between those companies that had established a link with the university and the way in which they used IS; thus, it was considered that the sample was representative of the population under investigation.

4.5.3 Step 3: Selecting a sampling method

The sample members were selected from the sample frame using a probability sampling method [18]. This ensured that only one practicing manager from each organisation who used IS in their working lives and had an e-mail address were selected.

4.5.4 Step 4: Determining the sample size

The fourth and final step in the sampling design process is to identify the number of respondents required for the sample. A total of 1160 organisations were used in the survey. Table 4.1 presents a breakdown of the number of people selected from the different professional and personal ties.

Source	Number
MBA Aston	100
MBA Loughborough	90
Managers Undergraduate	120
Alumni association	400
Bromsgrove School	450
Total	1160

Table 4.1 Breakdown of sample selected from professional and personal ties

4.6   Study error

This section identifies any errors that may occur within the study and discusses the strategies that will be used to guard against them. The two major elements of study error are (1) sampling error and (2) non sampling error. Combining these two types of error will give the total error of the study. Figure 4.3 identifies the different types of sampling errors and non-sampling errors, each of which are discussed in turn.

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[18]   Selection of sample members either on the basis of the judgment of the researcher or some other non-random process (Green et al. 1988).
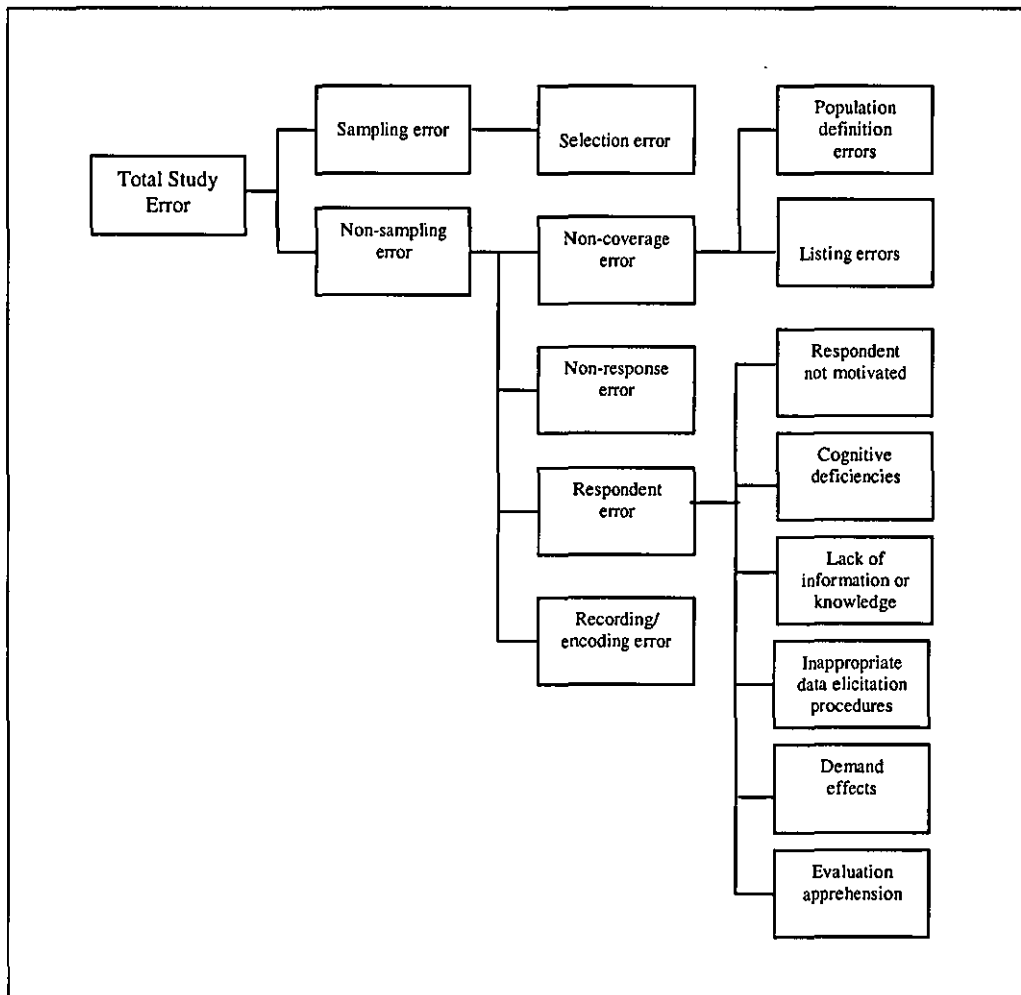
Figure 4.3 Study error

4.6.1 Sampling error

Sampling error is the result of surveying only some, and not all, elements of the survey population (Dillman, 2000). Subsequently, even if two studies start with the same population, differences could appear in the results. Although it must be recognised this type of error always exists at some level when a sample is drawn, it can be reduced through larger samples but cannot be eliminated completely unless one conducts a census (Lindner et al. 2001).

Selection error: can occur from the improper selection of subjects from the sampling frame (Sekaran, 1984). Selection error is much more common in non-random sampling because it is impossible by definition for these methods to control the

probability that a respondent is selected into the sample. It is recognised that selection error will occur in this research, as the sampling method used is non-random. However, as Buchanen et al. (1988) remark, *"in the conflict between the desirable and the possible, the possible always wins"*. Due to the complexity of the questionnaire it was felt if respondents were not specifically selected, based on their appropriateness to answer the questionnaire and thus incurring some selection error, the questionnaire would have not yielded an adequate response rate with which to prove or disprove the research propositions.

4.6.2 Non-sampling errors

Non-sampling errors are viewed as consisting of 4 types: non-coverage errors, non-response errors, respondent errors and recording and encoding errors. Each of which are discussed below:

Non-coverage error: occurs when there is an omission, duplication or wrongful inclusion of the units in the population. Omissions are referred to as undercoverage, while duplication and wrongful inclusions are called overcoverage. These errors usually occur as a result of population definition errors and/or listing errors.

Population definition errors: arise through inappropriately defined or insufficiently precise operational criteria, which can lead researchers to define the study population too broadly, or too narrowly. The potential errors associated with population definition errors were overcome in this research by having a specific definition of the population - large UK based organisations with over 250 employees.

Listing errors: result from the uncharacteristic nature of the sampling frame i.e. how well the sampling frame reflects the characteristics of the population. For example, if sample members are selected from a database, and that database is not updated regularly or is inaccurate, it can result in sample members being selected that no longer meet the requirements of the study population. As this study conducted a non-probability sampling method, this could be overcome by identifying specific sample members that met the study population criteria.

Non-response error: is the result of people who responded to a survey being different from sampled individuals who did not respond, in a way relevant to the study (Dillman, 2000). The most common protection against non-response bias is to attempt to increase response rate. Among the methods that can be used, include: advance telephone calls, personalisation of material for sensitive issues, assurance of confidentiality for sensitive issues and follow up questionnaires (Lambert and Harrington, 1990; Diamontopolous and Schlegemich, 1996). However, Oppenheim (1992) emphasised that non-response error is likely to occur in all surveys despite the increasing sophistication in the approaches to respondents.

Respondent error: is where the respondent causes the error. Although it is almost impossible to completely eliminate respondent error (particularly in large-scale surveys) general coping strategies and specific tactics can be utilised to reduce their effects.

Respondents may not be motivated: to provide accurate data. Reasons for this may be a reluctance to disclose information potentially adverse to the respondent's career and/or desire to project an image of conformance to accepted norms. An example of a situation where a respondent may not be motivated to respond is if they helped implement an IS that fell short of its intended purpose. If the IS had been a failure the respondent will not want their name associated with it. Huber and Power (1985) observe you can overcome this, or reduce its effect with an attempt to motivate the informants to co-operate with the researcher. This was done through assuring complete anonymity for both the respondent and their organisation. It is common practice for researchers to offer their subjects protection. A number of writers support this stance:

'In general there is a strong feeling among fieldworkers that settings and respondents should not be identifiable in print and they should not suffer harm or embarrassment as a consequence of research' (Punch, 1994. p.92).

'Clearly, if respondents are to reveal backstage information about themselves, they need to be confident that it will not be used against them in any way' (Hoffman, 1980, p.49).

Cognitive deficiencies: are limitations in recall and a tendency to anchor phenomena to recent events. An example in this research would be if a respondent put their competitive advantage down to direct impacts of the IS-enhancement, when in fact the competitive advantage is due to complementary organisational resources. As Huber and Power (1985) note, you can over come this by *'seeking factual data from informants with higher emotional involvement'* meaning you need to seek factual data from informants who have had significant involvement in what you are trying to find out. For this reason I am targeting practicing managers who use IS in their working lives.

Information and knowledge: may be lacking in the respondent concerning the area of inquiry. In such situations second-hand information and imagination may fill in information gaps and lead to inaccurate responses. Huber and Power (1985) note you can overcome this if you *'identify persons most knowledgeable about the issue of interest'*. This was done through identifying IS manages who use IS in their working lives and suggesting that if the respondent does not have the information or knowledge to complete the questionnaire they should pass it onto someone who does.

Inappropriate data elicitation procedures: can create situations where the meaning attached to a question by the respondents is different from that intended by the researcher. An example of this could occur in my research if the questions in my questionnaire are not clear and easy to understand. Huber and Power (1985) note you can overcome this if you *'use questions that are pre-tested, structured and that impart an image of being rich in information content without being complex'*. The problem associated with data elicitation was overcome by making the questionnaire clear and easy to understand and by conducting a pilot survey to fully test the questionnaire.

Demand effects: which are most likely to occur in interviews are the result of the respondent acting in a way they believe the researcher requires in order to please and/or help the researcher. To overcome this, Marginson's (1996) view that the researcher should make it clear to the respondents that the researcher does not have a specific theory to prove or disprove and thus interviewees are not meant to provide the *'right answer'* was adopted.

Evaluation apprehension: on the part of the interviewees, that may lead them to provide answers showing them in a more favourable light. In order to guard against evaluation apprehension during the interviews I will adopt Argyris (1985) view that the researcher should encourage respondents to illustrate their statements and get them to reflect on their theories governing their inferences about other peoples behaviour, as well as their own.

Other methods that will be used to guard against evaluation apprehension include:

1. Asking respondents to illustrate the behaviour or issues they are describing ('that's interesting, could you provide an example?').

2. Inquiring into comments that appear to the researcher to be puzzling or inconsistent with prior remarks, in a way that seeks to communicate the absence of a value judgment on behalf of the researcher.

3. The researcher can re-phrase the respondent's answer in order to test whether his or her understanding is as accurate as possible. For example, *'let me re-phrase the way I understand this and please tell me whether that is a fair representation of what you are saying'*.

Table 4.2 summarises the potential respondent error that could occur in this research with the coping strategies that have been adopted.

Table 4.2 Respondent errors and coping strategies

Source of data Inaccuracy	Coping strategy	Tactic utilised in present study
• Respondent not motivated to answer or answer correctly	• Attempt to motivate the informants to co-operate with the researcher	• Anonymity • Tailored research summary
• Imperfect recall	• Seek factual data from informants with higher emotional involvement	• Practicing managers who use IS in their working lives surveyed
• Lack of information or knowledge	• Identify person most knowledgeable about the issue of interest	• Literature review
• Inappropriate data elicitation procedures	• Use questionnaires that are pre-tested, structured and that impact an image of being rich in information content without being complex	• Pre-tested items • Pre-tested survey instrument
• Demand effects	• Emphasise the researcher is really interested in learning about something and not (dis) proving a specific theory or point of view	• Emphasis the interviewees are not meant to provide the 'right answer'
• Evaluation apprehension	• Emphasis the researcher is really interested in learning something and not here to judge the respondent	• Encourage respondent to illustrate their statements • Anonymity

Recording and encoding error: can occur when data is entered into a statistical package or at any stage of the transcription of data given by a respondent. When encoding large amounts of data it is very easy to make a mistake. For example if information was encoded wrongly it could lead to propositions being incorrectly accepted or rejected. Recording and encoding errors will be overcome by rigorously going through all the data that has been encoded to check no encoding errors have occurred.

4.7 Summary

This chapter reviewed various research strategies being used within the field of IS research. In order to fulfil the stated research objectives the researcher determined that the combination of an initial web-based survey, followed by qualitative interviews would be the most appropriate research method. It was identified that the sample frame would consist of professional and personal ties and a non-random sampling method would be adopted. Finally the chapter outlined a number of potential errors that could arise in the study and discussed the approaches that were adopted to reduce these errors. The next chapter discusses the process of questionnaire design and data collection.

Chapter 5

Questionnaire design, validation, delivery and analysis

5.1 Introduction

Having presented the research methodology, the IS-enabled sustainability framework and the research questions in the previous chapters, this chapter sets out to explain the method adopted in order to design, validate, deliver and analyse the chosen research instrument, the questionnaire.

5.2 Method for research instrument development

In order to maximise the reliability and validity of the questionnaire, a framework was developed, adapted from Churchill (1995). Churchill's (1995) framework was first introduced in 1976 and enhanced by its author several times. Although the framework was initially presented in the context of developing marketing constructs, due to its general nature, as identified by Straub (1989), it is applicable to a variety of studies, including IS research. Churchill's (1995) framework was adapted for the purpose of this research to highlight the need to select items for each domain if possible through existing scales, or if not, use literature to determine the type and form of each question, and the wording and measurement of each question. This adapted framework consisting of the 6 major steps carried out before conducting the survey is depicted in Figure 5.1, followed by a discussion of each step.

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┌─────────────────────────────────────────┐
│         ┌───────────────────────┐        │
│         │        Step 1         │        │
│         │   Define objectives   │        │
│         └───────────┬───────────┘        │
│                     ▼                    │
│         ┌───────────────────────────────┐│
│         │           Step 2              ││
│         │ Specify domain of the construct││
│         └───────────┬───────────────────┘│
│                     ▼                    │
│         ┌───────────────────────────────┐│
│         │           Step 3              ││
│         │ Select items for each domain  ││
│         │ through                       ││
│         │ •Existing scales              ││
│         │ •OR use literature to determine││
│         │ content of questions          ││
│         │ Type and form of each question││
│         │ Wording of each question      ││
│         │ Measurement for each question ││
│         └───────────┬───────────────────┘│
│                     ▼                    │
│         ┌───────────────────────────────┐│
│         │           Step 4              ││
│         │ Determine sequence of questions││
│         │ and general questionnaire appearance││
│         └───────────┬───────────────────┘│
│                     ▼                    │
│         ┌───────────────────────────────┐│
│         │           Step 5              ││
│         │ Pre-test questionnaire and    ││
│         │ review as necessary           ││
│         └───────────┬───────────────────┘│
│                     ▼                    │
│         ┌───────────────────────────────┐│
│         │           Step 6              ││
│         │ Pilot test questionnaire and  ││
│         │ review as necessary           ││
│         └───────────┬───────────────────┘│
│                     ▼                    │
│         ┌───────────────────────────────┐│
│         │           Step 7              ││
│         │      Conduct survey           ││
│         └───────────────────────────────┘│
└─────────────────────────────────────────┘
```

Figure 5.1 Questionnaire development framework
(Adapted from Churchill, 1995)

5.2.1 Step 1: Define objectives

Step 1 in the framework is to define the objectives for developing the research instrument. As discussed in chapter 3, the specific research objectives were specified after an extensive literature review. Based on these objectives, the researcher was able

to focus the questionnaire on what information should be sought and what relationships should be investigated.

5.2.2 Step 2: Specify domain of the construct

Step 2 involves specifying the domain of each construct. This involves the researcher specifying what exactly is included and what is excluded in the definitions of the research constructs. Churchill (1979) states that it is essential to *'consult the literature when conceptualising constructs'* and specific domains of interest. Within this study, the previously developed definitional frames of IS capabilities, business processes, complementarity, improved competitive positioning and sustained improved competitive positioning (see chapter 3) provide the theoretical underpinnings for further operationalisation.

5.2.3 Step 3: Selecting items for each domain

Step 3 involved generating a sample of items that reflect the domains specified above. As recommended by Churchill (1979), wherever possible the research should adopt existing measurement scales for the domains of interest as the unnecessary use of new scales makes it difficult to compare and accumulate findings, thereby inhibiting synthesis of what is known. Although a number of studies within the field of IS research rely upon previously utilised instruments as the primary means of validation, it can have its drawbacks. Straub (1989) identified that many previously used instruments were themselves never fully validated and instruments have been frequently adopted from those validated in previous research in non-IS areas and altered significantly. For this reason the literature was reviewed to identify valid measures for each domain of interest that had been used within the same context as this study. However, due to the fact the resource-based view has only come to the fore in the field of IS research in the last twenty years and is largely underdeveloped, it was not possible to identify any existing measurement scales for the domains of interest that have been used within the same context as this study. As no existing

measurement scales for the domains of interest could be identified, the relevant literature was reviewed to determine the content of individual questions, the type and form of each question, the wording of each question and the measurement of each question. Each of these four important aspects of item development is described below.

1). *Determine Content of Questions*: In order to maximise the effectiveness of the content and purpose of individual questionnaire questions, the following questions, as suggested by Churchill (1995) where asked and validated by the researcher:

- Is the question necessary? The questions should be framed to secure an answer with
.. the required detail but not more detail than needed.
- Are several questions needed instead of one?
- Do respondents have the necessary information?
- Will respondents give the information?

2). *Determine the form of each question:* Whether the questions will be open-ended or closed. Open-ended questions allow the respondent to answer in any way they choose. A closed question, on the other had, would ask the respondent to make a choice between a set of alternatives provided by the researcher.

3). *Determine wording of each question*: The language and words used should approximate to the level of understanding of the respondents. In addition, the choice of words should depend on the educational level of the respondents. Different researchers, such as Dillman (1978); Sekaran (1992); Churchill (1995) and Saunders et al. (1997), have recommended certain principles or guidelines for the wording of questions. Therefore, to ensure the clarity and appropriateness of the current questionnaire's wording, the following principles were used:

- *Use of simple words:* It has been ensured that only easy, simple and understandable words, in the view of the respondent, have been used to compose questions.

- *Avoidance of double-barrelled questions:* A question that might have two possible meanings is called a double-barrelled question. In designing the current questionnaire this form of question was avoided.

- *Avoidance of ambiguous questions:* It has been ensured that questions are not ambiguously worded, so that the respondent is exactly sure of what is meant.

- *Avoidance of leading questions:* It has been ensured that questions are not phrased in such a way that they lead the respondent to give the answer that the researcher would like, or may come across as wanting to elicit.

4). *Determine scales of measurement*: A scale is 'a tool or mechanism by which individuals distinguished the variables of interest to our study, in some form or the other' (Sekaran, 1992; p.159). There are four major types of scales, nominal, ordinal, interval and ratio, each of which is discussed briefly below and where appropriate it is identified where they have been used within this study.

- *A nominal scale:* is one that categorises individuals or objects into mutually exclusive and collectively exhaustive groups. For example, as used in section A for number of employees and type of business activity (see appendix A).

- *An ordinal scale:* not only categorises the variables in such a way as to denote qualitative differences among the various categories, it also rank orders categories in some meaningful way.

- *An interval scale:* not only groups individuals according to specific categories; it also measures the magnitude of differences in the preferences among individuals, for example as seen with the Likert approach. This type of scale was used in section B for questions a, b, and d and in section C for questions f, g and h. (see appendix A).

- A Ratio scale: has *'a unique zero origin (not an arbitrary origin) and subsumes all the properties of the other three scales'* (Sekaran, 1992; p.163). For example, this scale was used in section B for questions c and e (see appendix A).

5.2.4 Determine sequence of questions

As suggested by Churchill (1995), the *'funnel'* approach was used in the flow and order of questions in the questionnaire. This means that the respondent is led from general to more specific questions and from easy questions to more difficult ones. In addition, as suggested by Dillman (1978), two relatively difficult questions were not placed together, but difficult ones interspersed with easy ones. For example, in the sequence of the current questionnaire the easiest part of the questionnaire, which included the demographic information (i.e. number of employees and type of business activity) was placed in the first part (i.e. Section A, see appendix A for a copy of the questionnaire).

In sequencing the order of the questionnaire this study followed the four basic principles of ordering suggested by Dillman (1978: p. 123-125). The four principles were applied on the basis that they would increase the respondent's motivation for and confidence in completing the questionnaire. The four principles are:

1. Questions are ordered in descending order of importance and usefulness.
2. Questions that are similar in content are grouped together, and within areas, by type of question.
3. Take advantage of the cognitive ties that respondents are likely to make among the groups of questions in deciding the order of the questions involved.
4. Position the questions that are most likely to be objectionable to respondents after the less objectionable ones.

Conforming to Dillman's four principles, the questionnaire was structured with three main sectors, each encompassing a different theme.

- **Determine general questionnaire appearance**

Not only is it important to address issues of wording the questions; it is also necessary to pay attention to the appearance of the questionnaire as a whole. It is important to begin the questionnaire with an introduction which is designed to tell respondents about the questionnaire, what it is for, the importance of the project and of the respondents replies, how long the questionnaire takes to complete, how the respondents benefit from it and the appreciation of the researcher (see appendix B for covering E-mail). Gill and Johnson (1991) argue that if the purpose of the research is revealed to the respondents, this then increases the likelihood of gaining a response.

Another important issue is the length of the questionnaire. Most researchers who investigated this issue suggested that short and simple questionnaires are preferable to long ones in order to increase the response rate and reduce bias (e.g. Dillman, 1978; Sekaran, 1992; Churchill, 1995). Sproull (1998) advocated the benefits of reassuring the respondents that the questionnaire could be completed quickly in order to increase their likelihood of response. During the design of the current questionnaire sufficient attention was paid to this aspect, particularly as the targeted population, being practicing managers who use IS in their working lives, are generally extremely busy. Therefore the questionnaire consisted of questions that utilized drop down boxes so the respondents could quickly and easily complete the questions that were relevant to them.

Having identified the best approach to: sequencing questions, developing questions to measure the research variables and developing measurement scales to measure the research variables, the next sections describe how the questionnaire was structured, and the research variables operationalised. Steps 5 and 6 will be discussed later in the chapter.

5.3   Structure of the Questionnaire

The IS-enabled sustainability questionnaire consisted ultimately of 3 parts (see appendix A). Each section is described briefly below:

- **Section A** of the questionnaire consists of a series of questions designed to elicit background information. This group of questions firstly focuses on the company background and elicits information regarding the company's size and sector of operation.

- **Section B** of the questionnaire was designed to investigate business process improvements, resulting from the IS-enhancement. This section consists of 11 specific business processes (as identified in section 3.2) that potentially could have been improved as a result of the IS enhancement. Moreover, it seeks to:

  - Identify the degree of improved competitive positioning for each process that was improved as a result of the IS enhancement.

  - Determine how much of the improved competitive position is directly attributed to the IS-enhancement, as opposed to the proportion realised through leveraging or changing organisational capabilities.

  - Determine the duration for which the improved competitive position can be sustained.

  - Determine how much of this duration of sustained improved competitive positioning is directly attributable to the IS-enhancement, as opposed to the duration realised through leveraging or changing organisational capabilities.

- **Section C** of the questionnaire was designed to investigate the contribution organisational IS capabilities had to the success of the IS-enhancement. This section consisted of eight organisational IS capabilities that could potentially contribute to the success of the IS enhancement (as identified in section 3.4). This

sections seeks to identify for each of the IS capabilities that contributed to the success of the IS enhancement, the degree of IS capability contribution and the degrees of IS capability transparency and the replicability.

5.4   Operationalisation of research variables

This section will now discuss the specific measurement scales of the research variables. This includes the major research variables of IS capability contribution, non-transparency, non-replicability, direct and indirect impacts of the IS-enhancement on improved competitive positioning and sustained improved competitive positioning.

As previously specified these variables could not be operationalised from existing scales. For this reason the literature was reviewed to determine the content of individual measures, the type and form of each question, the wording of each question and the measurement used for each question. In operationalising the variables this study mainly used three different scales:

1. The Likert-style rating scale, first proposed by Rensis Likert is "*a technique for the measurement of attitudes*" (Churchill, 1995), in which the respondent is asked how strongly they agree or disagree with a statement or series of statements on a ranging scale (Saunders et al. 1997). The scales used in this research range from 1-5.

2. Nominal scales were used where only one response can be selected from a given set of categories.

3. Ratio scales were also used, this is where a response can be selected from a given set of ratios or from identifying their own ratio.

The operationalisation of the variables for each of the three main parts of the questionnaire is discussed below.

5.4.1 Questions relating to background information (Section A)

Section A of the questionnaire contains two closed-category questions designed to elicit organisational background information. The questions relating to the background information are, (1) organisation sector and (2) number of employees. The main aim of these questions were to gain an understanding of the setting of the organisations under investigation. This follows a similar approach by other researchers (e.g. Guimaraes and Gupta, 1988; Raymond, 1990; Griffith and Finlay, 2004).

Organisational sectors were classified into thirteen categories, based upon the UK Standard Industrial Classification of Economic Activities (SICEA 1992). The original list of SICEA consisted of 16 activities but for the purpose of this study a modified and comprehensive list of activities was generated. These were:

Agriculture \ Banking and Finance \ Business services \ Construction \ Education \ Energy supply \ Health \ Leisure \ Manufacturing \ Public services \ Transport \ Wholesale and retail \ Other

The organisational size was classified into nine categories, largely based on other questionnaires investigating large organisation in the field of IS research (e.g. Fulford and Doherty, 2002;):

1-99 \ 100-249 \ 250-499 \ 500-999 \ 1,000-2499 \ 2500-4,999 \ 5000-9,999 \ 10,000 or more

Although this study focused on what Gorton (1999) and O'Regan and Ghobadian (2004) identified as large organisation (250 employees or more), it was decided to include measures of small and medium sized organisations to ensure that the questionnaire was being correctly aimed at its target population.

5.4.2 Requests relating to business process performance (Section B)

The purpose of the initial request in this section was to identify which business processes were improved as a result of the IS-enhancement, as in many cases not all of the processes would have been improved. For this reason the respondents were asked to *"Please click on the following shaded business processes that were improved as a consequance of your chosen IS-enhancement and fill in the drop down box that appears. For those processes that were not improved please click 'not applicable.' Further clarification of what each process entails can be gained by clicking the 'view help' icon"*.

Each of the 11 business processes were operationalised by providing a short definition as offered by the APQC process classification framework (2004). The short definitions provided for each of the 11 business processes, accompanied by examples of each process that were offered if the respondent clicked the view help icon, are presented in table 5.1 below.

Process definition used	Information provided in 'view help' icon for each process
The process of designing and developing products or services	• Generation of new products and services and evaluation of existing products or service • Researching customer and market needs • Development of product/service design specifications • Elimination of quality and reliability problems
The process of acquiring inputs required for products or services	• Collaboration with suppliers and contracting manufacturers • Identification of suppliers • Negotiation and management of contracts • Ordering of materials and services • Monitoring and managing supplier information • Management of inbound logistics and warehousing
The process of transforming acquired inputs into products or services	• Scheduling of production • Production of products or services
The process of marketing and selling products or services	• Management advertising, pricing and promotional activities • Identification of and management of key customers and accounts • Enter, process and track orders – order management • Identification of market segments
The process of delivering products or services	• Planning, transporting and delivering products or services to customer • Tracking of carrier delivery performance • Processing and auditing of carrier invoices and documents • Managing returns and warranty claims

The process of developing vision and strategy	• Development of business strategy • Defining the business concept and the long term vision • Analysing and understanding competition • Surveying, marketing and understanding customer needs and wants • Selection of relevant markets • Performing internal analysis
The process of managing information technology and knowledge	• Development of and tracking an IS plan • Management of projects • Management of information • Testing, evaluating and deploying IS • Management of IS infrastructure/data centre operations • Manage of centralised IS assets
The process of managing financial resources	• Performing planning and management accounting • Performing general accounting and reporting • Management of fixed assets • Process payroll • Management of treasury operations
The process of managing external relationships	• Management of government and industry relationships • Management of relations with board of directors • Management of public relations • Communication with share holders
The process of customer service	• Development and management of customer profiles • Performance of customer support • Obtaining after sales feedback • Responding to customer enquiries • Management of customer complaints
The process of developing and managing human capital	• Creation of and management of human resources • Recruiting, sourcing and selecting employees • Rewarding and retaining employees • Management of employee information
Other process	If the IS enhancement improved a business process that is not listed above, please click the 'Other process' and fill in the drop down box that appears.

Table 5.1 Operationalisation of business processes

Once the respondent had identified a relevant process that had been improved as a result of the IS-enhancement they 'clicked' on the process to reveal requests A to E. Once the responded had completed requests A to E they moved onto the next relevant process. Requests A to E are identified and discussed below.

Request A and B: Improved competitive positioning

Wade and Hulland (2004) identified that any dependent variable used in studies investigating the resources-based view and sustainable competitive advantage needs to incorporate a competitive assessment element. There is a need for some level of comparativeness, assessing performance relative to that experienced by competitors,

because firm performance taken in isolation contains only limited meaning. For example, an organisation could gain significant improvements in a specific process but still lag behind key competitors. In order to identify the competitive assessment element for each process that was improved as a result of the IS-enhancement the respondents were requested to:

A: *'Please use scale A to indicate how you compared with your competitors with regard to this process before the implementation of the IS enhancement'.*

B: *'Please use scale B to indicate how you compared with your competitors with regard to this process after the implementation of the IS enhancement'.*

	Very competitively advantaged			Level pegging			Very competitively disadvantaged
Scale A	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$	$\square_6$	$\square_7$
Scale B	$\square_1$	$\square_2$	$\square_3$	$\square_4$	$\square_5$	$\square_6$	$\square_7$

A comparison of the scoring on the two scales gives an indication of the degree of improved competitive positioning for each process. By structuring the question like this it allows both the situations where an organisation narrows the competitive gap through catching up as well as that where it is widened through being a leader to be identified.

Request C: Direct and indirect impacts of the IS-enhancement on improved competitive positioning

Request C is concerned with determining how much of the improved competitive positioning identified from request A and B is directly attributed to the IS-enhancement, as opposed to the proportion realised through leveraging or changing organisational capabilities. For this reason the following request was presented, *'Please indicate the extent to which the degree of this improved competitive position*

can be <u>directly attributed to the IS enhancement itself</u>, as opposed to indirectly through the <u>leveraging of existing organisational resources/capabilities</u>, or through <u>initiating organisational change</u> to leverage the contribution of the IS enhancement. Please click a single pair of values[19].

Direct IS contribution	0%	20%	40%	60%	80%	100%
	☐	☐	☐	☐	☐	☐

Indirect IS contribution	100%	80%	60%	40%	20%	0%
	☐	☐	☐	☐	☐	☐

As this request was deemed quite complex, further help was offered to the respondent by clicking on the phrases that are underlined in the request. When the respondent clicked on the phrase/s underlined, box/es appeared containing the following definitions:

- *Directly attributed to the IS enhancement itself:* The degree to which the improved competitive position can be attributed to the IS-enhancement in and of itself. For example, an electronic data interchange (EDI) system could directly improve competitive positioning in the process of acquiring products or services by reducing the costs and time associated with interacting with suppliers.

- *Leveraging of existing organisational resources/capabilities:* The degree to which the improved competitive position can be attributed to existing organisational resources/capabilities that are leveraged by the implementation of the IS-enhancement. For example, an electronic data interchange (EDI) system that under ordinary conditions only gives competitive parity in the process of acquiring inputs required for products or services, but delivers improved competitive positioning when combined with pre-existing supplier trust. The EDI system will directly

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[19] It must be noted that when completing sections C and E in the online questionnaire, once the respondent clicked on a 'direct IS contribution', the matching 'indirect IS contribution' to sum to 100%, was automatically selected, and vice versa. For example, if the respondent clicked 20% 'direct IS contribution', the questionnaire was programmed to automatically select the 80% 'indirect contribution' Thus, any possibility of the respondent clicking two values not equalling 100% was negated.

enable you to enhance supplier trust, while the pre-existing supplier relationship will maximise the inherent information sharing capabilities of EDI.

- *Initiating organisational change:* The degree to which the improved competitive position can be attributed to changes to organisational resources/capabilities and processes that leverage the contribution of the IS-enhancement. For example, if you have implemented an electronic data interchange (EDI) system you can take advantage of the direct savings in cost and time associated with integrating with suppliers. However if the process of acquiring and storing inputs required for products or services is changed from a standard monthly delivery practice to a just-in-time practice it can leverage the EDI systems ability to give precise shipping quantities to suppliers electronically.

By structuring the request thus, it was envisaged that it would be possible to determine how much of the improved competitive position could be directly attributed to the IS-enhancement, as opposed to the proportion realised through leveraging or changing organisational capabilities.

Request D: Duration of sustained advantage

Request D is concerned with the time for which the organisation was able to sustain the improved competitive position, identified in requests A and B. For this reason the following request was asked *'With regard to this process please indicate the appropriate length of time that you have been, or anticipate you will be able to sustain this improved competitive position'.*

1 year	2 years	3 years	4 years	5 years	6 years	Over 7 years
☐	☐	☐	☐	☐	☐	☐

This covers Wade and Hulland's (2004) suggestion that the dependent variable should address the notion of performance over time. As this research is looking at sustained

improved competitive positioning any performance advantage must be able to be measured over time. As identified in chapter two, a sustained improved competitive position is defined as *'the duration for which a business experiences a degree of improvements compared to competitors'.* For the purpose of this research sustained improved competitive positioning is measured over calendar time, as offered by Jacobsen (1988) and Porter (1985).

Request E: Direct and indirect impact of IS-enhancement on sustained improved competitive positioning

Réquest E is concerned with identifying if it was the IS-enhancement in and of itself that caused the improved competitive positioning to be sustained or if it was the capabilities/resources that complemented the IS-enhancement. For this reason the respondents were requested to *'Please indicate the extent to which the duration of sustainability, of this improved competitive position can be directly attributed to the IS-enhancement itself, as opposed to indirectly through the leveraging of existing organisational capabilities/resources, or through initiating organisational change to leverage the contribution of the IS enhancement. Please click a single pair of values'*

Direct IS contribution	0%	20%	40%	60%	80%	100%
	☐	☐	☐	☐	☐	☐
Indirect IS contribution	100%	80%	60%	40%	20%	0%
	☐	☐	☐	☐	☐	☐

As this request was deemed quite complex, further help was offered to the respondnt by clicking on the phrases that were underlined in the question. When the respondent clicked on the phrase/s underlined the following help box/es appeared:

- *Attributed to the IS-enhancement itself:* The degree to which the duration of sustainability of this improved competitive position can be attributed to competitors not being able to replicate the IS-enhancement in and of itself.

- *Leveraging existing organisational capabilities/resources:* The degree to which the duration of sustainability of this improved competitive position can be attributed to competitors not being able to replicate the existing organisational resources/capabilities that leveraged the value of the IS-enhancement.

- *Initiating organisational change:* The degree to which the duration of sustainability of this improved competitive position can be attributed to competitors not being able to replicate the investments in changes to organisational capabilities/resources and processes that leveraged the value of the IS-enhancement.

By structuring the request thus, it was envisaged that it would be possible to determine how much of the degree of sustained improved competitive position could be directly attributed to the IS-enhancement, as opposed to the duration realised through leveraging or changing organisational capabilities/resources.

It was envisaged that the respondents would fill in requests A, B, C, D and E for each business process improved as a result of their IS-enhancement.

5.4.3 Requests relating to IS capabilities (Section C)

The purpose of the initial request in this section was to identify which IS capabilities contributed to the success of the organisation's IS-enhancement, as in many cases an organisation would not have employed all of the eight IS capabilities identified. For this reason the respondents were asked to: *'Please click on the following shaded* <u>*Organisational IS capabilities*</u> *that contributed to the successful implementation of your chosen IS-enhancement and fill in the drop down box that appears. If an IS capability did not contribute to the success of the IS-enhancement, please click 'not applicable'. Further clarification of each capability can be gained by clicking the 'view help' icon.*

Each of the eight IS capabilities were operationalised by providing a sentence summarising the definitions proposed by Wade and Hulland (2004). The sentences

that summarise each of the eight IS capabilities and the definitions that were offered, are presented in table 5.2 below.

Capability definition	Further Help
Your organisation's ability to develop and experiment with new technologies that enable you to take advantage of emerging technologies and trends.	The IS development capability also includes your organisation's ability to manage IS-development life cycles. If the IS enhancement has taken advantage of emerging technologies and it is of an appropriate quality that functions effectively it can be an enabler of improved competitive positioning.
Your organisation's ability to share information throughout the organisation through the effective deployment of hardware, software and communication platforms.	The IS infrastructure of an organisation comprises computer and communication technologies and the sharable technology platforms. These computer and communication technologies and the shareable technology platforms are used to share information throughout the organisation and can be looked at in terms of their reach (the locations to which it can access and to which it can link) and range (the kind of information that can be seamlessly and automatically shared). If the IS enhancement is supported by an IS infrastructure that is superior to your competitors in can be an enabler of improved competitive positioning.
The ability of your IS staff to understand and use the organisation's hardware, software and communications platforms.	IS technical skills are a result of the appropriate, updated technological skills, relating to both systems hardware and software, that are held by the IS/IT employees of the firm. Such skills do not only include current technical knowledge but also the ability to deploy, use and manage that knowledge. It also includes technical skills that are advanced, complex and therefore difficult to imitate, such as corporate level knowledge and technical integration skills. If the IS enhancement is supported by IS technical skills that are superior to your competitors it can be a source of improved competitive positioning.
Your organisation's ability to anticipate future changes and growth, to chose platforms (including hardware, network and software standards) that can accommodate this change and to efficiently manage the resulting technology change and growth.	The IS planning and change management capability also includes the ability of the IS managers to understand how technologies can and should be used, as well as how to motivate and manage IS personnel through the change process. If the IS enhancement was planned effectively and IS personnel were motivated and managed through the change, it can be a source of improved competitive positioning.
Your organisation's ability to provide efficient and cost-effective IS operations on an ongoing basis.	Firms with greater efficient and cost effective IS operations can develop a long-term competitive advantage by using this capability to reduce costs and develop a cost leadership position in their industry. If your organisation's IS enhancement avoided persistent cost overruns, unnecessary down time and system failure, it can be an important precursor to improved competitive positioning.
Your organisation's ability to manage linkages between the IS function and stakeholders outside the firm i.e. the ability to work with suppliers to develop systems for the organisation.	The capability to manage external relationships can manifest itself as an ability to work with suppliers to develop appropriate systems and infrastructure requirements for the firm, to manage relationships with outsourcing partners and to manage customer relationships by providing solutions, support and/or customer service. The ability to work with and manage these relationships

	can be an important enabler of improved competitive positioning.
Your organisation's ability to undertake strategic change due to changes in market conditions through the rapid development and management of IS projects.	Market responsiveness involves both the collection of information from sources external to the firm as well as the dissemination of a firm's market intelligence across departments. It includes the abilities to develop and manage projects rapidly and to react to changes in market conditions. A key aspect of market responsiveness is flexibility, which allows the organisation to undertake strategic change when necessary. If your organisation was able to identify changes in market conditions and rapidly develop the IS enhancement to take advantage of these changes it can be an important enabler of improved competitive positioning.
Your organisation's ability to ensure IS development plans are integrated with organisational functional plans and IS align with organisational needs.	The IS business partnership capability has also been referred to as synergy. It includes your organisation's ability to integrate business/IS thinking and align the IS function with other functional areas or departments of the organisation. Ensuring IS development plans are integrated with organisational functional plans should mean the IS-enhancement is aligned with organisational strategies and organisational needs which can be an enabler of improved competitive positioning.
Other Capability	If an organisational IS capability contributed to the success of the IS-enhancement that is not listed above please click 'other capability' and fill in the drop down box that appears.

Table 5.2 Capabilities and their definitions

Once the respondent had identified which IS capabilities had contributed to the success of the IS enhancement they would then click on it to reveal the following requests:

Request F: IS capability contribution

Request F is concerned with the degree to which an IS capability contributes to the success of the IS-enhancement. A measure of the contribution for specific capabilities is required as more than one IS capability may have contributed to the success of the IS-enhancement. If this is so it will be essential to identify the degree to which each has contributed. For this reason the respondents were requested to: *'Please indicate the degree to which this IS capability was a contributing factor in the success of the IS-enhancement'.*

Low   High

☐$_1$ ☐$_2$ ☐$_3$ ☐$_4$ ☐$_5$

Request G: IS capability transparency

Request G is concerned with the transparency of the IS capability contributing to the success of the IS-enhancement. For this reason the following request was made: *'Please indicate the ease with which your competitors could understand how the IS capability operates and contributes to the success of the IS-enhancement'*.

Low   High

☐$_1$ ☐$_2$ ☐$_3$ ☐$_4$ ☐$_5$

Request H: IS capability -replicability

Request H is concerned with the replicability of the IS capability contributing to the success of the IS-enhancement. For this reason the respondents were requested to: *'Please indicate the ease with which your competitors could copy this IS capability'*.

Low   High

☐$_1$ ☐$_2$ ☐$_3$ ☐$_4$ ☐$_5$

The respondents filled in questions F, G and H for each of the IS capabilities that they had identified as having contributed to the success of the IS-enhancement.

5.5   Pre-testing

Step 5 in the questionnaire development framework encourages the pre-testing of the research instrument; this step was designed to facilitate critical evaluation, in order to locate and correct weaknesses in the questionnaire. The importance of pre-testing a

survey is well recognised in the literature (e.g. Dillman, 1978; Sekaran, 1992; Reynolds et al. 1993; Churchill, 1995). Pre-testing was used to refine the questionnaire's design and to identify errors, which may only be apparent to the population concerned. Indeed, *'pre-testing is the most inexpensive insurance the researcher can buy to ensure the success of the questionnaire and overall research project'* (Churchill, 1995; p.438). The pre-testing consisted of three phases as shown in table 5.3. After each phase the questionnaire was reviewed and the necessary changes were made before the next phase.

Table 5.3: Pre-testing the questionnaire

Phase Number	Stage Sample	Number of test respondents
One	Doctorial students	6
	Lecturers and Professors	6
Two	Doctorial students	4
	Lecturers and Professors	3
Three	Practising managers	10
	Total	29

The **first** phase was conducted within Loughborough University Business School and included sending an e-mail containing the covering letter with a link to the questionnaire to selected professors, lecturers and doctorial students (total of 12).

In the **second phase** 7 interviews were conducted, 4 with doctorial students and 3 with lecturers and professors.

The **third and final phase** of the pre-testing was with practising managers who use IS routinely in their working lives. An e-mail containing a covering letter and a link to the questionnaire was sent to 10 practitioners. All 10 responded as it had been pre-arranged before they received the questionnaire that they would do so. The

respondents were able to complete and return the questionnaire electronically in order to ensure that the questionnaire worked. Interviews were later conducted to pick up any comments and suggestions for improving the questionnaire and covering letter.

The comments, suggestions and actions taken from conducting the three phases of pre-testing can be seen in table 5.4.

Table 5.4 Feed-back and actions taken based on the pre-test exercise

Area of concern	Comments on issues raised	Action taken
Introductory E-mail	Lay out introductory e-mail in more e-mail format than letter. Don't think the logo helps with authenticity, looks more like SPAM. Drop opening sentence and get straight to the point, include web address, as link might not always work.	Removed Loughborough University logo from covering e-mail. Removed opening sentence. Included web address for questionnaire.
Front page	Highlight 'Before starting...' parts of this in bold so that they refer to one and only one system, not from a number of developments that their company has been involved with over time. Do you need the name and tel. no. box at the end if they've entered details at the beginning? Would have started clicking boxes rather than reading your opening paragraph, perhaps have 'please read this before starting'.	Highlighted 'before starting' the questionnaire in bold.
Question 3	Have open entry fields for other processes that may have been improved that are not listed. Not convinced the purple shaded questions and the 'reveal' is that intuitive.	Made open entry field for processes not listed. Made it more intuitive by having clearer instructions.
Question 4	Have open entry fields for other capabilities that are not listed. Not convinced the purple shaded questions and the 'reveal' is that intuitive. I would make the help icon (or text as it actually is) look more like a link - if I put the pointer over it nothing changes so it initially looks like an inactive link (although it does work quite nicely when you click).	Made open entry field for capabilities not listed. Made it more intuitive by having clearer instructions. Made the 'help' icons look like a link, namely the colour changes to blue when the cursor is placed over it.
Questionnaire submission	Message arose when submitting the questionnaire 'I would be giving away my email address when I did so'. Interesting that you use my email address, which I assume you have when the form is submitted - to be honest I find that pretty off-putting and might be inclined to pull out at that point. With cgi-mailer, which is what I use, you don't have to input your email address to send the form. Once I've submitted a form I don't get any confirmation to say that it was done successfully (such as a thank you for submitting page) - good idea to include this.	Changed to use cgi-mailer. Put in message saying 'thank you for completing the questionnaire' to let respondent know they have successfully submitted the questionnaire.

5.6   Pilot Study

The pilot study is a dry run of the entire research process (Reynolds et al. 1993). The size of a sample in a pilot study is generally small, ranging from 5-100 depending on the researcher concerned and the type of respondent. For the purpose of pilot-testing, it was decided that the questionnaire would be piloted with the employers of undergraduates on their placement year for Loughborough University. A total of 57 e-mails containing a link to the questionnaire were e-mailed out. A total of 7 completed questionnaires were successfully returned, a response rate of 12%. It was also assumed that the link to the questionnaire, within the covering e-mail, was working effectively as questionnaires were returned and no respondents reported problems in opening or returning it. Finally, no respondents queried the wording of any questions or expressed difficulties in answering the questionnaire. Thus, it was decided to continue with the main survey.

5.7   Summary

This chapter discussed the procedure by which the questionnaire was developed and thoroughly validated. It has also presented the results of the three phases of the questionnaire pre-testing and the pilot study. Following this validation a total of 839 questionnaires were successfully sent out to practising managers and a total of 109 usable responses were received, representing a 13% response rate. The next chapter presents the descriptive profile of these responses.

Chapter 6

A descriptive profile of the respondents

6.1   Introduction

The previous chapter described the process involved in developing the questionnaire and implementing the data collection process. This chapter presents and discusses a range of descriptive statistics, such as frequencies and cross tabulations, that were produced to facilitate a better understanding of the broad nature and characteristics of improved competitive positioning, resulting from IS-enhancements. It also seeks to provide new insights into the nature of the IS capabilities that contribute to the success of the IS-enhancements.

In presenting a descriptive profile of the responses, the results of each question within the questionnaire are presented and discussed in turn. A copy of the questionnaire can be found in appendix A.

6.2   Response profile

A total of 109 usable responses were returned from a total of 839 successful e-mailings, resulting in a 13% response rate. The respondents were all practicing managers for whom information systems played an important role in their working lives. The researcher is reassured that the respondents had these characteristics as in the covering e-mail (see appendix B) it was stated: *'I have designed the questionnaire to be answered by practicing managers, who use information systems in their working lives. However, if you feel you are not in a position to answer the questionnaire and you know of anyone else who may be able to complete it, perhaps work colleagues or friends, I would be very grateful if you could forward the questionnaire link to them'*, thus, trying to ensure that all respondents were adequately qualified to respond to the questionnaire.

6.2.1 Types of industries

Based upon 13 distinct categories identified from the original UK Standards Industrial Classification of Economic Activities (SICEA) 1992, respondents were asked to choose from at total of 13 distinct industrial categories (as discussed in chapter 5).

As this study was not focused upon a particular sector or group of sectors it is not perhaps surprising that the responses were received from a wide variety of industrial sectors. Table 6.1 outlines the type of industries represented in the sample: 33% of the 109 companies that responded to the survey are from the manufacturing sector - and dominate the sample - 18.3% represent the banking and finance sector and another 13.8% represent business services.

Table 6.1 Response by industry type

Industry	Frequency	Percent
Manufacturing	36	33.0
Banking and finance	20	18.3
Business services	15	13.8
Other	14	12.8
Wholesale and retail	11	10.1
Transport	4	3.7
Education	4	3.7
Energy Supply	4	3.7
Leisure	1	0.9
Total	109	100.0

Although 13 distinct industry categories were recognised, the following industry sectors weren't represented: agriculture, construction, public services and health. Furthermore, a flavour of the industry sectors from respondents who identified 'other' include: IT; building block supplier to the internet economy; satellite telecoms; consulting engineers; research; engineering and communications.

6.2.2 Company size

The use of the total number of employees as a measure of company size is consistent with previous work in the IS field (Raymond, 1990; Griffith and Finlay, 2004). Table 6.2 shows the breakdown of the total usable responses returned, in terms of the company's number of employees.

Table 6.2 Response by total Number of employees

Number of employees	Frequency	Percent
1-99	0	0%
100-249	0	0%
250-499	18	16.5%
500-749	11	10.1%
750-999	7	6.5%
1,000-2,499	15	13.7%
2,500-4,999	15	13.7%
5,000-9,999	16	14.7%
Over 10,000	27	24.8%
Total	109	100%

As presented in table 6.2, the majority of the responding companies had over 10,000 employees, representing 24.8% of the sample. It is also worth identifying that 66.9% of the responding companies had between 1,000 and over 10,000 employees. Moreover, based on the normal classification of SME's, which is any organisation under 250 employees (Gorton, 1999; O'Regan and Ghobadian 2004), it can be seen that the responses to the survey all came from those that can be defined as large organisations.

Although it is often of interest to identify whether there are any associations between an organisation's demographic factors, such as company size or industry type, and the other research variables, in the context of this study it was not deemed to be of any great interest. The inclusion of the demographic factors within this research is purely to ensure that the sample covers a wide range of organisations, representing a wide

variety of industrial sectors, ensuring the research findings can be generalised across industry type and industry size, as discussed in the following section.

6.2.3 Representation of the sample

As discussed in Chapter Four, collecting information from all members of a large population (i.e. census) is not possible or desirable for several reasons (e.g. cost, time, contamination of population members, confidentiality, and accuracy) - (Churchill, 1995; Diamantopoulos and Schlegelmilch, 1997). The alternative is to collect information from a selection of the population in such a way that their response and characteristics reflect those of the population from which they are drawn (de Vaus, 1996). There are two broad types of samples, which can be categorised as probability and non-probability. In probability samples the chance of each case being selected from the population is known and is usually known for all cases; for non-probability the chance of each case being selected from each population is not known (Saunders et al, 1997).

In light of the sensitive subject matter of this research, an opportunistic approach was adopted, based on a probability sample, to ensure access to organisations (see chapter 4). Consequently, it is unlikely that the sample will be perfectly representative of the study population as it was largely shaped by constraints. This is evident as nearly 25% of the responding organisations had 10,000 employees or more and 33% came from the manufacturing sector; hence, it is likely that these groups of companies were somewhat over represented. This is an important point that needs to be taken into consideration when reflecting on the findings in the later chapters. However, the fact that the sample is comprised of responses from a wide range of both industries (table 6.1) and sizes of organisations (table 6.2) provides some reassurance as to the representativeness of the sample.

6.2.4 Degree of improved competitive positioning

The respondents were asked to indicate how they compared with their competitors with regard to each process before the implementation of the IS-enhancement, with the scale ranging from 1, very competitively disadvantaged to 7, very competitively advantaged. They were then asked to indicate how they compared with their competitors for each process after the implementation of the IS-enhancement using the same scale. By subtracting how they originally compared with their competitors, before the implementation of their IS-enhancement, from how they compared after the implementation of the IS-enhancement allowed the degree of improved competitive positioning for each process to be determined. For example, a respondent might indicate that they were at level pegging with their competitors, for a given process, before the implementation of the IS-enhancement, by selecting a value of 4 on the competitive positioning scale. If after the system's implementation, they then believed themselves to be very competitively advantaged, as reflected in their choice of a value of 7 on the competitive positioning scale, then their degree of ICP would be 3 [7 minus 4]. Table 6.3 presents a summary of the degree of improved competitive positioning for each process, listed by average improvement.

As presented in table 6.3, all processes have been competitively improved, providing further support and validation for the process typology constructed in chapter 3. Moreover, the process of *'designing and developing products or services'* was the most widely represented process, represented in 55 cases, closely followed by the process of *'managing information technology and knowledge'*, represented in 51 cases. As this research presents a first attempt to measure competitive impacts of IS-enhancements through a process typology, these kinds of findings may be of particular interest to academics such as Ray et al. (2004).

It is also of interest to note that about 70% of the processes experienced what could be considered a low degree of improved competitive positioning (improvements with a magnitude of 1 or 2); about 30% experienced what could be considered a medium degree of improved competitive positioning (improvements with a magnitude of 3 or 4) whilst 3% experienced a high degree of improved competitive positioning (improvements with a magnitude of 5 or 6). Consequently, it is interesting to note that

although IS-enhancements can enable high degrees of improved competitive positioning, this phenomenon is generally rare.

Table 6.3 Degree of improved business process performance (listed by average impact)

Process of	Degree of improved competitive positioning						Average Improvement	Row Total
	1	2	3	4	5	6		
Acquiring and storing inputs required for products or services	11 (22.9%)	18 (37.5%)	11 (22.9%)	5 (10.4%)	2 (4.2%)	1 (2.1%)	2.97	48
Transforming acquired inputs into products or services	12 (30.8%)	15 (38.4%)	7 (17.9%)	4 (10.3%)	1 (2.6%)	0 (0%)	2.47	39
Developing and managing human capital	6 (31.6%)	5 (26.3%)	3 (15.8%)	4 (21.0%)	1 (5.3%)	0 (0%)	2.42	19
Designing and developing products or services	18 (32.7%)	16 (29.1%)	13 (23.7%)	6 (10.9%)	2 (3.6%)	0 (0%)	2.24	55
Managing financial resources	13 (40.6%)	6 (18.8%)	9 (28.1%)	3 (9.4%)	0 (0%)	1 (3.1%)	2.19	32
Managing information technology and knowledge	15 (29.4%)	19 (37.3%)	12 (23.5%)	4 (7.8%)	1 (2.0%)	0 (0%)	2.16	51
Delivering products or services	18 (36%)	19 (38%)	7 (14%)	4 (8%)	1 (2%)	1 (2%)	2.08	50
Managing external relationships	8 (30.8%)	11 (42.3%)	7 (26.9%)	0 (0%)	0 (0%)	0 (0%)	1.96	26
Marketing and selling products or services	15 (44.1%)	10 (29.4%)	8 (23.5%)	0 (0%)	1 (3%)	0 (0%)	1.88	34
Developing vision and strategy	8 (33.3%)	12 (50%)	4 (16.7%)	0 (0%)	0 (0%)	0 (0%)	1.83	24
Customer service	20 (43.5%)	15 (32.6%)	10 (21.7%)	1 (2.2%)	0 (0%)	0 (0%)	1.83	46
Column Total/Average	144	146	91	31	9	3	2.18	424

6.2.5 Direct and indirect IS-enhancement contribution to improved competitive positioning

The respondents were asked to indicate the extent to which the improved competitive positioning for each process could be directly attributed to the IS-enhancement itself, as opposed to indirectly through the leveraging of existing organisational capabilities/resources, or through initiating organisational change to leverage the contribution of the IS-enhancement. Table 6.4 presents a summary of the number and

percentage of times each pair of direct and indirect values were identified as being the perceived levels of the direct and indirect contribution of the IS-enhancement to improved competitive positioning, for all processes that were improved as a result of the IS-enhancement.

The results presented in table 6.4 identify that in two thirds of the cases the direct impacts were judged to be generally more important than the indirect impacts in the attainment of improved competitive positioning. Furthermore, the results confirm that it is not simply a case of either the direct impacts or the indirect impacts enabling improved competitive positioning: in the majority of cases both the direct and indirect impacts, interacting with one another to varying degrees, ultimately deliver improved competitive positioning. Consequently these results provide some support for Bharadwaj's (2000) validated theory of an 'IT capability', namely, it is the combination of: IT infrastructure, human IT resource (direct impacts) and IT-enabled intangibles (indirect impacts) that results in superior performance from an IS investment.

Table 6.4 Direct IS enhancement contribution to improved competitive positioning for all processes

Direct % contribution to ICP	0%	20%	40%	60%	80%	100%	
Indirect % contribution to ICP	100%	80%	60%	40%	20%	0%	
Number and % of responses	0 (0%)	39 (9.1%)	101 (23.6%)	178 (41.6%)	88 (20.6%)	22 (5.1%)	**Total 424 100%**

6.2.6 Duration of sustained improved competitive positioning

For each process the respondents were asked to indicate the appropriate length of time that they were able to sustain the degree of improved competitive position that they identified in sections A and B. Table 6.5 provides a summary of the duration for which improved competitive positioning was sustained (not a summary of the degree

of sustained improved competitive positioning[20]). Table 6.5 provides a summary of the duration of improved competitive positioning for each process, ordered by average duration.

Table 6.5 Duration of the improved competitive positioning for each process (Listed by average duration)

Process	Duration of sustainability (years)							Average Duration	Row Total
	1	2	3	4	5	6	7		
Customer service	5 (10.9%)	11 (23.9%)	14 (30.4%)	8 (17.4%)	6 (13%)	0 (0%)	2 (4.4%)	3.15	46
Transforming acquired inputs into products or services	1 (2.6%)	12 (30.7%)	16 (41%)	6 (15.4%)	3 (7.7%)	0 (0%)	1 (2.6%)	3.05	39
Acquiring and storing inputs required for products or services	3 (6.2%)	17 (35.4%)	16 (33.3%)	8 (16.7%)	2 (4.2%)	0 (0%)	2 (4.2%)	2.96	48
Developing and managing human capital	1 (5.3%)	4 (21.0%)	9 (47.4%)	5 (26.3%)	0 (0%)	0 (0%)	0 (0%)	2.95	19
Designing and developing products or services	7 (12.7%)	16 (29.1%)	17 (30.9%)	9 (16.4%)	3 (5.5%)	0 (0%)	3 (2.8)	2.95	55
Managing information technology and knowledge	6 (11.8%)	17 (33.3%)	15 (29.3%)	5 (9.8%)	6 (11.8%)	1 (2%)	1 (2%)	2.90	51
Delivering products or services	4 (8%)	18 (36%)	17 (34%)	6 (12%)	4 (8%)	0 (0%)	1 (2%)	2.84	50
Managing financial resources	4 (12.5%)	10 (31.3%)	9 (28.1%)	6 (18.7%)	2 (6.3%)	1 (3%)	0 (0%)	2.84	32
Developing vision and strategy	3 (12.5%)	8 (33.3%)	10 (41.7%)	2 (8.3%)	1 (4.2%)	0 (0%)	0 (0%)	2.58	24
Marketing and selling products or services	4 (11.8%)	17 (50.0%)	7 (20.5%)	4 (11.8%)	2 (5.9%)	0 (0%)	0 (0%)	2.50	34
Managing external relationships	4 (15.4%)	12 (46.2%)	4 (15.4%)	6 (23.1%)	0 (0%)	0 (0%)	0 (0%)	2.46	26
Column Total/Average	42 (9.9%)	142 (33.5%)	134 (31.6%)	65 (15.3%)	29 (6.8%)	2 (0.5%)	10 (2.4%)	2.83	424

Table 6.5 shows that the process of *'customer service'* had the longest duration of improved competitive position resulting from an IS-enhancement, with an average duration of 3.15 years. This was closely followed by the process of *'transforming*

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[20] In order to work out the overall degree of sustained improved competitive positioning for each process, it is necessary to multiply the degree of improved competitive positioning with the duration of improved competitive positioning.

acquired inputs into products or services', with an average duration of 3.05 years. This study it not particularly concerned with processes at an individual level, rather it is concerned with summating across all processes to give an indication of the total degree of sustained improved competitive positioning of each respondent. However, the results will be of interest from a methodological perspective as they enable processes to be compared with one another for their ability to sustain an improved competitive positioning from IS-enhancements. Consequently, providing insights into which processes might be of most interest to conduct further analysis on.

In the vast majority of instances, about 65% of the cases the improved competitive positioning could only be sustained for 2 to 3 years, whilst in only around 3% of the cases could the advantage be sustained for 6 or 7 years. Consequently, although improved competitive positioning resulting from an IS-enhancement can be sustained for 7 years or longer, generally within 3 years competitive parity or even decline is likely to return.

6.2.7 Direct and indirect contribution to sustained improved competitive positioning

The respondents were asked to indicate the extent to which the degree of sustained improved competitive position for each process could be directly attributed to the IS-enhancement itself, as opposed to indirectly through the leveraging of existing organisational capabilities/resources, or through initiating organisational change to leverage the contribution of the IS-enhancement. Table 6.6 presents a summary of the number and percentage of times each pair of direct and indirect values were identified as being the perceived levels of the direct and indirect contribution of the IS-enhancement to sustained improved competitive positioning, for all processes that were improved as a result of the IS-enhancement.

Table 6.6 IS-enhancement contribution to sustained improved competitive positioning for all processes

Direct % contribution to ICP	0%	20%	40%	60%	80%	100%	
Indirect % contribution to ICP	100%	80%	60%	40%	20%	0%	
Number and % of responses	2 (0.5%)	74 (17.6%)	111 (26.2%)	151 (35.5%)	68 (16%)	18 (4.2%)	**Total 424 100%**

The results presented in table 6.6 identify in around 55% of the cases the direct impacts were judged to be more important than the indirect impacts in the attainment of sustained improved competitive positioning. Furthermore the results identify that, with improved competitive positioning, it is not simply a case of either the direct impacts or the indirect impacts enabling sustained improved competitive positioning. Again it is generally a case of both the direct and indirect impacts, interacting with one another to varying degrees, to deliver sustained improved competitive positioning. Wade and Hulland (2004) proposed 3 ways in which the direct and indirect impacts of an IS-enhancement could impact sustained improved competitive positioning, namely[21]:

- **Proposition A:** IS-enhancements directly influence sustained improved competitive positioning.

- **Proposition B:** IS-enhancements influence sustained improved competitive positioning both directly and indirectly through interaction with other constructs (including other resources)

- **Proposition C:** IS-enhancements influence sustained improved competitive positioning only indirectly through interactions with other constructs (including other resources)

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[21] The terms IS-enhancement and sustained improved competitive positioning have been used to fit with the terminology used within this research, although not specifically used by Wade and Hulland.

Based on the assumption (Wade and Hulland, 2004) that only one of these propositions can be correct, the results of table 6.6 provide important empirical support that proposition B is the most plausible.

6.2.8 Degree to which each IS capability contributed to improved competitive positioning

The respondents were asked to indicate the degree to which each IS capability contributed to the success of the IS-enhancement, ranging from 1, low to 5, high. If the respondent clicked the *'not applicable'* box it was assumed that the IS capability did not contribute at all to the success of the IS-enhancement, so it was given a value of 0. Table 6.7 presents a summary of the results by average degree of contribution.

Table 6.7 Degree of IS capability contribution to IS success

IS Capability	0 No contribution	1 Low	2	3	4	5 High		Average	Capability Type
IS infrastructure	26 (23.8%)	0 (0%)	4 (3.7%)	16 (14.7%)	36 (33%)	27 (24.8%)	83	3.07	Inside-out
IS technical skills	43 (39.4%)	0 (0%)	5 (4.6%)	19 17.4%	22 (20.2%)	20 (18.4%)	66	2.34	Inside-out
Cost effective IS operations	51 (46.8%)	0 (0%)	3 (2.8%)	18 (16.5%)	19 (17.4%)	18 (16.5%)	58	2.07	Inside-out
IS development	52 (47.7%)	2 (1.8%)	O (0%)	15 (13.8%)	25 (22.9%)	15 (13.8%)	57	2.04	Inside-out
IS business partnerships	56 (51.4%)	0 (0%)	1 (0.9%)	14 (12.8%)	23 (21.1%)	15 (13.8%)	53	1.94	Spanning
External relationship management	57 (52.3%)	0 (0%)	6 (5.5%)	14 (12.8%)	18 (16.6%)	14 (12.8%)	52	1.80	Outside-in
Market responsiveness	61 (56%)	0 (0%)	3 (2.8%)	8 (7.3%)	23 (21.1%)	14 (12.8%)	48	1.76	Outside-in
IS planning	62 (56.9%)	0 (0%)	3 (2.8%)	8 (7.3%)	28 (25.7%)	8 (7.3%)	47	1.67	Spanning
Column Total/Average	**408 (46.8%)**	**2 (0.2%)**	**25 (2.8%)**	**112 (12.8%)**	**194 (22.2%)**	**131 (15.0%**	**464 (53.2%)**	**2.09**	

Given that each of the 8 IS capabilities could potentially contribute to the success of an IS-enhancement in any of the 109 cases for which a response was received, there was a total of 872 candidate opportunities for specific capabilities to make a contribution. Of these 872 potential instances in which specific IS capabilities could have contributed to the success of an IS-enhancement, in over 50% of the cases (464) they did. However, it is important to note that in the remaining 408 cases IS capabilities were perceived to have made no contribution. This is an interesting result as it suggests that IT practitioners were able to discriminate between instances where specific IS capabilities did, or did not, make a contribution.

Table 6.7 identifies that inside out IS capabilities generally have a much higher average degree of contribution to the success of the IS-enhancement than both spanning and outside-in IS capabilities. More specifically the average contribution of inside-out IS capabilities is 2.38, compared to a combined average of 1.80 for that of outside-in and spanning capabilities. Clearly this is an interesting result as it has previously been suggested that the outside-in and spanning IS capabilities will have a greater impact on improved competitive positioning (Wade and Hulland, 2004). A possible explanation for this is that inside-out IS capabilities are the building blocks of most IS-enhancements. For example, it would be very difficult to implement an IS-enhancement without a good IS infrastructure or competent IS technical staff. By contrast, if an organisation is a follower with regards to IS innovations, they don't necessarily need market responsiveness and IS planning capabilities[22].

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[22] It must be noted that as 0's were inserted for capabilities that did not contribute to the success of the IS-enhancement – to reflect their non-contribution - table 6.7 only measures the average contribution for each IS capability across all 109 responses. Consequently, one type of capability could contribute very highly to the success of the IS-enhancement but not very often and another type of IS capability could contribute lowly to the success of the IS-enhancement but on a regular basis. This could result in two different types of IS capabilities having very similar average degrees of IS capability contribution but in fact they contribute in a very different manner. Hence, a possible further explanation for the observed contradictions between Wade and Hulland's (2004) propositions and the results shown in table 6.7 and 6.8.

6.2.9 Degree to which each IS capability was non-transparent

The respondents were asked to indicate the ease with which their competitors could understand how the IS capability operated and contributed to the success of the IS enhancement, with scales ranging from 1 low to 5 high. Respondents only indicated the degree of transparency for the IS capabilities that contributed to the success of the IS-enhancement. However, it is important to recognise that as the research is concerned with gaining a weighted aggregate score for IS capability contribution and IS capability transparency, IS capability transparency had to be reverse coded in order for both the scales of IS capability contribution and IS capability transparency to run in the same direction. Thus, the scale of IS capability contribution runs from 1 low contribution to 5 high contribution and IS capability transparency runs from 1 low non-transparency to 5 high non-transparency. Table 6.8 presents a summary of the results reverse coded, by average degree of non-transparency.

Table 6.8 identifies that inside-out and spanning capabilities tend to be less transparent than outside-in IS capabilities. More specifically the average degree of non-transparency for spanning IS capabilities is 2.61, whilst for inside-out IS capabilities its 2.53; and for outside-in IS capabilities it is 2.21. This result is particularly interesting as it provides evidence to counter Wade and Hulland's (2004) suggestion that outside-in and spanning capabilities will have a higher degree of non-transparency than outside-in IS capabilities, as shown in table 3.9. One possible explanation for this it that inside-out IS capabilities are deployed from inside the firm in response to market requirements and tend to be internally focused, whilst spanning IS capabilities involve integrating the organisations inside-out and outside-in IS capabilities. Consequently, it is recognised that as inside-out and spanning capabilities are very much internally orientated and outside-in IS capabilities are externally oriented, it will be much harder for competitors to identify if outside-in and spanning IS capabilities are contributing to improved competitive positioning than it would be for that of outside-in IS capabilities.

Table 6.8 Degree to which each IS capability is non-transparent

IS Capability	Degree of IS Capability Non-Transparency					Row Total	Average	Capability Type
	1 Low	2	3	4	5 High			
IS planning	4 (8.5%)	14 (29.8%)	20 (42.6%)	8 (17%)	1 (2.1%)	47	2.74	Spanning
IS technical skills	4 (6.1%)	25 (37.9%)	31 (46.9%)	6 (9.1%)	0 (0%)	66	2.59	Inside-out
IS development	8 (14%)	18 (31.6%)	23 (40.4%)	7 (12.3%)	1 (1.7%)	57	2.56	Inside-out
IS infrastructure	10 (12%)	35 (42.2%)	29 (35.0%)	5 (6%)	4 (4.8%)	83	2.49	Inside-out
IS business partnerships	5 (9.4%)	22 (41.5%)	22 (41.5%)	3 (5.7%)	1 (1.9%)	53	2.49	Spanning
Cost effective IS operations	7 (12.1%)	24 (41.4%)	23 (39.6%)	4 (6.9%)	0 (0%)	58	2.48	Inside-out
Market responsiveness	6 (12.5%)	25 (52.1%)	16 (33.3%)	1 (2.1%)	0 (0%)	48	2.25	Outside-in
External relationship management	13 (25%)	20 (38.4%)	16 (30.8%)	3 (5.8%)	0 (0%)	52	2.17	Outside-in
Column Total/ Average	57 (12.3%)	183 (39.4%)	180 (38.8%)	37 (8.0%)	7 (1.5%)	464	2.47	

6.2.10 Degree to which each IS capability was non-replicable

The respondents where asked to indicate the ease with which their competitors could copy each capability that was contributing to the success of the IS-enhancement, with the scales ranging from 1, low to 5 high. Once again as with transparency the data was reverse coded to ensure a weighted aggregate score could be obtained for IS capability contribution and IS capability non-replicability. Table 6.9 presents a summary of the results, reversed coded, by average degree of non-replicability.

Table 6.9 suggests that outside-in and spanning capabilities tend to have a higher degree of non-replicability than outside-in IS capabilities. Moreover, the average degree of non-replicability for outside-in IS capabilities is 2.93; for spanning IS capabilities it is 2.54 and for outside in IS capabilities it is 2.21. This supports Wade and Hulland's (2004) proposition, that outside-in and spanning capabilities will have a

higher degree of non-replicability than inside-out IS capabilities, as depicted in table 3.9.

Table 6.9 The degree to which each IS capability is non-replicable

IS Capability	IS capability non-replicability					Row Total	Average	Capability Type
	1 Low	2	3	4	5 High			
Market responsiveness	5 (10.4%)	5 (10.4%)	23 (47.9%)	14 (29.2%)	1 (2.1%)	48	3.02	Outside-in
External relationship management	5 (9.6%)	13 (25%)	21 (40.4%)	12 (23.1%)	1 (1.9%)	52	2.83	Outside-in
IS planning	3 (6.4%)	11 (23.4%)	29 (61.7%)	4 (8.5%)	0 (0%)	47	2.72	Spanning
IS development	6 (10.5%)	29 (50.9%)	17 (29.8%)	5 (8.8%)	0 (0%)	57	2.37	Inside-out
IS business partnerships	6 (11.3%)	25 (47.2%)	19 (35.8%)	3 (5.7%)	0 (0%)	53	2.36	Spanning
Cost effective IS operations	8 (13.8%)	31 (53.4%)	15 (25.9%)	4 (6.9%)	0 (0%)	58	2.26	Inside-out
IS technical skills	12 (18.2%)	38 (57.6%)	13 (19.7%)	3 (4.5%)	0 (0%)	66	2.11	Inside-out
IS infrastructure	18 (21.7%)	43 (51.8%)	18 (21.7%)	4 (4.8%)	0 (0%)	83	2.10	Inside-out
Column Total/ Average	63 (13.6%)	195 (42.0%)	155 (33.4%)	49 (10.6%)	2 (0.4%)	464	2.42	

6.3   Summary

This chapter has presented and discussed a descriptive analysis of the survey data, which has provided important new insights into the nature of the participating organizations and the development and impacts of their IS-enhancements. More specifically, it indicates that the sample covers a wide range of large organizations, from many industrial sectors, which has helped confirm the representativeness of the sample. It also identifies that all the processes were widely represented, further validating the process typology presented in chapter 3. Inside-out capabilities had a higher contribution to the success of the IS-enhancement than spanning or outside-in capabilities. Inside-out and spanning capabilities had a higher degree of non-

transparency than outside-in capabilities and inside-out capabilities are easier too replicable than outside-in and spanning capabilities. This chapter has provided an understanding of the results and provides a foundation for further analysis of the research propositions.

Chapter 7

Identification and validation of summated measures to be used within the analysis

7.1   Introduction

This chapter seeks to utilise the advantages of summated scales, which are commonly used within social science research, to help reduce the complexity of the data and make findings easier to interpret. As noted in chapter 3, typologies of IS capabilities and business processes have been developed. This chapter first explores whether the eight IS capabilities can be summated into unidimensional measures of IS capability contribution, IS capability non-transparency and IS capability non-replicability and secondly, if it is appropriate to summate the 11 business process to give unidimensional measures of improved competitive positioning and sustained improved competitive positioning. Summated measures are an important component of this study as they provide an organisational level perspective of IS capabilities and improved competitive positioning, thus enabling the research to move beyond individual IS capabilities and business processes. A guide adopted from de Vaus (1996) is identified and followed to examine and discuss the validity, unidimensionality and reliability of the summated measures to be used within this study. The chapter also explores the applicability of Wade and Hulland's (2004) classification of inside-out, outside in and spanning capabilities.

7.2   The definition and benefits of summated scales

A summated scale is comprised of several individual variables that are grouped into a single composite measure (Hair et al. 1998). The principle behind developing a

summated scale is to avoid only using a single variable to represent a concept and instead combine several variables that measure different facets of the same concept.

According to Hair et al. (1998), there are two benefits of using a summated scale:

1. To some extent it provides a means of overcoming the measurement error in all measured variables and respondent error. The summated scale reduces measurement and respondent error, by reducing the reliance on a single response through the use of multiple indicators (variables). Employing an *'average'* or *"'typical'* response to a set of variables will decrease the measurement error that may occur in a single question.

2. Summated scales enable the representation of multiple aspects in a single measure. Hair et al. (1998) suggested that often researchers employ many variables in their multivariate models in order to represent the many *'facets'* of a concept that we know to be quite complex. In doing this, the researchers complicate the implementation of the concept. Therefore, not only would summated scales accommodate the *'richer'* description of concepts by using multiple variables, they would also maintain fewer numbers of variables in the multivariate model. The summated scale, when properly created, combines the multiple indicators into a single measure representing what is held in common across a set of measures.

7.3   The applicability of summated scales within this study

As de Vaus (1996) notes: *'we cannot simply add together the scores from any set of questions: we must be confident that they all tap the same underlying concept'*. For this reason the following two step guide as formulated by de Vaus (1996) will be followed to explore the applicability of summated scales within this study.

7.3.1 Step 1: Scale Validity

The first stage is to identify the scale validity, which is the extent to which a scale or set of measures accurately represent the underlying concept of interest. According to de Vaus (1996) there are two complementary approaches that help ensure summated scales are valid. The first form of validity is conceptual, termed *'content'* or *'face'* validity. Content validity is getting an idea of which items might go together by looking at their content. By looking at the survey it is possible to identify, on the face of it, which individual measures appear to gauge the concepts of interest.

The second stage in identifying which scale items can be used to measure the concepts of interest is to conduct a correlation matrix for the items identified from conducting face validity. Items that belong together in a scale will often have at least a modest correlation with each other item in the scale.

7.3.2 Step 2: Item Analysis

Further empirical tests can be conducted to ensure that the variables, relating to the concept of interest, are all scaling and measuring the same underlying concept. One such test is item analysis and the two aspects the researcher should always consider are:

• **Unidimensionality:** An underlying assumption and fundamental requirement for constructing a summated scale is that the items are unidimensional; this means that they are strongly associated with each other and represent a single concept (de Vaus, 1996). Factor analysis plays a crucial role in making an empirical assessment of the dimensionality of a set of items by determining the number of factors and loadings of each variable on the factors. The test of unidimensionality is that the summated scale should contain items loading highly on a single factor. If the summated scale is proposed to have multi dimensions, each dimension should be reflected by a separate factor. Unidimensionality can be assessed with either exploratory or confirmatory factor analysis. Prior to implementing factor analysis, Norusis (1994) suggest it is important to formally evaluate its

appropriateness by assessing the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett test of sphericity (i.e. to see if the items are correlated and factor analysis worth doing or not). A small value of KMO means that factor analysis of the variables might not be appropriate, as correlation between pairs of variables cannot be explained by other variables. Kaiser (1974) characterises a KMO value in the 0.90s as marvellous, in the 0.80s as meritorious, in the 0.70's as middling, in the 0.60s as mediocre, in the 0.50s miserable and below 0.50 as unacceptable. In addition, Bartlett's test of sphericity is used to identify relationships among variable, determining the appropriateness of factor analysis.

- **Reliability:** A reliable scale is one in which individuals would obtain much the same scale score on two different occasions (de Vaus, 1996). In addition, reliability assesses the issue of the similarity of results provided by independent but comparable measures of the same object, trait, or construct (Churchill, 1995). It is an important indicator of a measure's quality, because it determines the impact of inconsistencies on measurement of the results; it is a necessary, but not sufficient condition for ensuring the validity of a measure. Cronbach's Alpha is an example of a statistical tool to estimate the reliability of a measure (Hair et al. 1998), which is simple to administer and a widely accepted test of reliability in social science research. According to Nunnally (1967), an instrument can be considered to possess an acceptable reliability standard if the Cronbach Alpha scores are greater then 0.60, and for basic or exploratory research a score greater than 0.50 is also deemed acceptable.

Scale validity and item analysis were conducted on the following major constructs, where it was anticipated that these summated scales would facilitate the analysis of research data: (1) IS capability contribution (2) IS capability non-transparency (3) IS capability non-replicability (4) improved competitive position (5) sustained improved competitive position. The applicability of summating each of the major constructs is now reviewed and discussed in turn.

7.4　Summated measures for IS capability contribution

The first step in identifying if it is appropriate to summate the eight IS capabilities to give an organisational measure of IS capability contribution is to conduct scale validity. The first stage in scale validity is face validity. Identifying which measures appear to gauge IS capability contribution is very clear cut in this case, each of the eight IS capabilities has a question identifying its degree of IS capability contribution. Therefore on the face of it, it would appear appropriate to include all eight IS capabilities within the correlation matrix discussed below.

The second stage in conducting scale validity is to construct a correlation matrix. A correlation matrix containing the eight IS capabilities, as previously identified from conducting face validity is set out in table 7.1.

Table 7.1 Correlation matrix for IS capabilities contribution

	IS development	IS infrastructure	IS technical skills	Cost effective IS operations	IS planning	IS business partnerships	External relationship management	Market res-ponsiveness
IS development	1.000							
IS Infrastructure	.193*	1.000						
IS technical Skills	.449**	.364**	1.000					
Cost effective IS operations	.387**	.204*	.422**	1.000				
IS planning	.447**	.222*	.348**	.405*	1.000			
IS business partnerships	.481**	.282*	.475**	.497**	.486**	1.000		
External Relationship Management	.335**	.080	.303**	.281**	.335**	.424**	1.000	
Market res-ponsivness	.420**	.226*	.369**	.416**	.439**	.569**	.416**	1.000

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

The results shown in table 7.1 indicate that all eight IS capabilities correlate reasonably well with one another; they are all significant at the 0.05 level or above apart from 'external relationship management' and 'IS infrastructure' which show no significant correlation. Although these two IS capabilities show no significant correlation with one another, each shows significant correlations with all other IS capabilities. Thus, it was considered inappropriate to remove them from further analysis. However, if the KMO test, Bartlett's test of sphericity, or factor analysis had

not provided satisfactory results, the two capabilities would have been excluded and the tests would have been re-conducted. Having reviewed table 7.1 it would suggest that the IS capability contribution measures of the eight IS capabilities have similar traits, therefore advocating the next steps of conducting the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett test of sphericity in order to identify the appropriateness of factor analysis.

The results of the KMO test, which is reported in figure 7.1, show that the 8 measures of IS capability contribution have a KMO value of 0.801. This indicates a "meritorious" adequacy according to the Kaiser (1974) scale; hence supporting the inclusion of all eight IS capabilities in the factor analysis. In addition, the results of the Bartlett test of sphericity, shown in figure 7.1, indicate that the correlations among the 8 IS capabilities is highly significant. Combining the results of the KMO test and Bartlett test of sphericity identifies that the 8 IS capabilities used to measure IS capability contribution meet the conditions for the application of factor analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.801
Bartlett's Test of Sphericity	Approx Chi-Square	239.569
	Df	28
	Sig.	.000

Component Matrix (1 component extracted)

Variable	Communality	Factor	Eigenvalue	Pct of Var	Cum Pct
IS development	0.704	1	3.643	45.532	45.532
IS infrastructure	0.425				
IS technical skills	0.694				
Cost effective IS operations	0.683				
IS planning	0.696				
IS business partnerships	0.807				
External relationships	0.587				
Market responsiveness	0.425				

Extraction method: Principal Component Analysis.

Only one component was extracted. The solution cannot be rotated

Figure 7.1 Factor analysis for IS capability contribution

Norusis (1994) advocated the general rule of using as many factors as there are eigenvalues greater than one. The results of the factor analysis, presented in Figure 7.1, the full list of eigenvalues in table 7.2 and the scree plot in Figure 7.2 show only one factor was obtained[23] with an eigenvalue greater then one, indicating all eight IS capabilities load onto just one factor, which will be termed '*IS capability contribution*'.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.643	45.532	45.532	3.643	45.532	45.532
2	.986	12.321	57.853			
3	.705	8.815	66.668			
4	.641	8.006	74.675			
5	.626	7.828	82.503			
6	.538	6.728	89.230			
7	.459	5.736	94.967			
8	.403	5.033	100.000			

Table 7.2 Eigenvalues for IS capability contribution

Scree Plot
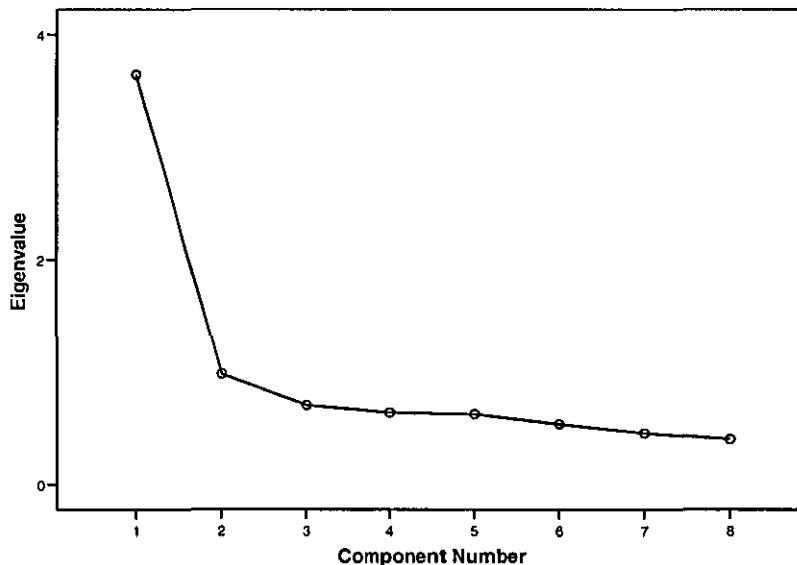
Figure 7.2 Scree Plot for IS capability contribution

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[23] It is important to again note that 0's were inserted for all IS capabilities that did not contribute to the success of the IS-enhancement. Consequently, all eight IS capabilities for each of the 109 responses were included in the factor analysis for 'IS capability contribution', 'IS capability non-transparency' and 'IS capability non-replicability' even though a large proportion of the values were initially missing. The implications of the large number of 0's inserted into the factor analysis would be that IS capabilities are more likely to load onto a fewer factors than if the 0's had been omitted.

Reliability: The final stage is to conduct Cronbach's Alpha to estimate the reliability of the measure for IS capability contribution. The results shown in figure 7.3 show that the alpha reliability value is 0.825, which is very high, suggesting the measures are reliable.

Reliability Coefficients	8 items
Alpha = 0.825	Standard item alpha = 0.823

Figure 7.3 Cronbach's Alpha Value for IS capability contribution

The implications of obtaining one factor, with an eigenvalue greater the one from conducting factor analysis (figure 7.1) and an alpha reliability value of 0.825 (figure 7.3), would suggest that it is appropriate to summate all eight IS capability contribution measures to give a single organisational measure of IS capability contribution.

7.4.1 Measures to be used for IS capability contribution

As a result of the tests conducted above it can be concluded that it is valid and reliable to summate all eight IS capabilities into the one measure of IS capability contribution (*'capability total'*). The *'capability total'* will be used as a summated measure to gain an indication of the degree to which each organization has exploited its IS capabilities to contribute to the success of the IS-enhancement[24].

Further measures of IS capability contribution include *'capability range'* and *'capability individually'*. *'Capability range'*, was used as a measure to gain an indication of the number of IS capabilities that each organization exploited to contribute to the success of the IS-enhancement. *'Capability individually'* was used to

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[24] It is important to note that for IS capability contribution, IS capability non-transparency and IS capability non-replicability an average was also calculated by dividing their total by 'capability range'. However, the finding between 'total' and 'average' did not differ in their level of significance when correlated with other variables and were only marginally different in the strength of their correlation. Hence 'average' was omitted to stem any unnecessary repetition.

gain a complete picture of IS capability contribution, each IS capability was looked at individually for its contribution to the success of the IS-enhancement. Table 7.3 provides a summary of the measures used for IS capability contribution.

Table 7.3 Measures for IS capability contribution

Measure	*Description*
Capability total:	The sum of each of the IS capabilities contribution to the success of the IS enhancement.
Capability range:	The number of capabilities that an organisation exploited to contribute to the success of the IS enhancement. This can range from 1 through to all 8 capabilities.
Capability individually	The degree to which each IS capability individually contributed to the success of the IS enhancement.

7.5   Summated measures for IS capability non-transparency

The previous section identified the measures and summated measures to be used for IS capability contribution using a simple '*overall affect*' approach; namely, a unidimensional attitude scale measuring the degree to which the respondents thought each IS capability contributed to the success of the IS-enhancement. This section seeks to identify the measures and summated measures for IS capability non-transparency. However, using a simple '*overall effect*' approach is not applicable here. As discussed in chapter 3, it is not felt appropriate just to consider the non-transparency of a capability without considering its degree of contribution to the success of the IS-enhancement. If an overall effect approach was used only the degree to which the IS capability was non-transparent could be measured. This could give misleading results as there could be cases where the IS capability had a high degree of non-transparency but only slightly impacted the success of the IS- enhancement. Through the use of a summated scale, it is possible to take into consideration the degree to which the IS capability contributed to the success of the IS-enhancement

and its non-transparency, thus, giving a degree of importance to IS capability non-transparency.

7.5.1 Scale validity

The first step in identifying if it is appropriate to sum across the relevant IS capabilities to gain the respondents overall attitude towards non-transparency is to conduct scale validity. Again the first stage in scale validity is to conduct face validity. Identifying which measures appear to gauge IS capability non-transparency is very clear cut in this case as each of the eight combined measure have questions identifying the degree of IS capability contribution and IS capability non-transparency. Therefore on the face of it, it would appear appropriate to include all eight combined measures of IS capability non-transparency within the correlation matrix discussed below.

The second stage in conducting scale validity is to construct a correlation matrix. A correlation matrix containing the eight combined measures as previously identified from conducting face validity is set out in table 7.4.

Table 7.4 Correlation matrix for IS capabilities' non-transparency

	IS development	IS infrastructure	IS technical skills	Cost effective IS operations	IS planning	IS business partnerships	External relationship management	Market res-ponsiveness
IS development	1.000							
IS Infrastructure	.237*	1.000						
IS technical Skills	.489**	.216*	1.000					
Cost effective IS operations	.321**	.111	.362**	1.000				
IS planning	.385**	.213*	.304**	.321**	1.000			
IS business partnerships	.417**	.221*	.458**	.483**	.414**	1.000		
External Relationship Management	.312**	.054	.296**	.183	.298**	.292**	1.000	
Market res-Ponsivness	.353**	.241*	326**	330**	.421**	.466**	.383**	1.000

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

The results shown in table 7.4 indicate that all eight combined measures are reasonably well correlated with each other, they are all significant at the 0.05 level or above apart from *'IS infrastructure'* and *'external relationship management'*, *'IS infrastructure'* and *'cost effective IS operations'* and *'cost effective IS operations'* and *'external relationship management'*, which showed no significant correlation. However, these three IS capabilities show significant correlations with all of the other IS capabilities, thus it was decided inappropriate to remove them. However, if the KMO test, Bartlett's Test of Sphericity, or factor analysis had not provided satisfactory results, the 3 capabilities would have been excluded and the tests would have been reconducted. Having reviewed table 7.4 it would suggest that the combined IS non-transparency measures for the eight IS capabilities have similar traits therefore advocating the next steps of conducting the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett test of sphericity in order identify the appropriateness of factor analysis.

The results of the KMO test, which is reported in figure 7.4 shows that the 8 combined measures of IS capability non-transparency have a KMO value of 0.849. This indicates a "meritorious" adequacy according to the Kaiser (1974) scale; hence advocating the inclusion of all eight combined measures of IS capability non-transparency in factor analysis. In addition, the results of the Bartlett test of sphericity, reported in figure 7.4, indicate that the correlations among the 8 combined measures of IS capability non-transparency are highly significant. Combining the results of the KMO test and Bartlett test of sphericity identify that the 8 combined measures of IS capability non-transparency meeting the conditions for the application of factor analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.849
Bartlett's Test of Sphericity	Approx Chi-Square	193.703
	Df	28
	Sig.	.000

Component Matrix (1 component extracted)

Variable	Communality	Factor	Eigenvalue	Pct of Var	Cum Pct
IS development	0.702	1	3.302	41.274	41.274
IS infrastructure	0.495				
IS technical skills	0.609				
Cost effective IS operations	0.618				
IS planning	0.663				
IS business partnerships	0.761				
External relationships	0.541				
Market responsiveness	0.700				

Extraction method: Principal Component Analysis.

Only one component was extracted. The solution cannot be rotated

Figure 7.4 Factor analyses for IS capability non-transparency

As previously identified Norusis (1994) advocated the general rule of using as many factors as there are eigenvalues greater than one. The results of the factor analysis, presented in Figure 7.4, the full list of eigenvalues in table 7.5 and the scree plot in Figure 7.5 show only one factor was obtained with an egienvalue greater then one. This indicates that all eight aggregate measures of IS capability non-transparency load onto just one factor, IS capability non-transparency.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.302	41.274	41.274	3.302	41.274	41.274
2	.955	11.941	53.215			
3	.869	10.861	64.076			
4	.766	9.574	73.650			
5	.637	7.968	81.618			
6	.524	6.554	88.172			
7	.496	6.202	94.374			
8	.450	5.626	100.000			

Table 7.5 Eigenvalues for IS capability non-transparency
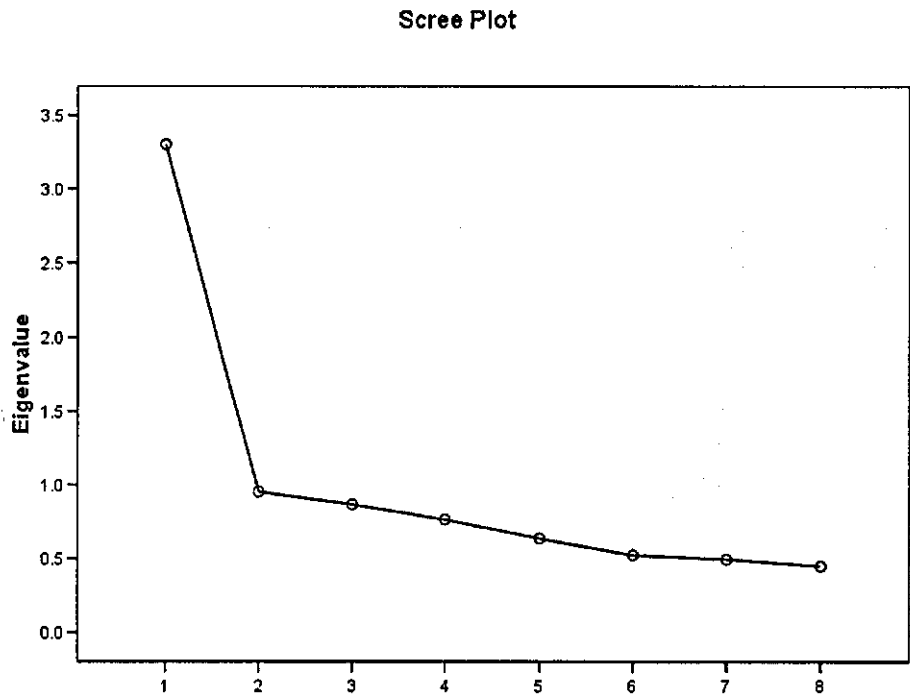
Scree Plot

Figure 7.5 Scree Plot for IS capability non-transparency

Reliability: The final stage is to conduct Cronbach's Alpha to estimate the reliability of the eight-combined measure of IS capability non-transparency. The results shown in figure 7.6 show that the alpha reliability value is 0.788, which is very high, suggesting the measures are reliable.

Reliability Coefficients	8 items
Alpha = 0.788	Standard item alpha = 0.788

Figure 7.6 Cronbach's Alpha Value for IS capability non-transparency

The implications of obtaining one factor, with an eigenvalue greater than one from conducting factor analysis and an alpha reliability value of 0.788, would suggest that all eight combined IS capability non-transparency measures can be summated. An

example of how the summated scale is being applied to identify 'IS capability non-transparency' is provided in table 7.6, thus, demonstrating the utility of the model.

Table 7.6 Calculating IS capability non-transparency

IS capability	Ranking IS capability contribution	Rating Non-transparency	Product Total IS capability non-transparency
IS development	4	2	8
IS infrastructure	3	3	9
IS technical skills	4	1	4
Cost effective IS operations	5	3	15
IS planning	2	4	8
IS business partnerships	3	5	15
External relationship management	4	2	8
IS business partnerships	1	4	4
	Aggregate score: (A0)		71

7.5.2 Measures to be used for IS capability non-transparency

As a result of the tests conducted above it can be concluded that it is valid and reliable to summate all eight IS capabilities into one measure of IS capability non-transparency (*'total IS capability non-transparent'*). *'Total IS capability non-transparency'* was used as a summated measure to gain an indication of the degree to which each organization is exploiting IS capabilities which are non-transparent. In order to gain a complete picture of IS capability non-transparency, each IS capability was further investigated individually *'IS capability non-transparency individually'*. Table 7.7 provides a summary of the measures used for IS capability non-transparency.

Table 7.7 Measures of IS capability non-transparency

Measure/summated measure	Description
Total IS capability non-transparency	*The total degree of IS capability non-transparency (summation across the measures of IS capability non-transparency).*
IS capabilities non-transparency individually	*The degree to which each IS capability is non-transparent and contributing to the success of the IS enhancement.*

7.6 Summated measures for IS capability non-replicability

As with the degree of IS capability non-transparency, this research also seeks to identify the attitude of the respondents towards the degree of IS capability non-replicability, for all eight IS capabilities.

7.6.1 Scale Validity

Identifying which measures appear to gauge IS capability non-replicability is very clear cut in this case as each of the eight combined measure have questions identifying the degree of IS capability contribution and IS capability non-replicability. Therefore on the face of it, it would appear appropriate to include all eight combined measures of IS capability non-replicability, within the correlation matrix discussed below.

A correlation matrix containing the eight combined measures as previously identified from conducting face validity is set out in table 7.8.

Table 7.8 Correlation matrix for IS capabilities non-replicability

	IS development	IS infrastructure	IS Technical skills	Cost Effective IS operations	IS Planning	IS business partnerships	External Relationship management	Market res-ponsiveness
IS development	1.000							
IS Infrastructure	.300**	1.000						
IS technical Skills	.478**	.457**	1.000					
Cost effective IS operations	.297**	.230*	.372**	1.000				
IS planning	.339**	.313**	.334**	.350**	1.000			
IS business partnerships	.462**	.373**	.367**	.416**	.403**	1.000		
External Relationship Management	.359**	.135	.273**	.263**	.336**	.423**	1.000	
Market res-ponsivness	.381**	.302**	.272**	.391**	.444**	.502**	.392**	1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

The results shown in table 7.8 indicate that all eight combined measures are reasonably well correlated with each other, they are all significant at the 0.05 level or above apart from '*IS infrastructure*' and '*external relationship* management', which show no significant correlation. Although these two IS capabilities show no significant correlation with one another, they do show significant correlations with all of the other IS capabilities, thus it was decided inappropriate to remove them from further analysis. However, if the KMO test, Bartlett's Test of Sphericity, or factor analysis had not provided satisfactory results, the two capabilities would have been excluded and the tests would have been reconducted. Having reviewed table 7.8 it would suggest that the combined IS non-replicability measures for the eight IS capabilities have similar traits therefore advocating the next step of conducting the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett test of sphericity in order to identify the appropriateness of factor analysis.

The results of the KMO test, which is reported in figure 7.7, show that the eight combined measures of IS capability non-replicability have a KMO value of 0.846. This indicates a '*meritorious*' adequacy according to the Kaiser (1974) scale; hence advocating the inclusion of all eight aggregate measures of IS capability non-replicability in factor analysis. In addition, the results of the Bartlett test of sphericity, reported in figure 7.7, indicates that the correlations among the eight aggregate measures of IS capability non-replicability are highly significant. Combining the

results of the KMO test and Bartlett test of sphericity identify that the eight combined measures of IS capability non-replicability meet the conditions for the application of factor analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		846
Bartlett's Test of Sphericity	Approx Chi-Square	223.252
	Df	28
	Sig.	.000

Component Matrix (1 component extracted)

Variable	Communality	Factor	Eigenvalue	Pct of Var	Cum Pct
IS development	0.690	1	3.513	43.907	43.907
IS infrastructure	0.573				
IS technical skills	0.668				
Cost effective IS operations	0.623				
IS planning	0.666				
IS business partnerships	0.760				
External relationships	0.595				
Market responsiveness	0.705				

Extraction method: Principal Component Analysis.
Only one component was extracted. The solution cannot be rotated

Figure 7.7 Factor analyses for IS capability non-replicability

As previously identified Norusis (1994) advocated the general rule of using as many factors as there are eigenvalue's greater than one. The results of the factor analysis, presented in Figure 7.7, the full list of eigenvalues in table 7.9 and the scree plot in Figure 7.8 show only one factor was obtained with an eigenvalue greater then one, which indicates that all eight combined measures of IS capability non-replicability load onto just one factor, IS capability non-replicability.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.513	43.907	43.907	3.513	43.907	43.907
2	.975	12.189	56.096			
3	.766	9.580	65.676			
4	.706	8.827	74.503			
5	.611	7.641	82.144			
6	.568	7.097	89.241			
7	.471	5.889	95.130			
8	.390	4.870	100.000			

Table 7.9 Eigenvalues for IS capability non-replicability
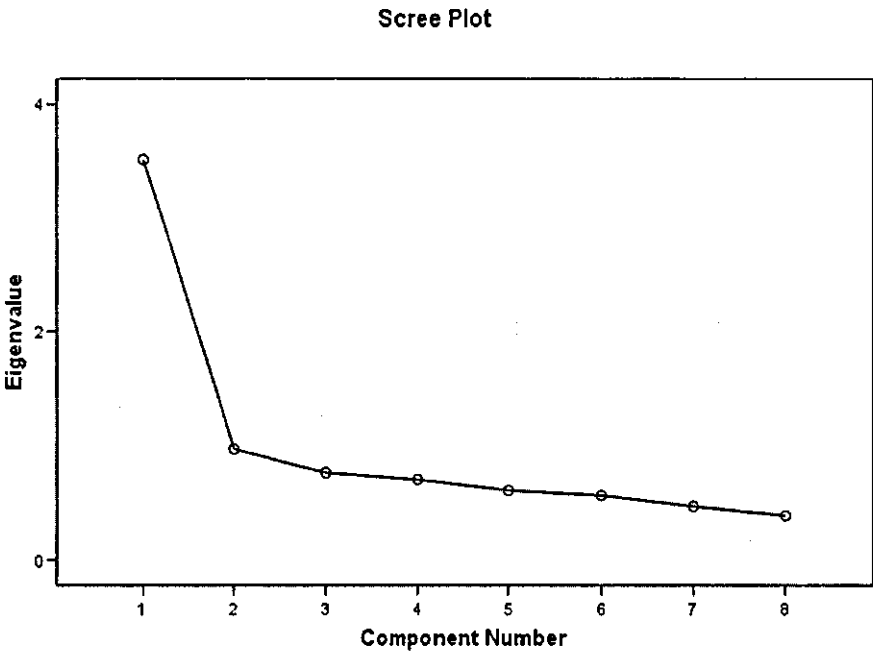
Scree Plot

Figure 7.8 Scree Plot for IS capability non-replicability

Reliability: The final stage is to conduct Cronbach's Alpha to estimate the reliability of the eight-combined measure of IS capability non-replicability. The results shown in figure 7.9 show that the alpha reliability value is 0.813, which is very high, suggesting the measures are reliable.

Reliability Coefficients	8 items
Alpha = 0.813	Standard item alpha = 0.815

Figure 7.9 Cronbach's Alpha Value IS capability non-replicability

The implications of obtaining one factor, with an eigenvalue greater the one from conducting factor analysis and an alpha reliability value of 0.813, would suggest that it is appropriate to summate all eight combined measures of IS capability non-replicability.

7.6.2 Measures to be used for IS capability non-replicability

As a result of the tests conducted above, it can be concluded that it is valid and reliable to summate the eight combined measures of IS capability non-replicability (*'total IS capability non-replicability'*). *'Total IS capability non-transparency'* was used as a summated measure; to gain an indication of the degree to which each organization is exploiting IS capabilities which are non-replicable. In order to gain a complete picture of IS capability non-replicability, each IS capability was further investigated individually *'IS capability non-replicability individually'*. Table 7.10 provides a summary of the measures used for IS capability non-replicability.

Table 7.10 Measures of IS capability non-replicability

Measure/summated measure	*Description*
Total IS capability non-replicability	*The total degree of IS capability non-replicability (summation across the measures of IS capability non-replicability).*
IS capabilities non-replicability individually	*The degree to which each IS capability is non-replicable and contributing to the success of the IS enhancement.*

7.7 Wade and Hulland's classification of IS capabilities

The IS capability typology used in this study was adopted from Wade and Hulland (2004), who identified that the typology could be classified into inside-out, outside-in and spanning capabilities. For this reason one of the aims of this study was to identify if the IS capabilities could sensibly be classified into these three classifications after

scale validity and unidimensionality has been assessed. If the IS capabilities had fallen into these three capability classifications then IS capabilities could have been summated into inside-out, outside-in and spanning capabilities and then correlated with measures of improved competitive positioning to identify if certain classifications of IS capabilities were more likely to enable and sustain improved competitive positioning than others. However, on assessing scale validity and unidimensionality for the various measures used for IS capabilities, it can be concluded that they summate into single measures of IS capabilities, not inside-out, outside-in or spanning capabilities[25]. As a result, IS capabilities in terms of their contribution, non-transparency and non-replicability will be correlated individually with the various measures of improved competitive positioning and sustained improved competitive positioning. Thus, still enabling conclusions to be inferred on the propositions set out in chapter 3.

7.8 Measures of improved competitive positioning

With measures identified for IS capability contribution, IS capability non-transparency and IS capability non-replicability, measures need to be identified for improved competitive positioning. However, when trying to assess scale validity and unidimensionality for the 11 measures of improved competitive positioning, it became apparent that factor analysis could not be conducted due to the large numbers of business processes that were not improved as a result of the IS-enhancement. The respondents were only asked to fill in the business processes that were improved as a result of the IS-enhancement resulting in a large majority of the business processes from each respondent being left blank. As factor analysis could not been conducted, it was deemed inappropriate to use summated measures for improved competitive positioning.

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[25] As discussed previously, due to the large number of 0's inserted into the factor analysis; fewer factor loadings would result than if the 0's had been omitted. Consequently this is a possible explanation of why 'IS capability contribution', 'IS capability non-transparency' and IS capability non-replicability load onto a single factor, instead of the three factors of inside-out, outside in and spanning IS capabilities as Wade and Hulland would suggest.

As a result of the inappropriateness of summating across measures of improved competitive positioning, the following two measure of improved competitive positioning have been used for the purpose of this research: '*range*', the number of processes improved as a result of the IS-enhancement and '*maximum*', the process with the greatest degree of improved competitive positioning. Table 7.11 provides a summary of the measures used for improved competitive positioning.

Table 7.11 Summary of measures for improved competitive positioning

Measure/summated measure	Description
ICP Range	The number of processes improved as a result of the IS enhancement
ICP Maximum	The process with the greatest degree of ICP

7.9   Measures of sustained improved competitive positioning

For the same reasons as with improved competitive positioning, scale validity and unidimensionality could not be conducted for the 11 measures of sustained improved competitive positioning. For the 11 measure of sustained improved competitive positioning it was deemed inappropriate to conduct factor analysis. Thus, no summated measures were used for sustained improved competitive positioning.

As a result, the two measure of sustained improved competitive positioning that will be used for the purpose of this research are '*range*", the number of processes sustained as a result of the IS enhancement and '*maximum*', the process with the greatest degree of sustained improved competitive positioning. Table 7.12 provides a summary of the measures used for sustained improved competitive positioning.

Table 7.12 Summary of measures for sustained improved competitive positioning

Measure/summated measure	Description
SICP Range	The number of processes sustained as a result of the IS enhancement
SICP Maximum	The process with the greatest degree of SICP

7.10 Measures of the direct and indirect impacts of the IS-enhancement on competitive positioning

As single scale measures were used to measure the direct and indirect impacts of the IS-enhancement on both improved competitive positioning and sustained improved competitive positioning they can be used in their original form. Table 7.13 provides a summary of the measures used for the direct and indirect impacts of the IS-enhancement on competitive positioning.

Table 7.13 Summary of measures for direct and indirect impacts of the IS-enhancement on competitive positioning

Measure/summated measure	Description
Direct contribution to ICP	*Degree of direct IS-enhancement contribution to improved competitive positioning*
Indirect contribution to ICP	*Degree of indirect IS-enhancement contribution to improved competitive positioning*
Direct contribution to SICP	*Degree of direct IS-enhancement contribution to sustained improved competitive positioning*
Indirect contribution to SICP	*Degree of indirect IS-enhancement contribution to sustained improved competitive positioning*

7.11   Summary

This chapter has identified through accessing scale validity and unidimensionality that for the purposes of this research it is not appropriate to summate the eight IS capabilities into inside-out, outside-in and spanning capabilities as identified by Wade and Hulland (2004), but instead they should be summated to give organizational measures of: IS capability contribution, IS capability non-transparency and IS capability non-replicability. It has also been identified that it is inappropriate to summate the 11 business process to give organizational measures of improved competitive positioning and sustained improved competitive positioning. The next chapter uses the measures and summated measures identified within this chapter to explore the research propositions.

Chapter 8

Testing the propositions through quantitative analysis

8.1 Introduction

The previous chapter identified measures: namely IS capability contribution, IS capability non-transparency, IS capability non-replicability and improved competitive positioning (immediate and sustained) that are to be used in this chapter to quantitatively test the propositions. This chapter firstly examines the relationship between various measures of IS capability and levels of both improved and sustained improved competitive positioning. The chapter then moves on to examine the relationships between both the direct and indirect impacts of IS-enhancements and the degree of improved competitive positioning and sustained improved competitive positioning achieved. Through the examination of the above relationships this chapter seeks to uphold the propositions presented in chapter 3, and to identify the further areas of research to be explored through the qualitative follow-up interviews.

8.2 List of variables used

In order to aid understanding of the results, table 8.1 provides a list of the main variables used within this research, with a brief description of each. To aid clarity, all variables referred to in this chapter will be underlined to enable the reader to easily distinguish them from the surrounding text.

Table 8.1 Summary and description of variables used

Variable	Description
ICP Range	Number of business process improved as a result of the IS-enhancement.
ICP Maximum	Process with the greatest degree of improved competitive positioning for each response.
ICP Individually	Improved competitive positioning for each individual process as a result of an IS-enhancement.
Capability Range	Number of IS capabilities that contributed to the success of the IS-enhancement.
Capability Total	Total degree of IS capability contribution to the success of the IS-enhancement, calculated by summating all contribution capabilities.
SICP Range	Number of business processes sustained as a result of the IS enhancement.
SICP Maximum	Degree of sustained improved competitive positioning for the process with the greatest degree of improved competitive positioning for each response.
SICP Individually	Sustained improved competitive positioning for each individual process improved as a result of an IS-enhancement.
Total IS capability non-transparency	Total degree of non-transparency of the IS capabilities contributing to the success of the IS-enhancement.
Total IS capability non-replicability	Total degree of non-replicability of the IS capabilities contributing to the success of the IS-enhancement.
Direct contribution to ICP	Degree of direct IS-enhancement contribution to improved competitive positioning.
Indirect contribution to ICP	Degree of indirect IS-enhancement contribution to improved competitive positioning.
Direct contribution to SICP	Degree of direct IS-enhancement contribution to sustained improved competitive positioning.
Indirect contribution to SICP	Degree of indirect IS-enhancement contribution to sustained improved competitive positioning.

8.3 Relationships between IS capability contribution and improved competitive positioning (Proposition1)

It has been argued that firm performance is not necessarily attributable to any single IS capability, in isolation, but on how firms integrate and combine their IS capabilities (Ross et al. 1996; Wade and Hulland, 2004). For this reason the following was proposed:

Proposition 1: The greater the degree to which the success of the host organisation's IS-enhancement is dependent upon IS capabilities, the greater will be their resulting degree of improved competitive positioning.

In order to prove or disprove this proposition, correlation analysis was used to identify any relationships between the measures of IS capability contribution (capability range and capability total (as identified in table 8.1) and the measures of improved competitive positioning (ICP range and ICP maximum). The results are presented in table 8.2.

Table 8.2 Correlations between IS capability contribution and ICP

	ICP Range	ICP Maximum
Capability Range	.474**	.283**
Capability Total	.438**	.395**

** Significant at the 0.01 level
* Significant at the 0.05 level

The first set of results presented in table 8.2 identifies a significant positive correlation, at the 0.01 level, between 'capability range' and 'ICP range', and also between 'capability range' and 'ICP maximum'. Therefore, it can be concluded from these results that as the number of capabilities that contribute to the success of the IS-enhancement increases, so does both the number of processes improved as a result of the IS-enhancement and the degree of improved competitive positioning for the process that was most improved.

The second set of results presented in table 8.2 identify a significant positive correlation, at the 0.01, level between 'capability total' and both 'ICP range', and 'ICP maximum'. Thus, it can be concluded that as the total IS capability contribution to the success of the IS-enhancement increases, so does both the number of processes improved as a result of the IS-enhancement and the degree of improved competitive positioning for the process that was most improved.

Although the correlations in table 8.2 are all significant at the 0.01 level, as the process typology was split into operating processes and management/support processes it was thought interesting to investigate each of the eleven business processes in turn. Doing this enabled any statistical association between a particular

business process and IS capability contribution ('capability range' 'capability total') to be identified. From these statistical associations it can then be inferred whether any differences exist between operating processes and management/support process. The results are presented in table 8.3.

Table 8.3 Correlations between ICP for each process and capability contribution

Process ICP	Capability Range	Capability Total	Process Type
Developing vision and strategy	.172	.242*	Operating
Designing and developing products or services	.223*	.243*	Operating
Acquiring and storing input required for products or services	.358**	.405**	Operating
Transforming acquired inputs into a product or service	.405**	.435**	Operating
Marketing and selling products or services	.078	.078	Operating
Delivering products or services	.293**	.327**	Operating
Customer service	.337**	.316**	Operating
Developing and managing human capital	.198*	.260**	Management and support
Managing information technology and knowledge	.172	.186	Management and support
Managing financial resources	.094	.055	Management and support
Managing external relationships	.192*	.168	Management and support

** Significant at the 0.01 level
* Significant at the 0.05 level

An examination of the data in table 8.3 suggests a pattern between the level of IS capability contribution ('capability range' and 'capability total') and the types of business processes being improved. More specifically, in four out of the seven operating processes there is a significant correlation at the 0.01 level between the degree of IS capability contribution (both 'capability range' and 'capability total') and

the degree of improved competitive positioning being achieved, with only the process of *'marketing and selling products or services'* showing no significant correlation. This is in contrast to none of the management/support processes having a significant correlation, at the 0.01 level, two having a positive significant correlation at the 0.05 level and two processes - *'managing information technology and knowledge'* and *'managing financial resources'* showing no significant correlations. Moreover, it would appear the size of the correlations between capability contribution and operating processes is generally much higher than that for the management/support processes. Based on these statistical associations, it is possible to infer that improved competitive positioning of operating processes is more sensitive to IS capability contribution ('capability range' and 'capability total') than management/support processes. One possible explanation for this is that systems used to support operating processes are more bespoke than MIS (management information systems) and thus require a greater number of IS capabilities to successfully implement the system. For example, the ability *'transform acquired inputs into products or services'* is very specific to organisations; it may be only one of a handful of companies producing that product and thus a very bespoke system is required. Although, as with the reasons why the degree of improved competitive positioning for the processes of *'delivering products and services'*, *'customer service'* and *'acquiring and storing input required for products or services'* have the greatest statistical association with IS capability contribution, no definitive conclusion can be offered at this stage. Furthermore, table 8.3 provides evidence that competitive positioning is best measured at the process level, supporting such academics as Ray et al. (2004).

Looked at in their entirety, the results presented in table 8.3 indicate that for the majority of business processes there is a significant statistical association between their degree of improved competitive positioning and IS capability contribution. Consequently, based upon the evidence presented in tables 8.2 and 8.3 it is possible to suggest that proposition 1 should be accepted.

Whilst the statistical evidence provides important support for proposition 1, it can't in itself provide any insights into the proposed direction of causality, namely that IS capabilities impact the success of the IS-enhancement, which in turn will directly

contribute to improved competitive positioning. Consequently, it was envisaged that a major object of the interviews would be to validate the direction of causality, as well as providing richer and deeper insight into the nature of this relationship.

8.4 Relationship between specific types of IS capability contribution and improved competitive positioning (Proposition 2)

In chapter 3, it was noted that proposition 1 was very general and more specific predictions could be made for different types of IS capabilities. More specifically, Wade and Hulland (2004) suggest that outside-in and spanning capabilities tend to have similar capability attributes in terms of their rarity, when compared with inside-out capabilities. It is this value and rarity that is perceived to impact that ability of a class of IS capability to confer improved competitive positioning. Thus, it is suggested that outside-in and spanning capabilities may have the potential to make a greater impact on improved competitive positioning than inside-out IS capabilities. For this reason the following was proposed:

- *Proposition 2: Outside-in and spanning IS capabilities will have a greater impact on improved competitive positioning, than inside-out IS capabilities.*

As noted in chapter 7, it was not possible to create summated measures for these 3 classes of IS capabilities as there was no clear statistical evidence to support such an approach. Consequently, correlation analysis was used to identify any statistical associations between individual measures of IS capability contribution and measures of improved competitive positioning ('ICP range' and 'ICP maximum'). By comparing and contrasting these statistical associations, it is then possible to infer whether outside-in and spanning IS capabilities do indeed have a greater impact on improved competitive positioning than inside out-IS capabilities. The results are presented in table 8.4.

Table 8.4 Specific IS capability contribution to the success of the IS-enhancement and measures of improved competitive positioning

IS capability contribution	ICP Range	ICP Maximum	Capability type
IS development contribution	.191*	.171	Inside-out
IS infrastructure contribution	.198*	.170	Inside-out
IS technical skills contribution	.271*	.259*	Inside-out
Cost effective IS operations contribution	.264*	.277*	Inside-out
IS planning contribution	.229*	.224*	Spanning
IS business partnerships contribution	.330**	.351**	Spanning
External relationships management contribution	.408**	.240*	Outside-in
Market responsiveness contribution	.500**	.429**	Outside-in

** Significant at the 0.01 level
*Significant at the 0.05 level

Firstly, it is interesting to note that table 8.4 identifies a statistically significant association between IS capability contribution and 'ICP range', for all 8 IS capabilities. Furthermore, a statistically significant association is recognised between six IS capabilities and 'ICP maximum'. Through establishing this, it further increases our confidence that IS capabilities can impact improved competitive positioning.

Table 8.4 further demonstrates that whilst all four correlations between inside-out IS capabilities and 'ICP range' are significant, it is only at the 0.05 level. By contrast, three of the outside-in and spanning IS capabilities are significant at the 0.01 level and a further one is significant at the 0.05 level. The divide between inside-out and both spanning and outside-in IS capabilities becomes even more evident when the correlations between IS capabilities and 'ICP maximum' are examined. Only two

inside-out IS capabilities are significant at the 0.05 level, with '*IS development*' and '*IS infrastructure*' showing no significant statistical association at all. Once again, this may be compared to two of the outside-in and spanning IS capabilities being significant at the 0.01 level and the other two being significant at the 0.05 level. Furthermore, it would appear that the sizes of the correlations between IS capability contribution and both outside-in and spanning capabilities are much higher than that of inside-out IS capabilities. From these statistical associations it is possible to infer that outside-in and spanning capabilities may have a greater impact on improved competitive positioning than inside-out IS capabilities.

These findings are of particular interest when considered in the context of the results previously presented in table 6.7, which indicated that inside-out IS capabilities tend to make a greater contribution to the success of IS-enhancements, on average, than either outside-in or spanning IS capabilities. However, in cases where an IS-enhancement leads to a high degree of improved competitive positioning, it is the outside-in and spanning capabilities which clearly make the greatest contribution. This would suggest that inside-out IS capabilities tend to make a more general contribution to the success of an IS-enhancement, but this contribution is less evident in the cases where a significant improvement in the organization's competitive positioning has been achieved. By contrast, the contributions of outside-in and spanning capabilities are less common, but they tend to be more important, in terms of the attainment of improved competitive positioning. Whilst this may be a valid explanation for the apparent contradiction between the data presented in tables 6.7 and 8,4, it is an interesting paradox, which will need to be more fully explored through interviews.

It is also of interest to look at the IS capabilities individually to see which IS capabilities make the greatest impact on improved competitive positioning. From table 8.4 it becomes evident that the IS capabilities of '*market responsiveness*' and '*IS business partnerships*' show the greatest statistical association with improved competitive positioning and the IS capabilities of 'IS development' and '*IS infrastructure*' show the least. Based on Wade and Hulland's (2004) suggestion that the value and rarity dictate the ability of an IS capability to confer improved competitive positioning, it can be surmised that the IS capabilities of '*market*

responsiveness' and '*IS business partnership*' make the greatest contribution to competitive positioning because of their greater value and rarity. However, as this is something which cannot be tested from the qualitative data, it will be explored further through the follow up interviews.

From reviewing the evidence in table 8.4, it can be inferred that outside-in and spanning capabilities do tend to have a greater impact on improved competitive positioning than inside-out IS capabilities. Based upon this statistical evidence, proposition 2 is supported.

8.5 Relationship between both IS capability non-transparency and non-replicability and sustained improved competitive positioning (Proposition 3)

It has been identified in chapter 3.5 that a firm's ability to sustain competitive advantage, over time, depends upon the speed with which other firms can imitate its strategy. Imitation requires that a competitor overcomes two problems. First is the information problem: what is the competitive advantage of the successful rival, and how is it being achieved? Second is the strategy duplication problem: can the would-be competitor amass the resources and capabilities required to replicate the successful strategy of the rival? Thus, if an organisation wishes to imitate the strategy of a rival, it must first identify those capabilities that contribute to the rival's competitive advantage (transparency), and then it must be able to acquire them (replicability) (Grant, 1991). Consequently, for the purpose of this research it has been suggested that the greater the degree to which IS capabilities are non-transparent and/or non-replicable, the greater their impact on sustained improved competitive position. This led to the development of the following proposition:

Proposition 3: The greater the degree to which the success of the host organisations IS-enhancement is dependent upon IS capabilities, which are non-transparent and non-replicable, the greater will be their resulting degree of sustained improved competitive positioning.

As IS capability non-transparency and IS capability non-replicability were addressed separately in the survey, the analysis of this proposition will be considered in two parts.

8.5.1 IS capability non-transparency

In order to uphold or disprove proposition 3, correlation analysis was used to identify any relationships between 'total IS capability non-transparency' and the degree of sustained improved competitive positioning ('SICP range' and 'SICP maximum'). The results are presented below in table 8.5.

Table 8.5 Correlations between measures of IS capability non-transparency and SICP

	SICP Range	SICP Maximum
Total IS capability non-transparency	.442**	.391**

** Significant at the 0.01 level
* Significant at the 0.05 level

The results presented in table 8.5 identify a significant positive correlation, at the 0.01 level, between 'total IS capability non-transparency' and both 'SICP range' and 'SICP maximum'. Therefore, it can be concluded from these results that as the degree to which a specific IS-enhancement is dependent upon non-transparent IS capabilities increases, so do both the resultant number of processes that experienced a degree of sustained improved competitive position and the degree of sustainability for the process that was most improved as a result of the IS-enhancement.

Although both the correlations in table 8.5 are significant at the 0.01 level, as the process typology was split into operating processes and management/support processes it was thought interesting to investigate each of the eleven business processes individually. It was suggested, in section 8.2 that operating processes are more sensitive to IS capability contribution than management/support processes. Consequently, it was envisaged that these processes may also be more sensitive to the

non-transparency and non-replicability of individual IS capabilities. Through investigating each of the eleven business processes it enabled any statistical association between a particular business process and IS capability non-transparency/non-replicability[26] to be identified. From these statistical associations, it can then be inferred whether any differences exist between operating processes and management/support process. The results are presented in table 8.6:

Table 8.6 Correlations between SICP for each process and capability contribution

Process SICP	Total IS capability non-transparency	Total IS capability non-replicability	Process Type
Developing vision and strategy	.218*	.206*	Operating
Designing and developing products or services	.337**	.324**	Operating
Acquiring and storing input required for products or services	.395**	.359**	Operating
Transforming acquired inputs into a product or service	.462**	.428**	Operating
Marketing and selling products or services	.119	.100	Operating
Delivering products or services	.392**	.367**	Operating
Customer service	.268**	.300**	Operating
Developing and managing human capital	.157	.198*	Management and support
Managing information technology and knowledge	.271**	.272**	Management and support
Managing financial resources	.033	.026	Management and support
Managing external relationships	.230	.157	Management and support

** Significant at the 0.01 level
 * Significant at the 0.05 level

The data in table 8.6 suggest a pattern between the types of business processes being sustained and the levels of IS capability non-transparency/non-replicability. More

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[26] As the results were very similar, both non-transparency and non-replicability are presented together in table 8.6 to avoid repetition.

specifically, in five out of the seven operating processes, there is a significant correlation, at the 0.01 level, between the degree of IS capability non-transparency ('Total IS capability non-transparency') and the degree of sustained improved competitive positioning being achieved. Only the process of *'marketing and selling products or services'* shows no significant correlation. This is in contrast to only one of the management/support processes having a significant correlation at the 0.01 level and three showing no significant correlation. Moreover, in five out of the seven operating processes there is a correlation at the 0.01 level between the degree of IS capability non-replicability ('Total IS capability non-replicability') and the degree of sustained improved competitive positioning. Only the process of *'marketing and selling products or services'* showed no significant correlation. In contrast one management/support processes is significant at the 0.01 level, one is significant at the 0.05 level and two showing no significant correlation. Furthermore, it would appear the size of the correlations between IS capability non-transparency/non-replicability and operating processes is much higher than that of management/support processes. Based on these statistical associations it is possible to infer that the sustained improved competitive positioning of operating processes is more sensitive to IS capability non-transparency/non-replicability than management/support processes. It has been argued that operating processes are more sensitive to IS capability contribution than management/support processes because the systems required to support operating processes are more bespoke than the systems required to support management/support processes and thus require a greater number of IS capabilities to successfully implement the system. Hence, as previously discussed, it stands to reason that if these processes are more sensitive to the IS capability in general, they will also be more sensitive to the IS-capabilities degree of non-transparency/non-replicability.

8.5.2 IS Capability non-replicability

To further investigate proposition 3, correlation analysis was used to explore the relationships between 'total IS capability non-replicability' and the degree of sustained improved competitive positioning ('SICP range' and 'SICP maximum'). The results are presented below in table 8.7.

Table 8.7 Correlations between measures of IS capability, non-replicability and SICP

	SICP Range	SICP Maximum
Total IS capability non-replicability	.436**	.359**

** Significant at the 0.01 level
* Significant at the 0.05 level

The results presented in table 8.7 show a similar picture to that observed for non-transparency as a significant correlation, at the 0.01 level, has been observed between 'total IS capability non-replicability' and both 'SICP range' and 'SICP maximum'. Again as with non-transparency it can be concluded that as the degree to which the specific IS-enhancement is dependent upon non-replicable IS capabilities increases, so does both the number of processes that experienced a degree of sustained improved competitive position, and the degree of sustainability for the process that was most improved as a result of the IS-enhancement.

Based on the statistical results, presented in tables 8.5 and 8.7, it is possible to suggest that proposition 3 should be accepted. However, this will be further validated and investigated through the follow up interviews.

8.6 Relationships between types of non-transparent and non-replicable IS capabilities and sustained improved competitive positioning (proposition 4)

It was noted in section 3.5 that proposition 3 is very general and a more specific prediction might be made for different types of IS capabilities. More specifically, it is proposed that the key drivers of long term competitive positioning are more likely to be the result of superior outside-in and spanning capabilities than inside-out IS capabilities, as they tend to have a higher degree of non-transparency and non-replicability. For this reason the following was proposed:

Proposition 4: Outside-in and spanning IS capabilities will have a greater impact on sustained improved competitive positioning, than inside-out IS capabilities.

As discussed in chapter 7, there is no statistical evidence to suggest that IS capabilities could be grouped into inside-out, outside-in or spanning capabilities. Consequently, correlation analysis was used to identify any statistical associations between individual measures of IS capability non-transparency/non-replicability and measures of sustained improved competitive positioning ('Maximum SICP'). By looking at these statistical associations it is then possible to infer whether outside-in and spanning IS capabilities have a greater impact on sustained improved competitive positioning than inside-out IS capabilities.

8.6.1 Relationship between specific non-transparent IS capabilities and sustained improved competitive positioning

Table 8.8 presents the results of the correlation analysis between the non-transparency of individual IS capabilities and the 'maximum SICP'. A significant positive correlation, at the 0.01 level, is identified for 3 out of the four spanning and outside-in IS capabilities and for the fourth a significant correlation, at the 0.05 level is shown. This is in contrast to all four inside-out IS capabilities showing a significant positive correlation, but only at the 0.05 level. Furthermore, it would appear the size of the correlations between IS capability non-transparency and both outside-in and spanning capabilities are much higher than that of inside-out IS capabilities. Based on these statistical associations it is possible to infer that non-transparent outside-in and spanning capabilities have a greater impact on sustained improved competitive positioning than non-transparent inside-out IS capabilities.

These findings are of particular interest when considered in the context of the results previously presented in table 6.8, which indicated that inside-out out and spanning IS capabilities tend to have a higher degree of non-transparency on average than outside-in IS capabilities. However, in cases where an IS-enhancement leads to a high degree of sustained improved competitive positioning, it is the outside-in and spanning capabilities which clearly make the greatest contribution. This is an interesting paradox, which will need to be more fully explored through interviews.

Table 8.8 Specific IS capability contribution * transparency and various measures of SICP

Capability	Maximum SICP	Capability type
IS development contribution (NT)[27]	.200*	Inside-out
IS infrastructure contribution (NT)	.214*	Inside-out
IS technical skills contribution (NT)	.220*	Inside-out
Cost effective IS operations (NT)	.237*	Inside-out
IS planning contribution (NT)	.318**	Spanning
IS business partnerships contribution (NT)	.304**	Spanning
External relationships contribution (NT)	.198*	Outside-in
Market response contribution (NT)	.292**	Outside-in

** Significant at the 0.01 level
*Significant at the 0.01 level

It is also of interest to look at the IS capabilities individually to see which non-transparent IS capabilities have the greatest impact on sustained improved competitive positioning. From table 8.8 it becomes evident that the non-transparent IS capabilities of '*market responsiveness*', '*IS business partnerships*' and '*IS planning*' show the greatest statistical association with 'Maximum SICP' and the non-transparent IS capabilities of '*external relationship management*', '*IS development*', '*IS-infrastructure*', 'IS technical skills' and '*cost effective IS operations*' show the least. Thus, through the follow up interviews further questions will be asked to interpret why this is the case, even though it would appear from table 6.8 that inside-out and

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[27] In all cases the way this has been calculated is to multiply the IS capability contribution by its non-transparency. NT = Non-transparency.

spanning capabilities tend to have a higher average degree of non-transparency than outside-in IS capabilities.

8.6.2 Relationship between types of non-replicable IS capabilities and sustained improved competitive positioning

Table 8.9 presents the results of the correlation analysis between the non-replicability of individual IS capabilities and the 'maximum SICP'. The results presented in table 8.9 identify a significant positive correlation at the 0.01 level for 3 out of the four spanning and outside-in IS capabilities. However, the fourth showed no significant correlation. In contrast, two of the inside-out IS capabilities show a significant positive correlation at the 0.01 level and the other two show non significant correlation. Furthermore, it would appear the size of the correlations between IS capability non-replicability and both outside-in and spanning capabilities are much higher than that of inside-out IS capabilities. Based on these statistical associations it is possible to infer that non-replicable outside-in and spanning capabilities have a greater impact on sustained improved competitive positioning than non-replicable inside-out IS capabilities.

It is also of interest to look at the IS capabilities individually to see which non-replicable IS capabilities have the greatest impact on sustained improved competitive positioning. From table 8.9 it becomes evident that the IS capabilities of '*IS business partnership*', '*market responsiveness*' and '*IS planning and change management*' show the greatest statistical association with 'Maximum SICP' and the non-replicable IS capabilities of '*IS development*', '*IS technical skills*' and '*external relationship management*' have the least. Thus, through the follow up interviews further questions will be asked to infer why this is the case. It is also interesting to note from table 8.10 that although it has been identified that outside-in and spanning capabilities tend to have a greater impact on sustained improved competitive positioning than inside-out IS capabilities, the inside-out IS capabilities of IS infrastructure and cost effective IS operations have a greater impact on sustainability than the outside-in IS capability of external relationship management.

Table 8.9 Specific IS capability contribution * replicability and various measures of SICP of BPP

	Maximum SICP	Capability type
IS development contribution (NR)[28]	.161	Inside-out
IS infrastructure contribution (NR)	.253*	Inside-out
IS technical skills contribution (NR)	.154	Inside-out
Cost effective IS operations contribution (NR)	.245*	Inside-out
IS planning contribution (NR)	.268**	Spanning
IS business partnerships contribution (NR)	.324**	Spanning
External relationships contribution (NR)	.185	Outside-in
Market response contribution (NR)	.308**	Outside-in

** Significant at the 0.01 level
*Significant at the 0.05 level

From reviewing the evidence in tables 8.8 and 8.9, it can be concluded that non-transparent and non-replicable outside-in and spanning capabilities will have a greater impact on sustained improved competitive positioning than non-transparent or non-replicable inside-out IS capabilities. However, it must be recognised that non-transparent or non-replicable inside-out IS capabilities can still impact sustained improved competitive positioning. Based upon this statistical analysis proposition 4 can be supported.

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[28] In all cases the way this has been calculated is to multiply the IS capability contribution by its non-replicability. NR = Non-replicability.

8.7 Direct and indirect impacts of the IS enhancement on improved competitive positioning (Proposition 5)

It is now widely recognised that IS-enhancements can either directly[29] or indirectly[30] impact competitive positioning. As it has also been suggested that the benefits from IS projects are generally derived from the complementary organisation changes rather than the IS itself (Ward et al. 1996; Strassman, 1990), it was anticipated that the indirect impacts might be more dominant. Consequently the following proposition was constructed:

Proposition 5: The degree of improvement in competitive positioning will be greatest in those instances where the indirect contribution of the IS enhancement is greater than the direct.

In order to support or disprove this proposition correlation analysis was used to identify whether there were any significant statistical associations between the direct and indirect impacts of the IS-enhancement to improved competitive positioning and the degree of improved competitive positioning achieved ('ICP Individual' and 'ICP Maximum'). The results are presented in table 8.10.

Table 8.10 Direct and indirect contribution to ICP

	ICP Individual	ICP Maximum
Direct contribution to ICP	.077	-.029
Indirect contribution to ICP	-.077	.029

** Significant at the 0.01 level
* Significant at the 0.05 level

Table 8.10 identifies no statistical relationships between 'direct contribution to ICP' and improved competitive positioning achieved ('ICP Individual' and 'ICP Maximum'). Hence, it can be concluded that no relationships exist between the degree

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[29] Degree to which the improved competitive position can be directly attributed to the IS-enhancement.
[30] Degree to which the improved competitive position can be attributed to the IS-enhancement by leveraging existing organisational resources/capabilities or through initiating organisational change to leverage the contribution of the IS-enhancement.

to which an IS-enhancement directly or indirectly[31] impacts improved competitive positioning and the degree of improved competitive positioning achieved. This is of interest as although in has been identified that IS-enhancements generally have a greater direct impact than indirect impact on improved competitive positioning (see table 6.4), it is not a determinant of the degree of improved competitive positioning achieved.

Although the correlations in table 8.10 show no significant relationships, as with previous propositions each of the eleven business processes were investigated in turn. Doing this enabled any statistical association between a particular business process and the direct/indirect impacts of the IS-enhancement to be identified. From these statistical associations it can then be inferred whether any differences exist between operating processes and management/support process. The results are presented in table 8.11. From table 8.11 it becomes apparent that none of the business processes show a statistical association between their degree of improved competitive positioning and the direct/indirect impacts of the IS-enhancement. Hence, there is no evidence to suggest operating processes are more sensitive to either the direct/indirect impacts of the IS-enhancement than management/support processes.

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[31] As a ratio scale was used to measure the direct and indirect contribution to ICP, what is shown for direct will be the opposite of what is shown for indirect and vice-versa.

Table 8.11 Direct and indirect impacts of IS enhancement for each process and ICP

Process ICP	Direct	Indirect	Process Type
Developing vision and strategy	-.004	.004	Operating
Designing and developing products or services	.112	-.112	Operating
Acquiring and storing input required for products or services	-.225	.225	Operating
Transforming acquired inputs into a product or service	.169	-.169	Operating
Marketing and selling products or services	-.195	.195	Operating
Delivering products or services	.202	-.202	Operating
Customer service	.237	-.237	Operating
Developing and managing human capital	-.035	.035	Management and support
Managing information technology and knowledge	1.37	-.137	Management and support
Managing financial resources	.060	-.060	Management and support
Managing external relationships	-223	.223	Management and support

** Significant at the 0.01 level
*Significant at the 0.05 level

Based on the statistical results presented in tables and 8.10 and 8.11, proposition 5 should be rejected. Given that the statistical evidence appears to run counter to the prevailing wisdom regarding complementary organisation change, this proposition will be investigate more thoroughly through the follow up interviews.

8.8 Direct and Indirect IS-enhancement contribution to sustained improved competitive positioning

It has been recognized that IS can change very rapidly (Cecil and Goldstein, 1990; Senn, 1992) and have ever shortening development life cycles, thus, the sustained improved competitive positioning derived directly from the IS-enhancement will not

be as great as the sustained improved competitive position derived indirectly through complementary organisational resources. Moreover, it is argued that complementary organisational resources/capabilities, for example, culture is difficult to articulate (Reed and DeFillippi, 1990; Fiol, 1991), select manufacturing processes are difficult to change and require many stops and starts to evolve toward a successful system (Brynjolfsson et al. 1997) and hence require years to imitate. For this reason the following was proposed:

Proposition 6: The degree of sustained improved competitive positioning will be greatest in those instances where the indirect contribution of the IS-enhancement is greater than the direct contribution.

In order to prove or disprove this proposition, correlation analysis was used to identify any significant statistical associations that might exist between the direct or indirect impacts of the IS-enhancement on sustained improved competitive positioning and the degree of sustained improved competitive positioning achieved ('SICP individually' and 'SICP maximum'). The results are presented below in table 8.12.

8.12 Direct and indirect contribution to SICP

	SICP Individual	SICP Maximum
Direct contribution to SICP	-.224**	-.290**
Indirect contribution to SICP	.224**	.290**

** Significant at the 0.01 level
* Significant at the 0.05 level

Table 8.12 presents a significant statistical relationship, at the 0.01 level, between 'Indirect contribution to SICP' and sustained improved competitive positioning ('SICP Individual' and 'SICP Maximum'). Hence it can be concluded that as the degree to which an IS-enhancement indirectly impacts sustained improved competitive positioning increases, so does the degree of sustained improved competitive positioning achieved, for both processes in general and the processes that was most significantly impacted. This is of interest, as although the indirect impacts rarely have

a greater impact on sustained improved competitive positioning than the direct impacts (see table 6.6), in cases where the level of indirect impact is high so to is the resulting level of sustained improved competitive positioning.

Whilst the results presented in table 8.12 provide a good overview of the relationship between the impact of IS and the level of sustained improved competitive positioning, it is also important to explore whether the resultant level of sustained improved competitive positioning is greater with regard to any specific business process, or a group of business processes. In particular, it was envisaged that there might be differences in the direct or indirect effects of IS upon operating processes as opposed to management/support processes. These results are presented in table 8.13.

Table 8.13 Direct and indirect impacts of IS enhancement for each process and SICP

Process SICP	Direct	Indirect	Process Type
Developing vision and strategy	-.347*	.347*	Operating
Designing and developing products or services	-.315*	.315*	Operating
Acquiring and storing input required for products or services	-.597**	.597**	Operating
Transforming acquired inputs into a product or service	-.524**	.524**	Operating
Marketing and selling products or services	-.051	.051	Operating
Delivering products or services	-.342*	.342*	Operating
Customer service	-.255*	.255*	Operating
Developing and managing human capital	-.067	.067	Management and support
Managing information technology and knowledge	-.158	.158	Management and support
Managing financial resources	-.185	.185	Management and support
Managing external relationships	.058	-.058	Management and support

** Significant at the 0.01 level
* Significant at the 0.05 level

An examination of the data in table 8.13 suggests a pattern is apparent between the 'direct' and 'indirect' impact of the IS-enhancement on sustained improved competitive positioning and the types of business processes being sustained. Moreover, in six out of the seven operating processes there is a significant positive correlation, at the 0.05 level or above, between the degree of indirect IS-enhancement contribution and the resultant degree of sustained improved competitive positioning. Only *'marketing and selling products or services'* processes show no significant correlation. By contrast, none of the management and support processes have a significant correlation at the 0.05 level or above. One possible explanation for this is that the resources/capabilities within operating processes are much less transparent or replicable than is the case for operating/support processes, thus making the indirect impact much harder to imitate. This however clearly warrants further research by academics exploring the impacts of IS-enhancements on individual processes.

Reviewing tables 8.12 and 8.13, it can be seen that as the degree to which the IS-enhancement directly impacts the sustainability of the improved competitive positioning increases, then the degree of sustained improved competitive positioning achieved decreases. Conversely, as the degree to which the IS-enhancement indirectly impacts the sustainability of the improved competitive positioning increases, the degree of sustained improved competitive positioning also increases. Whilst this effects appears to be strongest in the cases of operating processes, there is still strong evidence to support proposition 6.

8.9 Summary

This chapter has presented and discussed in detail the statistical evidence enabling the six propositions identified in chapter 3 to be upheld or not. The propositions upheld are:

Proposition 1: The greater the degree to which the success of the host organisation's IS-enhancement is dependent upon IS capabilities; the greater will be their resulting degree of improved competitive position.

Proposition 2: Outside-in and spanning IS capabilities will have a greater impact on improved competitive positioning, than inside-out IS capabilities.

Proposition 3: The greater the degree to which the success of the host organisation's IS-enhancement is dependent upon IS capabilities, which are non-transparent and non-replicable, the greater will be their resulting degree of sustained improved competitive positioning.

Proposition 4: Outside-in and spanning IS capabilities will have a greater impact on sustained improved competitive positioning, than inside-out IS capabilities.

Proposition 6: The degree of sustained improved competitive positioning will be greatest in those instances where the indirect contribution of the IS-enhancement is greater than the direct contribution, but primarily for operating processes rather than management/support processes.

The quantitative data provides important new evidence in support of much of what has been proposed from a theoretical perspective in the resource based literate. However, as the statistical analyses has only allowed association to be tested, it was important that the direction of causality and the reasons for the causality be more deeply explored through qualitative interviews.

Chapter 9

Revisiting the propositions through a qualitative lens

9.1 Qualitative Analysis

The findings of the analysis, presented in the previous chapter, enabled the propositions presented in chapter 3 to be statistically tested, to explore the extent to which each could be either supported or rejected. However, whilst such statistical analyses provides many interesting insights, it must be recognised that they can only measure statistical associations between variables, rather than delivering a deeper appreciation of the direction of causality and the meaning of these relationships. Consequently it was envisaged that through conducting in-depth follow-up interviews, richer insights into the nature of these relationships would be revealed.

The chapter firstly discusses the appropriateness of combining data collection methods, namely using qualitative interviews as a means of following up and building upon the initial quantitative questionnaires. It then presents and discusses in turn each of the seven steps, adopted from (Kvale, 1996), that guided the course and conduct of the interview investigation. Most substantially, the chapter revisits the statistical findings and explores them further through the interview data.

9.2 Combining quantitative and qualitative methods

Mixed methods research is characterized as research that combines elements of both qualitative and quantitative approaches (Brewer and Hunter, 1989; Howe, 1988; Miles and Huberman, 1984; Patton, 1990; Reichardt and Cook, 1979). More than 40 years ago, quantitative researchers Campbell and Fiske (1959) suggested mixing methods to accurately measure a psychological trait. Their call for multiple methods *'to ensure*

that the variance was reflected in the trait and not on method' (Creswell, 1994, p. 174) later expanded into what Denzin (1978) dubbed *'triangulation'*. Triangulation in research takes advantage of using two methods to get a more accurate picture of what is going on. If you arrive at the same results with two or more methods, then it gives increased confidence that the results you have found are genuine and reflect something real about the topic under study, rather than an artefact of the method chosen (Todd et al. 2004).

However, there still remains debate as to the conditions under which multiple methods ought to be used. Some researchers have adopted the complementary notion of the two approaches (Greene et al. 1989), whereby each approach is used in relation to a different research problem or different aspect of the research problem. By contrast, Denzin (1970), in his original conceptualisation of triangulation, saw the combining of research strategies as a means of examining the same research problem, through different yet complementary lenses and thereby enhancing claims concerning the validity of the conclusions that could be drawn from the data. In his view, the assumption was that the data generated by the two approaches should be consistent with one another. By contrast, Greene et al. (1989) argue that the two approaches should complement one another, rather than necessarily being consistent. In the context of this research, the interviews seek to both validate (Denzin, 1970) and complement the statistical findings (Green et al. 1989) by providing further insights. As Reichardt and Cook (1979, p. 23) observed *'Quite simply, researchers cannot benefit from the use of numbers if they do not know, in common sense terms, what the numbers mean'*.

9.3 Conducting the interviews

A framework is presented which describes the process adopted to ensure the interview data was collected in a focused, rigorous and appropriate manner. The framework consists of seven stages, adapted from Kvale (1996), as it did not include the step of piloting the interviews. The seven stages are presented in Figure 9.1, followed by a discussion of each stage.

Figure 9.1 Course of interview investigation

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│   ┌─────────────────────────────────┐    │
│   │           Planning              │    │
│   │ Formulate purpose of investigation│  │
│   └─────────────────────────────────┘    │
│                  │                        │
│                  ▼                        │
│   ┌─────────────────────────────────┐    │
│   │          Designing              │    │
│   │        Design the study         │    │
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│                  │                        │
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│   ┌─────────────────────────────────┐    │
│   │         Pilot testing           │    │
│   │       Pilot test interviews     │    │
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│   ┌─────────────────────────────────┐    │
│   │         Interviewing            │    │
│   │      Conduct the interviews     │    │
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│                  ▼                        │
│   ┌─────────────────────────────────┐    │
│   │         Transcribing            │    │
│   │ Prepare interview material for analysis│
│   └─────────────────────────────────┘    │
│                  │                        │
│                  ▼                        │
│   ┌─────────────────────────────────┐    │
│   │           Analysis              │    │
│   │        Carry out analysis       │    │
│   └─────────────────────────────────┘    │
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│   ┌─────────────────────────────────┐    │
│   │          Reporting              │    │
│   │ Communicate the findings of the study│ │
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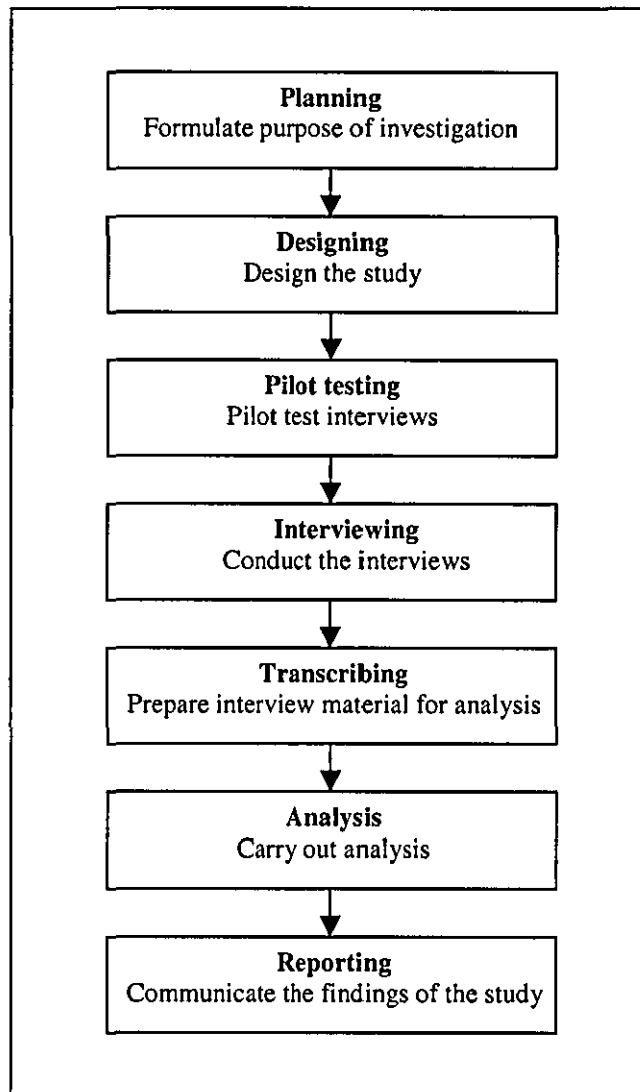
9.3.1 Planning

The key questions for planning an interview investigation concern the what, why and how of the interview (Kvale, 1996):

- **What** - obtaining a pre-knowledge of the subject matter to be investigated. By reflecting upon the literature (see chapter 2) the research propositions (see chapter 3) and the results of the quantitative analysis (see chapter 8) it was possible to identify the primary themes that were to be investigated through the qualitative data collection exercise. Perhaps not surprisingly the interviews were primarily

used to focus more deeply on the six research propositions (see table 9.1), a summary of the areas which require further validation and investigation are presented in column 2 of table 9.1.

Table 9.1 Focus of interviews

Research Objectives	Key finding for further validation and interpretation	Broad focus of interview questions
To explore the relationship between IS capability contribution to IS success and ICP.	Significant positive relationship between degree to which IS capabilities contributes to the success of the IS enhancement and ICP.	To ensure that IS capabilities were perceived to have facilitated improved competitive positioning (direction of causality) and to explore the mechanisms by which this might have occurred.
To explore the relationship between inside-out, outside-in and spanning capability contribution to IS success and ICP.	Inference of a greater relationship between outside-in and spanning capabilities on ICP than inside-out capabilities.	To ensure that outside-in and spanning capabilities were perceived to have a greater impact on improved competitive positioning than inside-out IS capabilities and to explore the reasons why.
To explore the relationship between IS capability non-transparency, non-replicability and SICP.	Significant positive relationship between IS capability non-transparency, non-replicability and degree of SICP.	To ensure that non-transparent and non-replicable IS capabilities were perceived to have facilitated sustained improved competitive positioning (direction of causality) and to explore the mechanisms by which this might happen.
To explore the relationship between inside-out, outside-in and spanning capability contribution to IS success and SICP.	Inference of greater relationship between outside-in and spanning capabilities on SICP than inside-out capabilities.	To ensure that non-transparent and non-replicable outside-in and spanning IS capabilities were perceived to have a greater impact on sustained improved competitive positioning than non-transparent or non-replicable inside-out IS capabilities and to explore the reasons why.
To explore the relationship between direct and indirect impacts of the IS-enhancement on ICP.	No significant relationship between direct or indirect impacts of the IS enhancement and the degree of ICP.	To ensure that the direct and indirect impacts of IS-enhancements on improved competitive positioning were perceived to have no bearing on the degree of improved competitive positioning achieved.
To explore the relationship between direct and indirect impacts of the IS enhancement on the degree of SICP.	Significant negative relationship between direct impacts of the IS enhancement and the degree of SICP Significant positive relationships between indirect impacts of the IS-enhancement and the degree of ICP.	To ensue that the indirect impacts of the IS-enhancement on sustained improved competitive positioning were perceived to result in a greater degree of sustained improved competitive positioning than the direct impacts of the IS-enhancement and to explore why.

- **Why** - In this research, the primary purpose of conducting the interviews was to validate the statistical findings (Denzin, 1970) and complement the statistical findings by providing further and deeper insights (Greene et al. 1989), thus allowing researchers and the readers of the study to improve their understanding of the results. In particular, it was envisaged that the interviews would allow the researcher to confirm the direction of causality, something that is not apparent from the statistical analysis alone.

• *How* – The interviews were conducted with respondents who had previously completed the online questionnaire. This ensured respondents would already have a clear understanding of the topic under investigation and the interview results could also be matched to the qualitative findings. At the end of the online questionnaire (see appendix A) respondents were asked to: '*Please indicate if you would be willing to take part in a short telephone interview to explore your responses further*'. If the respondent clicked yes then the respondent was asked '*please supply your name and contact telephone number*'. For further clarification of how the interviews where conducted see section 4.2. Table 9.2 provides a cross reference between interview numbers and the respondents sector.

Table 9.2 Interviewee reference numbers and the sector they worked in

Number	Sector	Number	Sector
1	Wholesale and retail	2	Business services
3	Wholesale and retail	4	Banking and finance
5	Business services	6	Manufacturing
7	Other	8	Banking and finance
9	Wholesale and retail	10	Manufacturing
11	Manufacturing	12	Manufacturing
13	Manufacturing	14	Banking and finance
15	Business services	16	Business services
17	Business services	18	Manufacturing
19	Wholesale and retail	20	Manufacturing
21	Business services	22	Banking and finance
23	Business services	24	Other
25	Other	26	Banking and finance
27	Transport	28	Banking and finance
29	Energy supply	30	Engineering
31	Manufacturing	32	Engineering
33	Manufacturing	34	Other
35	Business services	36	Other

9.3.2 Designing

Having reviewed the statistical findings presented in chapter 8, identified the areas which required further validation and identified what information was required to complement the statistical findings, the next step was to design the questions, which would facilitate this information. Column three in table 9.1 indicates the broad focus

of the interview areas. However, each of these six areas was decomposed into a number of distinct yet complementary lower level questions, to allow each theme to be explored more competently. A full copy of the interview script is presented in appendix C. Although an interview script is presented, it supported a semi structured interview style. Thus, it has a sequence of themes to be covered as well as suggested questions, yet there was the option to change the sequence and forms of the questions (Fielding, 1993).

9.3.3 Pilot Testing

The interview format needed to be pilot tested to take into consideration not only the nature of the questions but also the interaction between participants. The pilot testing was accomplished by applying two types of test. The first was by having academics with knowledge of the subject under investigation to review the questioning route and identify any potential problems. The second element of the pilot test procedure was actually enacted during the initial interviews. After each of the first five interviews the researcher asked the participants to reflect upon the wording and sequencing of the questions. If major changes were needed to the questions or to the facilitators' procedures, then the results of the first interviews would have been set aside and not used in later analysis. As it happened, there were no significant concerns raised in the study and the first interviews were therefore included in later analysis.

9.3.4 Interviewing

Interviews were conducted based on the interview script with the respondents who ticked the box agreeing to take part in a follow up interview to explore their responses further. In total 36 distinct and very detailed interviews were conducted which ranged from 45 minutes up to one and a half hours. 45 minutes allowed for interviewees to thoroughly review their responses, but given that some respondents wanted to talk for longer, no time limit was set. Indeed, in a number of cases interviews lasted as long as 90 minutes. It is felt that the high number of respondents agreeing to take part in the interviews was due in part to their general interest in the topic, but also because it was possible to exploit professional and personal ties.

9.3.5 Transcribing

Methods that can be used for recording interviews for documentation and later analysis include audiotape recording, videotape recording, note taking, and remembering. For the purpose of this research a tape recorder was used, enabling the researcher to concentrate on the topic and dynamics of the interview. Thompson (1988, p.108) summarizes the case for audio documents:

'The recording is a far more reliable and accurate account of an encounter than a purely written record. All the exact words used are there as they were spoken and added to them are social clues, the nuances of uncertainty, humor or pretence as well as the texture of dialect'.

If interviews are recorded they must be transcribed before they can meaningfully be analysed. A transcription is a text version of what has been said (Taylor, 2001, p.36). To ensure no transcription errors occurred, each interview transcription was checked to ensure the written text reflected the tape recording. More importantly five respondents were asked to read through their transcription to ensure it was a true reflection of the interview. All five respondents concluded that the transcription of their interview was a true reflection of the interview and thus the transcription method adopted can be deemed valid. The transcriptions varied between 5 and 10 hours of work, supporting Ritchie (2003) view that accurate transcription takes between 6 and 8 hours of work for each hour of interview.

9.3.6 Analysis

To provide a more systematic, thorough and potentially richer analysis, the transcribed interviews were imported in rich text format into Nvivo, a computer assisted qualitative data analysis software tool. The use of Nvivo made it possible to edit, code, annotate and more fully explore the transcribed interview texts. In Nvivo there are three options to code data: free nodes (coded but not categorized nodes), tree nodes (codes in a hierarchical mode), and case nodes (codes categorized under different cases). This research mainly relied upon tree nodes, for example, non-transparency was a node under which rested two nodes called *'high non-*

transparency; and 'low non-transparency'. Editing and coding the data enabled the researcher to organise and summarise the data by concept and to compare portions of text from multiple documents with similar codes so common themes could be developed. By comparing similar areas across multiple documents, similar themes and patterns soon became evident. Another advantage of Nvivo is that it is possible to search the documents or nodes in the project, which was a function that was used extensively in this research. Although Nvivo analysis tools were heavily relied upon to identify patterns it must be noted that the original interviews were often referred back to, to ensure the comments were being looked at in their context.

The qualitative review of the propositions employed cross-case analysis. Cross-case analysis offers a way to reconcile the need for a *'thick description'* of uniquely individual cases, yet captures the themes and patterns that emerge across cases (Miles and Huberman (1994). A cross-case analysis starts by considering each case as an independent entity. Only after understanding the relationships, configurations, associations, and the like, within the case does the researcher move to a cross-case analysis. Two approaches to cross-case analysis have been promoted: case-oriented analysis and variable-oriented analysis (Ragin, 1987). A cross-case analysis starts by considering each case as its own entity. The goal is to discover the underlying themes, similarities, and associations that hold across all cases. For the purpose of this research, however, a variable oriented approach was adopted, as the key aim was to identify richer patterns with respect to the key constructs and the relationship between them across cases, rather than, for example, to compare interview 6 with 27.

9.3.7 Reporting

The final stage in the course of an interview investigation is to report the findings. However, as Miles and Huberman (1994, p. 299) note *'The reporting of qualitative data may be one of the most fertile fields going; there are no fixed formats, and the ways data are being analysed and interpreted are getting more various'*. Consequently, in order to aid the readers' understanding, more quotations and detail were chosen from a few respondents, which provided the clearest examples, to help interpret and develop our understanding of the statistical findings presented in chapter

8. However, it must be noted that the chosen quotations are also very representative of the full sample of responses.

9.4 Qualitative findings

This section will review each of the six propositions in turn, presenting a number of quotes, which are representative of the respondents, to support and further extend our understanding of the statistical data presented in chapter 8.

9.4.1 Relationships between IS capability contribution and improved competitive positioning (Proposition 1)

The statistical results presented in Section 8.2 support proposition 1, viz *'the greater the degree to which the success of the host organisations IS-enhancement is dependent upon IS capabilities, the greater will be their resulting degree of improved competitive position'*. Although a statistical association has been identified between the degree to which IS capabilities contribute to the success of an IS-enhancement and the degree of improved competitive positioning achieved, the statistical analysis doesn't further our understanding of the direction of causality. To do so, it must be identified whether or not (1) IS-capabilities impact the success of IS-enhancements, (2) IS-enhancements impact improved competitive positioning and (3) if it is the IS capabilities impacting through the IS-enhancement which determines its ability to confer improved competitive positioning, as shown diagrammatically in Figure 9.2.

Figure 9.2 Direction of causality

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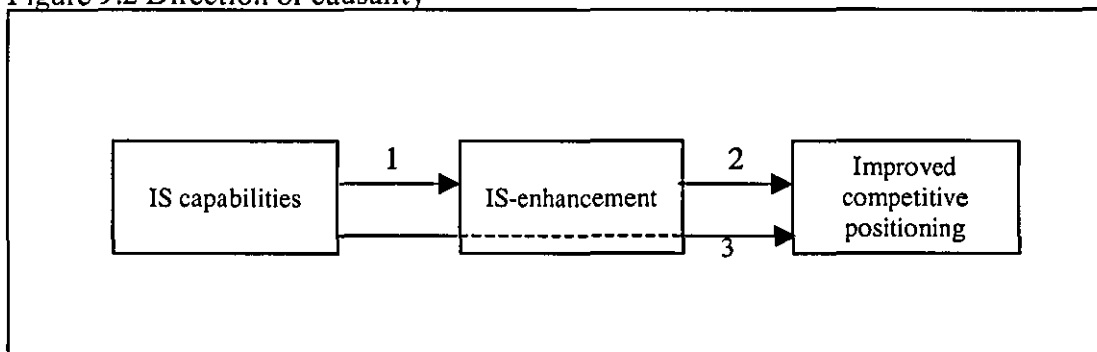
Firstly, from the analysis of the qualitative data it can be concluded that IS-capabilities are perceived to have a strong impact on the success of IS-enhancements. For example, as **respondent 17**[32] noted:

'As I mentioned, the IVR (system) itself is something that you buy off the shelf to a degree, and at this stage when dealing with the suppliers we were very much making sure it could support what we wanted to do with it. So it wasn't something where you flick a switch and a green light comes on and then you say 'there you go, you've got this level of interactivity'... We always knew there were going to be things we had to do to the back end of it to be able to guide it along to make sure it did what we wanted it to do, so without the capabilities I mentioned, like supplier relationships, etc., I could categorically say that we wouldn't have even got close to implementing as an efficient system as what we have now'.

Further support for the view that IS capabilities are essential to the success of the IS-enhancement was offered by **respondent 4**, who commented:

'I would say the capabilities I have mentioned played an important part in the success of the system and it probably would not have succeeded without them... we probably wouldn't have identified the right system or been able to link it throughout the organisation'.

The above quotes are good examples of the consensus that emerged across the sample in support of the view that IS capabilities, can and do, impact the success of IS-enhancements. Further evidence and examples of the importance of individual IS capabilities to the success of IS-enhancements is provided in section 9.3.2, where it is found that all IS capabilities can have a high degree of value.

Secondly, from further analysis of the qualitative data it can be concluded that some IS-enhancements have an impact on improved competitive positioning. For example, as **respondent 31** notes:

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[32] Please see appendix D for a brief description of the IS-enhancement identified by each respondent.

'It is an Internet-based system with an SQL database on each of the salesmen's laptops which is linked with the inside sales organisation as well as the plant. Basically CRM is a relationship management database, but it is a database that is accessible to every employee on online. This enabled the salesmen to see the activity of all of their customers......if a project is over £10000 we put the limit on the system, an opportunity pipeline would be created and that opportunity pipeline then tasks the salesman to follow up the quotation after a number of days, it triggers him to go and follow up, it then asks him what the follow up was, does it need a requote or is it waiting on customer reactions? Based on the follow up you have to tick a number of boxes, then it triggers you to follow up again if no decision was made on that particular project. If the opportunity is not won, it is lost for any reason because the price wasn't right, the technology was inappropriate, we lost to the competition etc then there is a drop down box in the database that you tick if the opportunity is lost for whatever reason..... We now have an advantage over our competitors based on the efficiency of our sales process because our salesmen can now log onto the system from anywhere and identify which enquiries have been won and closed off and also to see which ones need further follow up'.

Further support for the view that IS-enhancements do have the potential to facilitate improved competitive positioning was offered by **respondent 12,** who commented:

'It's basically one we have implemented and continue to implement which is a system called SAP R3. It was implemented to look after all of the finances both internal, external, pay-rol and HR. SAP R3 is basically an ERP, enterprise resource planning system which enabled us to remove a number of old legacy systems and replace them with one new system that is used throughout the UK. So when it talks about how has this helped contribute to competitive position, one of the ways that it has contributed is that people now don't have to know 5 systems to do their links or ask for leave or expenses, they can do it all on one system, something I don't think our competitors have tackled yet.... it gives us an advantage because it saves a lot of time training each individual and saves on technical support and services'.

The above examples are indicative of the general view that IS-enhancements can support improved competitive positioning. Finally, through the analysis of the qualitative data it can be concluded that IS capabilities are perceived to facilitate improved competitive positioning, through the introduction of an IS-enhancement. For example, as **respondent 12** noted:

'They really enabled us to implement new functionality into the system quicker and more cost effectively than our competitors, which is really why we were able to get the advantages that we did'.

Further support for the proposition that IS capabilities can facilitate improved competitive positioning through the introduction of an IS-enhancement was offered by **respondent 23**, who commented:

'The capabilities mentioned were essential in enabling us to gain the advantages we did from the system.... You can't simply implement a system and expect it to give you an advantage... I don't think we would have gotten the advantages we did without them'.

Based upon a thorough review of the qualitative data, using Nvivo, it became apparent that IS capabilities can impact the success of IS-enhancements, IS-enhancements can facilitate improved competitive positioning and IS-capabilities are perceived to improve the ability of IS-enhancements to support improved competitive positioning. This qualitative evidence provides strong support for the direction of causality depicted in figure 9.1. With the direction of causality confirmed, the next stage was to further explore why there is a significant relationship between the degree to which an organisation's IS-enhancement is dependent upon IS capabilities and the degree of improved competitive positioning achieved. Having analysed the interview data, the findings provide evidence to support the argument that firm performance is not necessarily attributable to any single IS capability in isolation but rather on how firms integrate and combine their IS capabilities (Mata et al. 1995; Ross et al. 1996). More specifically through the use of Nvivo, it was possible to determine that respondents generally recognised the importance of applying a range of IS

capabilities, rather than one or two critical capabilities. For example, **respondent 5** noted that:

> *'Our company has a competitive advantage in all of these capabilities over our competitors, except for maybe one key rival. We have such a good backbone we can react quickly because of our size and global capability and because of the investment we put into innovation. The infrastructure we have is also a major contributor to this capability. We are incredibly good at anticipating technological requirements... We can work technology into business requirements. For example, with CLAIM, we were able to identify the need for it, come up with an idea for CLAIM, develop it and implement it quicker than any of our competitors. As I said before with the increased sourcing from India we had to react quickly to this change in the market and developed the CLAIM system in order to reduce the costs of providing services'.*

In the above example it is suggested that in order to implement 'CLAIM', the IS-enhancement specified, they had to combine a number of the IS capabilities, all of which they had a competitive advantage in and were essential in the success of the IS-enhancement. However, it is necessary to unpick this quote to examine exactly which capabilities were being alluded to. For example, it was identified that *'with the increased sourcing from India we had to react quickly to this change in the market'*, highlighting the organisation's *'market responsiveness'* capability and its flexibility to undertake strategic change. It was also identified that with *'CLAIM'* they were able to *'identify the need, come up with the idea for CLAIM'* highlighting its IS business partnership capability. They were also able to *'develop it'* highlighting their IS development capability and *'implement it'* highlighting the IS infrastructure. By combining all of these capabilities they were able to identify a need, come up with a system to fulfil that need, design the system and implement the system quicker than any of their competitors.

A further example of the importance of multiple IS capabilities contributing the success of the IS-enhancement has been derived from **respondent 14**:

'We understand that you have to make IT your business if you want to be successful. You can't just have an IT department or a back office that will just provide whatever, as you will never get the true value out of them... We started off with making IT guy's sit on the trading desk for like a month at a time, they sat there and actually had to execute trades. The reason for that is the programmer needs to understand what you are doing because it is very difficult to express what I am trying to achieve if you haven't had training in it..... Once the programmers were actually able to understand what I was trying to achieve they had to be able to go back and rapidly develop the program. You have to have that because you might start of with an idea but if it takes too long to build it you might have missed the opportunity, especially in this business, so it was essential that we could develop and implement the system very rapidly... along with identifying the need to the IT developers and actually developing the program we also needed to be able to move the information, as making money in this industry is quality of information, speed of information and then quality of decision making that is all it is.... We also had strategic flexibility, because we are a private firm we were able to roll it out and we don't have to go through all the documentation and the requirements that you would have in a large organisations. Being the owner and the CEO I can decide so we don't really have the processes of a big company... each of the capabilities I identified all played their part in the rapid development and implementation of the RMS'.

Again, the example identifies a number of capabilities all played a part in enabling the rapid development and implementation of the RMS. It is recognised that good *'IS-business partnerships'* capability was needed so the program developers knew exactly what was required. A strong *'IS development'* capability was also required so that once the programmers knew what the business required they were able to rapidly develop it. Further the IS infrastructure was needed to ensure system responsiveness and finally it was recognised that because it was a private firm, it had a good market responsiveness capability due in part to its strategic flexibility of implementing new systems as decisions regarding IS could be made very rapidly.

The findings from the interviews suggest that in the majority of cases there is strong evidence to support Mata et al's. (1995) and Ross et al's. (1996) theory that IS

capabilities rarely act alone in creating competitive advantage. Thus, the qualitative data analysis provides important new evidence to support proposition 1, *'the greater the degree to which the success of the host organisation's IS-enhancement is dependent upon IS capabilities, the greater will be their resulting degree of improved competitive position'.*

9.4.2 Relationship between specific types of IS capability contribution and improved competitive positioning (Proposition 2)

Through an analysis of the qualitative data it was possible to uncover important new evidence in support of proposition 2, that *'outside-in and spanning IS capabilities will have a greater impact on improved competitive positioning, than inside-out IS capabilities'.* The interview process has focused strongly upon the rarity and value of capabilities, as Wade and Hulland (2004) suggest that value and rarity dictates the ability of an IS capability to confer improved competitive positioning. Consequently questions were asked to investigate whether outside-in and spanning IS capabilities might have a greater degree of value and rarity as compared with inside-out IS capabilities. When interpreting the interview data, it became evident that in general no distinction could be made between different types of IS capabilities and their degree of value. Indeed, the following examples provide a flavour of the value inside-out IS capabilities can provide to IS-enhancements.

> **IS infrastructure capability:** *'Yes we have a very robust infrastructure, Because of our infrastructure you can go into any office no matter where you are in the UK and immediately be able to access anything you want to access on the network. There is a really good infrastructure in place, which has really helped in terms of being able to implement the system company wide. If the infrastructure wasn't in place we couldn't implement the system, so in terms of its contribution to the success of the system I once again rated it very highly'.* **(Respondent 12)**

IS development capability: *'It was vital that we had the ability to developed the system rapidly because you might start off with an idea but if it takes too long to build it you might have missed the opportunity, especially in this business'.* **(respondent 14)**

Cost effective IS operations: *'Typically we try and do a cut over, over a weekend or if it falls nicely over Easter or Christmas holidays, it gives you a little bit more of a window. But by and large this system went in without any lost down time. It is quite critical to us because we are a daily business so people phone us up saying we want this to get there the next day, so if we lose a days business we never get it back. We are very risk verse in that respect'.* **(Respondent 19)**

It was interesting to note that when outside-in and spanning IS capabilities were reviewed a very similar picture emerged to that found for inside-out IS capabilities. The following quotes provide an illustrative sample of the general pattern that outside-in and spanning capabilities are also perceived to have a high degree of value, to the success of IS-enhancements:

IS planning and change management capability: *'there was a lot of training before the system was implemented so I think from an employees perspective it was handled pretty well... Yes, if we did not have this prior training then I think there would have been much more resistance to change which would have affected the success of the system'.* **(Respondent 30)**

External relationship management capability: *'Well, it comes down to what I mentioned before, we had to work very closely with the suppliers of the system in order to actually get the system to run to its full potential. We went through so many teething problems. I think the way to look at it is if we didn't work closely with the suppliers of the system to adapt it to our needs then we wouldn't have had any success with the system at all'.* **(Respondent 31)**

When discussing IS-business partnerships: *'There was a much stronger voice and involvement from the IS side at the early stages of the initiative to make sure we understood what their limits were. So the interface between the IS and the*

business side is quite strong, which ensured we identified a system to meet our needs and it could be developed by the IT department. **(Respondent 4)**

From reviewing and comparing the above quotes it doesn't immediately become apparent that outside-in and spanning capabilities have a greater degree of value than inside-out IS capabilities. All the capabilities have been shown to have value, a view shared by Bharadwaj (2000), Feeny and Willcocks (1998), Lopes and Galletta (1997), Marchand et al. (2000), Mata et al. (1995), and Ross et al. (1996).

Although in general no difference in value has been observed between IS capabilities, the interviews identify that in general inside-out IS capabilities do tend to have less rarity when compared to outside-in and spanning capabilities. However, it must be noted that in some cases outside-in and spanning capabilities had a low degree of rarity and inside-out IS capabilities had a high degree of rarity, for example, when discussing IS technical skills it was noted by **respondent 18** that: *'employees with this technical knowledge are very sought after and to get the best one you have to pay the money as there just aren't enough of them out there'*, but this was not consistently the case. The following examples are indicative of the underlying trend that inside-out IS capabilities tend to have a relatively low degree of rarity:

IS infrastructure: *'Yes, definitely every thing is a commodity item[33] really with costs ever decreasing, so even if our competitors did not have an IS infrastructure in place to be able to run this kind of system it would not really be all that hard for them to go out and buy the hardware to implement it '. (***Respondent 10***)*

Cost effective IS operations: *'It was quite straightforward, there wasn't really any down time so it was cost effective in that sense and I wouldn't expect many of our competitors would have experienced major problems that would put them at a disadvantage'. (***Respondent 4***)*

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[33] It should be noted that in the original interviews, many of the respondents, when talking about the IS infrastructure, appeared to be focussing upon the physical infrastructure, which is a resource, rather than their organisations ability to effectively deploy it. Consequently, when conducting the follow-up interviews, the respondents were asked to confirm that the contribution of IS infrastructure to the success of there IS enhancement was directly dependent upon their organisation's ability to effectively deploy IS infrastructure.

IS technical skills: *'Yes, one of the employees that had been working in the IT department for about ten years was actually poached by another company and it was really bad for us... These is a lot of demand for these sort of jobs so it wasn't the fact that his position was irreplaceable, but the bad side of it is that I believe this employee had a lot of experience and information through the bank that he was able to pass on to the competition'.* **(Respondent 28)**

By contrast, when outside-in and spanning IS capabilities were looked at in comparison with inside-out IS capabilities it becomes apparent that in general they tended to have a higher degree of rarity. The following examples provide a sample from the quotes:

External relationship management: *'Because we worked in conjunction with the supplier we have developed new functionality within the software which our competitors could not simply go out and buy... not many of our competitors would be able to work the way we have with our suppliers.* **(Respondent 12)**

IS business partnerships: *'Without the identification of an appropriate system we would not have been able to get an advantage at all and this is something I'm not sure our competitors would be able do as effectively as us. Most managers in this industry don't come from an IT background like myself, so their interaction with the IT side of the organisation is very limited to say the least.. You can't simply go out and replace them with new managers with IT experience as they have years of experience in the industry'.* **(Respondent 6)**

Market responsiveness: *'We had strategic flexibility, because we are a private firm we are able to roll it out, we don't have to go through all the documentation and the requirements that you would have in a large organisations. Being the owner and the CEO I can decide so we don't really have the processes of a big company. Which is an advantage that very few of our competitors have as most of them are much larger with many more processes for system design and implementation '.* **(Respondent 14)**

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IS planning and change management: *'There was also a lot of training before the system was implemented, to try and reduce any resistance to the new system... Something that took a number of months before the implementation, it's almost as if you are trying to change an existing culture of an old way of doing things, something I think each individual company has to approach in their own way.* **(Respondent 30)**

When comparing the quotes regarding IS capability rarity, it can be seen that outside-in and spanning capabilities are perceived to have a greater degree of rarity than inside-out IS capabilities. This appears due, in part; to the fact that inside-out IS capabilities can be more readily bought in factor markets, than outside-in and spanning capabilities. Consequently, this result provides richer insights into proposition 2.

In summary, the findings of the follow up interviews suggest that all IS capabilities tend to have a high degree of value when contributing to the success of the IS-enhancement. However, outside-in and spanning IS capabilities tend to have a higher degree of rarity than inside-out capabilities. Consequently, it can be inferred that proposition 2, *'outside-in and spanning IS capabilities will have a greater impact on improved competitive positioning, than inside-out IS capabilities'*, is upheld.

9.5 Relationship between IS capability non-transparency, non-replicability and sustained improved competitive positioning (Proposition 3)

The statistical results presented in section 9.4 support proposition 3, viz, *'the greater the degree to which a specific IS-enhancement is dependent upon non-transparent or non-replicable IS capabilities, the greater the degree to which it delivers sustained improved competitive positioning'*. However, we need to further investigate whether it is through their non-transparency and non-replicability, that these types of IS capabilities can deliver an increased degree of sustained improved competitive positioning.

From reviewing the qualitative findings, it would appear that non-transparent and non-replicable IS capabilities are perceived to be able to facilitate sustained improved competitive positioning through the introduction of an IS-enhancement. For example, as **respondent 12** underlined:

'It really comes down to what I previously mentioned with the fact that our advantage really boiled down to us being able to implement new functionality into the system quicker and more cost effectively than our competitors. Now the longer it takes for our competitors to identify and use their IS capabilities in the same way as we have the longer it will take for them to implement a system which can compete with ours'.

A further example of IS capabilities being the source of sustained improved competitive positioning through an IS-enhancement is offered by **respondent 14**:

.... 'the success of the system was by and large based on the capabilities we have just discussed. There was nothing else that really helped. So the duration of the advantage is largely based on the time it takes competitors to identify and copy these abilities and implement a similar system'.

From the above examples and many similar ones acquired through the qualitative interviews, it became clear that non-transparent and non-replicable IS capabilities are perceived to strongly influence the degree of sustained improved competitive positioning that will be derived from the IS-enhancement. The next stage of the interview process sought to further validate and provide examples of why there is a significant relationship between the degree to which an organisation's IS-enhancement is dependent upon non-transparent and non-replicable IS capabilities and the resultant degree of sustained improved competitive positioning achieved. When interpreting the interview data, it became evident that in general the greater the degree to which the IS-enhancement is dependent upon non-transparent and non-replicable IS capabilities the harder it would be for their competitors to identify how to implement the IS-enhancement and how consequently to replicate it, supporting Grant (1991).

Through the use of Nvivo, it was possible to see a clear consensus emerging that respondents generally recognised that it was through the application of a range of non-transparent and non-replicable IS capabilities that sustained improved competitive positioning could be realised. For example, **respondent 5** noted that:

'As I said before CLAIM would be quite a simple system, the sustainability is really coming from our ability to identify the need for it, design it, develop it and implement it. For a company to replicate our ability to do all these things would be almost impossible. For starters even if a company did identify the need for it they would not be able to match our investment in innovation and development or our infrastructure. As I said before we are leading edge in most of the capabilities you identify and it would be very hard for are competitors to replicate them so the more we can take advantage of them the longer it will take for a competitor to implement a similar system'.... With regards to transparency *'I think I identified 6 or 7 out of the 8 capabilities as contributing to the success of CLAIM, I think external relationship management was the only capability I said did not contribute as we don't really do any outsourcing... The more capabilities you have contributing to the success of the system the more complex it is for your competitors to copy.... We are so strong in a number of the capabilities for a competitor to try and devise how we go about system development and implementation would once again be virtually impossible.'*

When discussing IS capability non-transparency and non-replicability and the reasons why the greater the degree to which an IS-enhancement is dependent upon non-transparent and non-replicable IS capabilities the greater the degree of sustained improved competitive positioning **respondent 14** noted that:

'For a system like RMS it would be much harder for our competitors to replicate what we have done because with a system like this which needs to be designed and implemented very rapidly, our larger competitors just can't compete with us. We can get our IT staff to understand exactly what is needed because they have the flexibility to be able to get by on the trading desk. They can then go back and develop the system very rapidly and all this in a very short time.... our competitors are much larger and decision like this have to go through a number of people

which you would not believe how long it can take... I guess because we are smaller we have so much more flexibility. Don't get me wrong, I am not saying we are better than are larger competitors but with regards to a small system like this, because of our flexibility and market responsiveness, we can get the system developed and implemented quicker than them. With regards to transparency I think they know why and understand why we can roll a systems like this out much quicker.'

The findings from the interviews suggest that in the majority of cases there is strong evidence to support Grant's (1991) proposition that with regard to transparency, a competitive advantage, that is the consequence of superior IS capability in relation to a single performance variable, is easier to identify and comprehend than a competitive advantage that involves multiple IS capabilities conferring superior performance across several variables. Furthermore, with regard to replicability, an improved competitive position that requires a complex pattern and coordination of IS capabilities will take longer to replicate than an improved competitive position that relies upon the exploitation of a single dominant IS capability is also supported. Subsequently, supporting and providing examples for the theory of why, proposition 3 *'the greater the degree to which a specific IS-enhancement is dependent upon non-transparent or non-replicable IS capabilities, the greater the degree to which it delivers sustained improved competitive positioning'*, has been upheld.

9.6 Relationship between the non-transparency and non-replicability of specific types of IS capability and sustained improved competitive positioning (Proposition 4)

Through the analysis of the qualitative data it was possible to confirm the validity of proposition 4: *'outside-in and spanning IS capabilities will have a greater impact on sustained improved competitive positioning, than inside-out IS capabilities'*. However, as identified in table 9.1, in order to further validate and investigate this relationship further questions were asked to explore why.

Accepted theory (Wade and Hulland, 2004) suggests that outside-in and spanning IS capabilities should confer a more sustainable level of improved competitive positioning, because they are less transparent and less easily replicated. Indeed, the quantitative analyses, in section 8.6, confirmed that in cases where an IS-enhancement lead to a high degree of sustained improved competitive positioning, it was the non-transparent outside-in and spanning capabilities, which clearly made the greatest contribution. However, somewhat paradoxically it has also been shown in table 6.8 that inside-out and spanning capabilities generally tended to have a higher degree of non-transparency than outside-in IS capabilities. Consequently, questions were asked in the follow up interviews to identify why less transparent outside-in and spanning IS capabilities tend to have a greater impact on the degree of sustained improved competitive positioning than non-transparent inside-out IS capabilities

Through the use of Nvivo, it was possible to see a pattern emerging that might explain the reasons behind this paradox. More specifically, when it comes to contributing to the sustainability of improved competitive positioning, non-transparent inside-out IS capabilities generally don't tend to contribute significantly. For example, even if competitors might find it difficult to identify exactly what an organisation is doing in terms of its IS infrastructure or IS developments, this need not greatly delay their ability to copy the IS-enhancement. This is due in part to the simplicity of inside-out IS capabilities; competitors can make educated inferences as to what infrastructure, skills, or developmental approach is necessary to replicate it. By contrast, even if it is apparent to competitors that outside-in IS capabilities are contributing to the sustainability of the improved competitive positioning - (due to their external orientation) - competitors probably won't be able to easily understand exactly how, as it is recognised they have a greater degree of complexity. The following quotes provide some representative examples, demonstrating the simplicity of inside-out IS capabilities.

IS infrastructure: *'I think it would be obvious that in order to implement this kind of system that you would need a fairly competent IS infrastructure so our competitors would know that we have a good IS infrastructure in order to be able*

to run it...they could hire in consultants to tell them what they needed if they had the funds'. (Respondent 16)

IS technical skills: *'employees know what an acceptable standard for IS personnel is and how it can be attained, so there's no great myths behind it'.* **(Respondent 28)**

Cost effective IS operations: *'as I mentioned before it was quite straightforward really and I'm guessing a lot of companies follow the same standard procedures that we do'. (Respondent 27)*

By contrast, when outside-in and spanning IS capabilities were looked at in comparison with inside-out IS capabilities, it became apparent that they are perceived to be far more complex, as the following illustrative examples would suggest:

IS planning and change management: *'what is a good way of managing change for one company might not work for another company so it is really quite a complicated process'. (Respondent 28)*

Market responsiveness: *'It would be almost impossible for our competitors to identify how we respond so quickly to changes in the market... it is a very complicated process which involves large investment in innovation, flexibility and a culture of continually looking to be the market leader... yes it really is very complex'. (Respondent 5)*

IS business partnerships: *'It would be very hard for our competitors to identify how our IT department worked with the business side of the organisation.... The way IT staff work with the business is deep rooted in the company, it is a culture that has built up over a number of year's with no one set way, just the way that works best for us'. (Respondent 19)*

The qualitative analysis provides important evidence to support the statistical findings from chapter 8 that non-transparent outside-in and spanning IS capabilities generally had a greater impact on sustained improved competitive positioning than non-

transparent inside-out IS capabilities. More importantly perhaps, the interviews provided important new insights into why this result has arisen: even it is clear to a competitor that outside-in or spanning IS capabilities are contributing to the success of the IS-enhancement, they probably wont be able to understand exactly how they are contributing, because of their greater degree of complexity.

Furthermore, the interviews also suggest that in general inside-out IS capabilities are perceived to be more easily replicated than outside-in and spanning IS capabilities. The following examples provide an illustrative sample from the quotes confirming that, in general, inside-out IS capabilities are perceived to be relatively easy to replicate:

IS development: *'It is really the time that it took to develop the extra functions into the system, some of our competitors could do this but not all of them.... if the competitor did not have the development skills they could always outsource it to a consultant, it would cost money but it would enable them to replicate our functionality.' (Respondent 12)*

IS technical skills: *'one of our key IT personnel was head hunted away from us so the IT technical skills can be replicated very easy. If you really want someone they usually have a price. (Respondent 4)*

IS infrastructure: *'The technology infrastructure itself was very much commodity, except there was good investment in security and all those sort of things, so there weren't any constraints, other than that it was being willing to make that investment. (Respondent 16)*

By contrast, when outside-in and spanning IS capabilities were looked at, it became apparent that they were perceived harder to replicate because they were much less mobile. For example, respondents noted when discussing:

External relationship management: *'It would be hard for our competitors to replicate this, it is not just a case of getting external consultants to come in and*

implement a system which is something any company can do, we actually worked in parallel with SAP to help develop functionality into the system and this is something your average company can't do.... You have to have the IS personnel capable of doing this and you have to build up the relationship, so for our competitors to replicate this, yes it would be hard. **(Respondent 12)**

Market responsiveness: *'One of the things is that we can react quickly because of our size and global capability and because of the investment we put into innovation and this not something our competitors can just go out an buy, as I said before this ability has taken 30 years to develop, it's built into are culture, we constantly strive to be the market leader in terms of IT'.* **(Respondent 5)**

IS business partnerships: *'Having good IS business partnerships has taken us a very long time to develop and certainly something our competitors couldn't go out and copy. It is really a cultural thing the way our IT staff work with the business is long established'.* **(Respondent 19)**

Whilst there was a general consensus that inside-out IS capabilities are more readily copied, at least one interviewee adopted a strong counter position. More specifically, when discussing *'IS infrastructure'* **respondent 5** noted: *'the underlying infrastructure would almost be impossible for a competitor to implement in a short period of time'*, however, this was not consistently the case.

The findings of the follow up interviews suggest that whilst it may be easier to identify whether outside-in and spanning IS capabilities are contributing to the sustainability of improved competitive positioning, due to their greater complexity, competitors probably wont be able to understand exactly how they are contributing. Furthermore, outside-in and spanning IS capabilities are perceived to have a higher degree of non-replicability than inside-out capabilities. Consequently, proposition 4: *'outside-in and spanning IS capabilities will have a greater impact on sustained improved competitive positioning, than inside-out IS capabilities'*, is confirmed.

9.7 Relationship between direct – indirect impacts of IS-enhancements and improved competitive positioning (Proposition 5)

The statistical results presented in 8.6 provide no evidence to support proposition 5, viz, *the degree of improved competitive positioning will be greater in those instances where the indirect organisational contribution to improved competitive positioning is greater than the direct IS-enhancement contribution'*. To further explore the statistical results, it was necessary to confirm that in instances where significant improved competitive positioning was achieved, it was equally likely that the IS-enhancement could contribute either directly or indirectly.

Respondent 5 provided a good example of how a strong improved competitive position could be derived directly through the deployment of an IS-enhancement:

'70 to 80% of all of our costs are people, despite the fact we manage, run and implement IT systems. Most of the time it is the customer that pays for the IT system and they pay for us: the majority of the cost is in the people not the IT. Systems are not really that expensive anymore it's really the expertise you pay for. That being our primary overhead we have to manage it really accurately, If you pay me for having a system available from Monday to Friday, and it takes me 20 people to deliver that service, that's fine, but if I could do it with ten people I save 10 people's costs because I am still charging the same amount, that's the way our business works. So by implementing this system we could manage costs down to a lower line item level, that is the reason why we have gained the competitive advantage that we have... Basically in the environment we are working in, that is strategically extremely important because, with outsourcing, the industry is competing on a cost basis at the moment, especially with regard to global sourcing with companies like Wipbro coming into the market and basically delivering services from places like India, so costs become very important'.

Moreover, it was noted that 80% of the improved competitive positioning could be directly attributed to the IS-enhancement itself as opposed to 20% indirectly, through the leveraging of existing organisational resources/capabilities or through initiating organisational change. As **respondent 5** explained:

'Basically the IS had a direct impact of 80% primarily because it was the tool itself that actually provided and managed the information. It allowed us to allocate our human resources more efficiently by being able to analyse how much time is being spent per account. By having a base line we could then challenge that base line.

Respondent 2 provided a good counterpoint example of where a strong improved competitive position had been brought about indirectly through an IS-enhancement:

'What we did was effectively establish a benchmarking bit of software that enabled us to look at each of our competitors, in terms of comparative machine configurations. The European association publishes every 4 years a list of all the equipment and every year updates it so we had a register of what they where actually receiving film into and the machines they where actually using. So we were able to effectively look at our 6 top competitors, the one in the UK and the 4, 5 in Europe and say how would they do it... The competitive disadvantage was because our competitors had different machine configurations and machines that were a lot more up to date. Our biggest machine was about a 2.4 meter machine wide, capable of producing 96 pages of A4 in one machine pass in 4 colours and their machine went up at that particular time to about 3.4 meters, so they could produce at a minimum 144 pages at one machine pass and their machines were a bit quicker.... Through the benchmarking system we could run scenarios to identify the most efficient press configuration, so do you go for a bigger press; do you go for a faster press; do you go for bigger and faster presses; do you go for presses with more circumference .... Based on this benchmarking and what we thought would be the most efficient press configuration we invested in a new gratuative printer and three presses, together with pre presses and rear ends to a total value of around 130 million pounds... If you are talking about the IKEA catalogue which is the largest catalogue in the world with the main catalogues come out twice a year, we printed something in the region of about 7 million copies which is worth around 20, 25 million pounds a year excluding paper, so when you think we can now do this in probably half the time we used to and around 20% faster than our major competitors, it really has given you an idea of the sort of advantages I'm talking about'.

However, in this case it was noted that 20% of the improved competitive positioning could be directly attributed to the IS-enhancement itself as opposed to 80% indirectly, as articulated below:

'I put 20% direct because of the IT department being able to run different scenarios through the piece of software on different press configurations and identifying which was the most efficient and I put 80% indirect as I thought the advantage really came about from making the changes to our presses because that's what made us more efficient and gave us the savings'.

The above two examples are indicative of the general view that in instances where a significant level of improved competitive positioning is achieved, the IS-enhancement can contribute either directly or indirectly. Consequently, if the principles for attaining improved competitive positioning from an IS capability, namely value and rarity, are applied to the direct and indirect impacts, it can be suggested that they can both have high degrees of value and rarity. By virtue of the fact that in the previous two representative examples, both the direct and indirect impacts resulted in an improved competitive positioning, it can be suggested they have a high degree of value. Furthermore, **respondent 5** noted that the organisation's ability to: *'design and implement it before our competitors'*, suggesting that it is something that is rare. In a similar vein, **respondent 2** also highlighted the rarity of what they had achieved: *'the press configuration was the most efficient out there'*. Thus, it is recognised both the direct and indirect impacts have the potential to be valuable and rare.

In summary, IS-enhancements that facilitate significant improvements to the host organisation's competitive position engender effects that are both valuable and rare, irrespective of whether these ensue directly or indirectly from the IS-enhancement. Consequently, based upon the qualitative data, it can be confirmed that proposition 5: *'the degree of improvement in competitive positioning will be greatest in those instances where the indirect contribution of the IS-enhancement is greater than the direct contribution'*, should not be supported.

9.8 Relationship between direct – indirect impacts of IS-enhancements and sustained improved competitive positioning

The statistical results presented in 8.7 provide evidence to support proposition 6, viz *'the degree of sustained improved competitive positioning will be greater in those instances where the indirect organisational contribution to the sustained improved competitive position is greater than the direct IS-enhancement contribution'*. To further explore the statistical results it was necessary to confirm that in instances where a significant improved competitive positioning had been sustained over many years, it was more likely to be the indirect impacts of the IS-enhancement that were more dominant than the direct impacts.

Respondent 28 provided a good illustrative example of where a competitive advantage, that had been derived directly, was short lived. He noted that 80% of the improved competitive positioning for *'customer service'* could be directly attributed to the IS-enhancement itself, as opposed to the other 20%, which was achieved indirectly. As he went on to note:

'I think the majority of the 1-2 year came down to the duration it took our competitors to implement the system. As I previously mentioned the time it took to develop loans was pretty much standardised. There was also a duration of learning how to use the new system because it would take competitors time to get their staff trained up to the standard we now have are staff trained at... I think our competitors caught up quite quickly with us because it became an industry standard quite quickly, if we were quoting loans for customers, and that customer had an account with a different bank, and that bank was using a different system, we had to wait for them to provide us with that information but, if they also had CMSI then they could actually send that information directly to us. So it actually made us more efficient when other banks started to use CMSI. Once our competitors had implemented CMSI everyone could access the information needed to develop loans rapidly so with regards to that the industry became very standardised. I think that is really the nature of the organisation, it wanted to be the number 1 banking organisation. So it was always like this, we would implement

*a system our competitors would catch up and then we would have to implement
something that makes us more competitive'.*

From the above example it is possible to see that the duration of sustained improved
competitive positioning was relatively short, namely around 1-2 years. Further, it is
interesting to note that the respondent identified *'we would implement a system our
competitors would catch up and then we would have to implement something that
make us more competitive'*, suggesting sustained improved competitive positioning
may not come down to a single IS-enhancement. This is a very interesting comment
as it suggests that sustained improved competitive positioning might be achieved
through a strategy of perpetual innovation across a serious of IS-enhancements rather
than through a so called *'silver bullet'* IS-enhancement (Venkatachalam, 2006;
Kettinger et al. 1994*).*

A good example of where a far more sustainable improved competitive positioning
could be achieved by the indirect affects was offered by **Respondent 1.** More
specifically, he noted 100% of the sustained improved competitive positioning for the
process of *'acquiring and storing inputs required for products or services'* could be
directly attributed to the IS-enhancement itself.

*'My feeling is that anyone could replicate the actual piece of software or near
enough so that wasn't really having all that much of a contribution to
sustainability. The indirect affect and what our competitors would find very
difficult to replicate was the mix of the EPOS with the organisational structure that
was in place because it was a very unique company structure in what its mission
was there to do. There was no similar structure with any of our competitors so that
type of EPOS levered up what the business was doing. The indirect effects of the
EPOS on sustainability was that it enabled us to leverage our economies of scale
and the company structure, which is something our competitors could not
replicate. It was the combination of economies of scale divided by the overheads of
our office function. We were the third biggest purchasing consortium in Europe....
Yes, these are the reasons why I identified 7 years for the duration of sustainability
because our competitors can't copy our company structure or our purchasing*

power, maybe they could one day but I very much doubt it, so as far as I can see the advantage we have gained would be ongoing'.

The above examples are indicative of the general view that where a significant improved competitive positioning could be sustained over many years, it is generally the indirect impacts of the IS-enhancement that were more dominant than the direct impacts. However, this creates a slight paradox as it has previously been suggested, in proposition 2, that it is through non-transparent and non-replicable IS capabilities that a high degree of sustained improved competitive position can be achieved. Consequently, it was important to explore whether it is the indirect impacts of an IS-enhancement, or the application of non-transparent and non-replicable, IS capabilities that are the more significant in leveraging sustainable improved competitive positioning. To this end a further 6 follow-up interviews were conducted with previous respondents who had recognised that their IS-enhancement facilitated an enduring degree of improved competitive positioning.

9.9   Indirect impacts versus IS capabilities

Based upon the previous interviews, and further data from the follow up interviews, it is concluded that the sustainability derived from IS capabilities is generally as a result of organisations being able to identify, design and implement an efficient and effective system faster than competitors. Furthermore, the duration of the improved competitive positioning, to be attained from the application of IS capabilities is not generally as significant as that which can be achieved through the indirect effects of the IS-enhancement. For example, when discussing the duration of sustained improved competitive position that directly resulted for the IS-enhancement, **respondent 30** noted:

'Realistically based on the time it took from them to identify the need for the system, configure the back end of it to meet their specific requirements, and get employees to accept the system, and use it to its full potential, I would say around two years'.

A similar duration was offered in the follow up with **respondent 31**:

'It was really between one and two years but no longer than 2 years I wouldn't have thought... It's really the time that we would have had a head start on our competitors for, within two years of us having the system I would have thought our competitors would more than likely have a similar system'.

Although in these cases the direct impacts of the IS-enhancement might endure for 1-2 years, the respondents estimated that the overall duration of sustained improved competitive positioning might be at least 5 years. Thus, further questions were asked to identify why the duration of sustained improved competitive positioning derived directly from the IS-enhancement, even though is was supported by non-transparent and non-replicable IS capabilities, was much shorter than the degree of sustained improved competitive positioning being derived from the indirect impacts. Through the follow up interviews it emerged that competitors did not necessarily need to replicate a competing organisation's IS capabilities in order to implement a similar system, as **respondent 30** noted:

'IS capabilities just really increase the time that it takes for competitors to implement a similar system. They aren't trying to copy your capabilities just the system and the price of systems are constantly coming down meaning systems are more available to people, for example look at the way the IT industry is consolidating..... your competitors don't really need the capabilities to implement a similar system, if there is a demand for a certain type of system it won't be long before you can just hire in consultants that can implement it.... Well the capabilities only really enable you to implement the system more quickly and more efficiently. I don't think they will ever really stop competitors from implementing a similar system for very long and with the rate of IT advances it doesn't take very long even if you have quite a cutting edge system ...even though our competitors will eventually have implemented a similar system they won't have copied our capabilities to manage change as effectively as us and be forward looking, we will still have an advantage in them'.

A similar rational was offered by **respondent 5**:

'Yes, I think I did mention 7 out of the IS capabilities as contributing to the success of the system and they did have high degrees of both non-transparency and non-replicability but I wouldn't really say these capabilities would stop our competitors from eventually implementing a similar system. As I said before, the system is really quite simple but the advantage we got through the capabilities was being able to identify the need for the system and design and implement it before our competitors.... The capabilities we have, have taken years to develop and they aren't going to be copied over night'.

Consequently, due in-part to the fact that competitors can go out and hire in consultants to implement a similar IS-enhancement, even if they don't have the necessary IS capabilities themselves, sustained improved competitive positioning derived directly through the IS-enhancement is generally fairly short lived. However, if an organisation does have non-transparent and non-replicable IS capabilities, it is suggested they should be able to continuously design and implement systems before their competitors, as **respondent 31** notes:

'By having these capabilities which our competitors were struggling to copy, it meant every time we made an incremental change to the system or implemented a new system we would continually get an advantage which we could sustain until our competitors identified what it was and, depending of the scale of the new system or change to the existing system, they would have to try and design and implement it themselves or pay for consultants to come and implement it... By having the capabilities we would continually see an advantage every time we implemented a new system and this will continue until out competitors have these capabilities'.

In similar vein, **respondent 5** noted:

By having this mix of IS capabilities which are superior to our competitors we can constantly implement systems; for example we have come up with technologies we

don't know how to use yet, for example, when we developed on demand it was a concept that was born out of grid computing, it was a concept we had years ago but we did not know how to use. We figured it was a good idea and a useful technology but it took us a while to actually be able to relate that technology to a useful business requirement so by having an excellent mix of capabilities we try and be one step ahead of our competitors all the time.

Having identified that the sustained improved competitive positioning that results directly from an IS-enhancement is generally short lived, the next stage was to identify why the sustained improved competitive positioning derived indirectly was more enduring. Again it was possible to identify a pattern, namely, that indirect impacts were generally much less obvious than the direct impacts. For example, **respondent 30** recognised:

'Culture is something that takes years to develop; a company can't just change its culture just like that, although you can see the company culture evolving over time. The key elements of the culture are very long established and deep rooted into the company and they are very strongly tied into the type of people that are recruited and so on and it is really a similar thing with organisational flexibility,...

Respondent 1 offered a similar response as to why the indirect impacts of the IS-enhancement were so enduring:

We were a purchasing consortium so the indirect impacts we got were really through us having a different company structure or business model I suppose, whereas our competitors were normal retailers so even if they implemented the same system as us they wouldn't have got the advantages we did.... We were working from a different company structure, ours was a group of companies banding together by saying we are going to try and reduce our costs by working together.... Through having this structure we got advantages through our economies of scale which would been almost impossible for our competitors to replicate because it would have meant they would have to completely change they way they did business. If they wanted to grow and increase their economies of scale there'd have to expand their existing stores or open new ones where as we

could simply add another store to the consortium so you can get an idea of why we
could sustain the advantage... I said the advantage could be ongoing because our
competitors will never be working from the same business model.

In conclusion, it is recognised that the competitive advantage derived from the IS capabilities is relatively short lived, due in part to it being fairly easy for a competitor to implement a similar IS-enhancement, be it though the ever-decreasing price of technology or through the hiring in of consultants. Even through IS-enhancements can be supported by non-transparent and non-replicable IS capabilities, competitors do not need to replicate these capabilities, they only serve as an ability to continually identify, design and implement a system more efficiently and faster than their competitors. However, for a competitor to replicate the indirect impacts of the IS-enhancement it is much harder as the resources/capabilities tend to be deep rooted in the organisation. Perhaps, this is best summed up by **respondent 30**, who noted:

'I'd say it came down to the fact that our competitors didn't really have to copy
our IS capabilities to be able to implement the system, but to gain the ongoing
advantage that would come from the system they would have to replicate our
culture and organisational flexibility, which would take a great deal of time and
much longer than recognising the need for the system and hiring consultants to
come and implement it'.

9.10   Summary

This chapter discussed how the interviews were conducted, before using the results of the qualitative analysis to further validate and interpret the key statistical findings presented in Chapter 8. From the statistical analysis it was concluded that the greater the degree to which a specific IS-enhancement is dependent upon organisational IS capabilities the greater the degree to which it delivers improved competitive positioning. The qualitative findings validated this result identifying firm performance is not necessarily attributable to any single IS capability in isolation but how firms integrate and combine their IS capabilities. Moreover, the direction of causality was

confirmed, namely, IS capabilities impact the success of IS-enhancements, IS-enhancements directly impact improved competitive positioning and it is these IS capabilities which impact the ability of the IS-enhancement to confer improved competitive positioning. With the direction of causality confirmed, the qualitative data further validated the proposition that outside-in and spanning IS capabilities will have a greater impact than inside-out IS capabilities on improved competitive positioning. Moreover it has been argued that this was due to outside-in and spanning capabilities having a higher degree of rarity than inside-out IS capabilities.

It was concluded in chapter 8, the greater the degree to which a specific IS-enhancement is dependent upon non-transparent or non-replicable IS capabilities; the greater the degree to which it delivers sustained improved competitive positioning. Moreover, through the qualitative data it was possible to validate this. Furthermore, the qualitative data enabled the finding that outside-in and spanning capabilities have a greater impact than inside-out capabilities on sustained improved competitive positioning to be validated. It is recognised that whilst it may be easier to identify whether outside-in and spanning IS capabilities are contributing to the sustainability of improved competitive positioning, due to their greater complexity, competitors probably wont be able to understand exactly how they are contributing.

In chapter 8 the proposition that the degree of improved competitive positioning will be greater in those instances where the indirect organisational contribution to improved competitive positioning is greater than the direct IS-enhancement contribution was not upheld. The qualitative data further validated this by identifying that improved competitive positioning can be both derived directly from the IS-enhancement and indirectly through organisational resources/capabilities and, the degree of improved competitive positioning has no bearing on where the improved competitive position is being derived. Finally, the statistical results in chapter 8 identified that the degree of sustained improved competitive positioning will be greater in those instances where the indirect organisational contribution to sustained improved competitive position is greater than the direct IS-enhancement contribution. Moreover, this was validated through the initial qualitative data, however, it was not possible to derive from the initial qualitative data why this was the case. For this reason a further 6 follow up interviews were conducted to identify why the degree of

sustained improved competitive positioning was greater when the indirect impacts of the IS-enhancement on sustained improved competitive positioning were greater then the direct impacts of the IS-enhancement. From the follow up interviews it was possible to conclude that the degree of sustained improved competitive positioning derived directly from the IS-enhancement was relatively short in comparison to the indirect impacts, as competitors did not need to copy a competing organisation's IS capabilities to be able to implement a similar IS-enhancement. The capabilities only served to enable the organisation to be able to design, develop and implement a system faster than their competitors. However, once a competing organisation had identified the IS-enhancement, if they did not have the necessary IS capabilities to be able to implement the system they could usually hire in consultants. If this is compared to the indirect impacts which tended to be much more deeply rooted in the organisation and much harder to copy, it explains the reasons why the sustained improved competitive positioning derived from the indirect impacts were far more enduring than the sustained improved competitive positioning derived form the direct impacts.

The next chapter, which is the final chapter, will discuss the implications for research, the implications for practice and the limitations of the research.

Chapter 10

Conclusions

10.1 Introduction

The previous two chapters discussed data analyses intended to test the research propositions. In this final chapter, the results of the formal empirical tests are critically reviewed to establish their contribution to existing knowledge. In the sections that follow, these findings are discussed in terms of their implications for researchers, within the field of IS research, and for practitioners with responsibility for delivering IS-enhancements. Finally, the chapter concludes by reviewing the potential limitations of this research and outlining further avenues for investigation.

10.2 Summary and contribution of research findings

This research has focused on six main research propositions. In the sections that follow, each of these propositions is contextualised in terms of existing knowledge, before its distinct contribution to the field is considered.

10.2.1 Relationship between IS capability contribution and improved competitive positioning (Proposition 1)

Past studies have hypothesised that firm performance is not necessarily attributable to any single IS capability in isolation, but how organisations integrate and combine their capabilities (Mata et al. 1995; Ross et al. 1996). Although a number of IS capability typologies have been proposed (Feeny and Willcocks, 1998; Wade and Hulland, 2004), little work has been conducted to investigate empirically the relationship between IS capabilities that an organisation can apply when

implementing an IS-enhancement, and the resulting level of improved competitive positioning. Previous studies that have investigated this relationship, including Bharadawaj (2000) and Santhanam and Hartono (2004), have only focused on a very limited number of IS capabilities, namely IS infrastructure and human IT resources.

This study built upon previous theory by operationalising the IS capability typology presented by Wade and Hulland (2004), to investigate the impact of applying and integrating IS capabilities on the ability of an organisation to confer improved competitive position. The results showed a significant positive relationship between the degree to which a specific IS-enhancement is dependent upon organisational IS capabilities and the degree to which it delivers improved competitive positioning. Whilst these results were of importance, they failed to confirm the direction of causality and gave no rationale as to why these results had come about. Thus, to further the understanding of these results, qualitative interviews were conducted. The interviews confirmed the direction of causality: IS capabilities impact the success of an IS-enhancement. It was also found that IS-enhancements directly contribute to improved competitive positioning and that this degree of improved competitive positioning is dependent upon the IS capabilities applied. Furthermore, it was established that IS capabilities rarely act alone in creating improved competitive positioning as they are very much interdependent.

In their totality, these results provide important evidence in support of proposition 1, and thus confirm that the application of IS capabilities positively impact the successful deployment of IS-enhancements, which in turn help improve competitive positioning. In so doing, the study provides empirical support for Mata et al. (1995) and Ross et al's. (1996) suggestion that performance is not necessarily attributable to any single IS capability in isolation, but on the degree to which organisations are able to successfully integrate and combine their IS capabilities.

10.2.2 Relationship between specific types of IS capability contribution and improved competitive positioning (Proposition 2)

Wade and Hulland (2004) suggested that certain types of IS capabilities will have a greater impact on improved competitive positioning than others. More specifically, it has been suggested that outside-in and spanning capabilities, which tend to have similar attributes in terms of their value and rarity, will have a greater impact on improved competitive positioning than inside-out capabilities. Although past studies have empirically investigated IS capabilities for their ability to confer improved competitive positioning (Powell and Dent-Micallef, 1997; Bharadwaj et al. 1998; Bharadwaj, 2000; Dehning and Stratopouls, 2003), no studies to date have empirically compared and contrasted the capabilities within a broad IS capability typology.

Consequently, this study has made a significant contribution to the literature by comparing and contrasting the IS capabilities within a typology for their ability to improve competitive positioning. From the analyses it was possible to confirm that outside-in and spanning capabilities do, indeed, tend to have a greater impact on improved competitive positioning than inside-out IS capabilities. Moreover, the qualitative analysis indicated that whilst all IS capabilities were perceived to be valuable, as they have the potential to contribute to improved competitive positioning, the outside-in and spanning capabilities were perceived to make a more significant contribution, due to their higher degree of rarity. To conclude, these results provide important new empirical evidence to support Wade and Hulland's (2004) proposition that outside-in and spanning capabilities will have a greater impact on improved competitive positioning than inside-out capabilities.

10.2.3 Relationship between IS capability non-transparency/non-replicability and sustained improved competitive positioning (Proposition 3)

Grant (1991) identified that a competitive advantage that is the consequence of superior capability in relation to a single performance variable, is easier to identify and comprehend than a competitive advantage that involves multiple capabilities conferring superior performance across several variables. He also suggested that a

capability that requires a complex pattern of coordination between large numbers of diverse resources is more difficult to replicate than a capability, which rests upon the exploitation of a single dominant resource. Although Grant's (1991) theory has been applied within the strategic management literature, it is yet to be applied within the field of IS research.

This study has made a significant contribution by applying resource based theory from the field of strategic management to the field of IS research, as suggested by Wade and Hulland (2004). Moreover, it provides a theoretical grounding to focus the sustainability implications of IS capabilities thereby answering Willcocks et al.s' (1997) and Wade and Hulland's (2004) call for more focussed studies on the relationship between IS capabilities and the sustainability of competitive advantage. The study found a significant positive relationship between the degree to which the success of the host organisation's IS-enhancement is dependent upon IS capabilities, which are non-transparent and / or non-replicable, and the resultant degree of sustained improved competitive positioning achieved.

The interviews were used to build upon the statistical analyses, by confirming the direction of causality: non-transparent and non-replicable IS capabilities do positively impact the duration for which an improved competitive position can be sustained. Moreover, they provided empirical support for Grant's (1991) suggestion that it is the interaction of a range of complementary IS capabilities, that are both non-transparent and non-replicable, that is the key to delivering a sustained improved competitive position. It has also been established that the more integrated non-transparent IS capabilities are, the harder it is for competitors to identify how the capabilities are working together to deliver competitive positioning. Furthermore, the greater the degree to which non-replicable IS capabilities are acting in concert, the harder it is for competitors to acquire the necessary capabilities to implement a competing IS-enhancement. Consequently, the application of highly integrated, non-transparent and non-replicbale IS capabilities is likely to result in a greater degree of sustained improved competitive positioning being derived from an IS-enhancement.

10.2.4 Relationship between specific types of non-transparent/non-replicable IS capabilities and sustained improved competitive positioning (Proposition 4)

Wade and Hulland (2004) suggested that certain types of IS capabilities will have a greater impact on sustained improved competitive positioning than others. More specifically, they have argued that outside-in and spanning capabilities, which tend to be less transparent and less easily replicable, when compared to inside-out capabilities, may well facilitate a more sustainable level of improved competitive positioning. However, few past studies have investigated IS capabilities for their ability to confer sustained improved competitive positioning, and no studies to date have empirically compared and contrasted the capabilities within an IS capability typology.

This study has made a significant contribution to the literature by comparing and contrasting the capabilities within Wade and Hulland's (2004) IS capability typology for their ability to confer sustained improved competitive positioning. Statistical associations between individual non-transparent/non-replicable IS capabilities and sustained improved competitive positioning support the thesis that non-transparent/non-replicable outside-in and spanning capabilities tend to have the greater impact on the duration of improved competitive positioning. To explore this result more deeply, the interviewees were questioned as to how any variance in the duration of an improvement in competitive positioning might be derived from the application of non-transparent and non-replicable IS capabilities. An analysis of the qualitative data showed that when a high degree of sustained improved competitive positioning was achieved inside-out and spanning capabilities tended to have a higher degree of non-transparency, non-replicability and importance to the attainment of the sustained improved competitive positioning than inside-out IS capabilities.

These results provide evidence to support Wade and Hulland's (2004) thesis that outside-in and spanning capabilities will have a greater impact on sustained improved competitive positioning than inside-out capabilities. Moreover, it can be inferred that outside-in and spanning capabilities are perceived to be less transparent and less easily replicated, in circumstances where a high degree of sustained improved competitive positioning has been experienced.

10.2.5 Relationship between direct/indirect contribution of the IS-enhancement and improved competitive positioning (Proposition 5)

Much debate has focused on the sources of improved competitive positioning, when derived from IS-enhancements (Clemons and Row, 1991; Kettinger, 1994; Powell and Dent-Micallef, 1997; Ravichandran and Lertwongsatien, 2002; Wade and Hulland, 2004). However, it was not possible to draw conclusions from the literature as to whether the greatest degrees of improved competitive positioning are derived directly or indirectly from IS-enhancements. Although competing arguments have long been recognised, no research to date has empirically compared and contrasted the direct and the indirect impacts of an IS-enhancement on the resultant level of improved competitive positioning.

The study made a significant contribution is this area by representing a first attempt to compare and contrast both the direct and indirect impacts of the IS-enhancment with one another. It was anticipated that this would help to determine from where the greatest degrees of improved competitive positioning could be derived. However, this study found no significant differences between the direct and indirect impacts of the IS-enhancement on the degree of improved competitive positioning ultimately achieved. Due to the underdevelopment of this topic within the academic literature, a variety of questions were posed during the interviews, to provide new insights into why this may be the case. Through this line of questioning, many examples were presented which confirmed that both the indirect and the direct impacts of the IS-enhancement were perceived to have the potential to be the more dominant facilitator of improved competitive positioning. Moreover, it was shown that the underlying rationale for this was that both the direct and the indirect effects of an IS-enhancement could be characterised as valuable and rare.

An interesting corollary of this analysis is that it provides new evidence that runs counter to Ward et al. (1996), and Strassman's (1990) suggestion that the value from IT investments is generally derived from the organisational change that accompanies the implementation, rather than from the software itself. This is clearly a result that needs to be more deeply investigated.

10.2.6 Relationship between direct/indirect contribution of the IS-enhancement and sustained improved competitive positioning (Proposition 6)

As with improved competitive positioning, there is an ongoing debate with regard to the relative importance of the direct and indirect impacts of an IS-enhancement on sustained improved competitive positioning (Clemons and Row, 1991; Mata et al. 1995; Wade and Hulland, 2004). Having applied Grant's (1991) theory to the field of IS research, it can be inferred that the longer it takes for competitors to identify how the success of the IS-enhancement has been achieved, or to replicate the capabilities needed to achieve this success, the longer will be the resultant duration of improved competitive positioning. Researchers also suggest that sustained improved competitive positioning is derived indirectly through the leveraging of existing organisational resources/capabilities, or through initiating organisational change to leverage the contribution of the IS-enhancement, not the IS-enhancement itself (Clemons and Row, 1991; Mata et al. 1994; Devorak et al. 1997; Melville, 2004). Although these competing arguments have been recognised, no research to date has empirically compared and contrasted the direct and indirect impacts of the IS-enhancement to identify which of these potentially important sources of sustained improved competitive positioning is most dominant.

The statistical analyses found a significant positive relationship between the degree to which the IS-enhancement indirectly contributes to the improved competitive positioning and the duration of the resulting improvement in competitive positioning. This position was supported by evidence from the interviews which identified the emergence of an important pattern: in cases where the most dominant impacts were indirect the duration of improved competitive positioning was lengthy, whilst in instances where the impacts of the IS-enhancement were primarily direct, any improvements were fairly short-lived.

By accepting both proposition 4 and proposition 6, this study has uncovered two important and plausible sources of sustained improved competitive positioning: the non-transparency and non-replicability of IS capabilities, applied in support of the IS-enhancement, and the degree to which the effects of the IS-enhancement are indirect. Consequently it was deemed important to explore these results further to clarify

which, if either, of these two potential sources of sustained improved competitive positioning was the most dominant.

From the follow up interviews it was possible to conclude that even though an organisation could support an IS-enhancement with a high degree of non-transparent and non-replicable IS capabilities, rival organisations did not necessarily have to copy these IS capabilities to be able to implement a competing IS-enhancement. If a rival could identify the nature of the IS-enhancement, it could hire external consultants to implement a competing system, within relatively short time frames. By contrast, it can be concluded that in instances where the indirect impacts of the IS-enhancement are the more dominant, then a more enduring improved competitive position is likely to be achieved. The most likely rationale for this is that organisational capabilities, used to leverage IS-enhancements, tend to be very deep rooted and firm-specific (Clemons and Row, 1991; Dvorak et al. 1997), and thus they are typically very difficult for competing organisations to understand or imitate. A further interesting result to emerge from the interviews was that it tended to be the complementary organisational resources/capabilities that were enabling the sustainability, rather than through initiating organisational change to leverage the contribution of the IS-enhancement. Consequently, this study makes an important contribution to the literature by helping to empirically clarify the most important sources of sustainable, IS-enabled improved competitive positioning.

10.3 Implications for research

The implications of this study for current and continuing research can be divided into methodological issues and theoretical issues. Methodological issues are concerned with the implications of the research design on future empirical efforts, while theoretical issues are concerned with the specific implications of the study's findings for existing theory applying the resource based theory within IS research.

10.3.1 Methodological issues

The contribution of this study, related to methodological issues, are discussed below:

- **Validation and measurement of improved competitive positioning:** Prior research investigating the impacts of IS-enhancements on competitive positioning have focused on what Ray et al. (2004) term *'highly aggregated independent variables'*; for example, return on sales, market share and new customers. However, researchers are now recognising that the use of such measures could generate very misleading results as IS-enhancements can impact organisations at many levels (Ray et al. 2001; 2004; Wade and Hulland, 2004). This has led researchers to suggest looking beyond organisational level measures to processes levels (Ray et al. 2001; 2004; Wade and Hulland, 2004). However, no previous research to date has proposed, validated and applied a generic set of business processes with which to measure the competitive implications of IS. Consequently, this study makes an important contribution to the methodological literature, by successfully establishing and validating a generic set of business processes to be used as the basis for measuring the degree of improved competitive positioning derived from IS at a process level.

- **Validation and measurement of improved competitive positioning:** Although it was recognised that competitive advantage should be measured at a process level rather than at a firm level, it was felt the term competitive advantage did not accommodate both the situations where an organisation narrows the competitive gap with competition, through catching up, as well as widening it through being a leader. For this reason the term improved competitive positioning was preferred. As no previous research instruments had been developed to measure improved competitive positioning in the context of IS-enhancements, a new set of measures of improved competitive positioning have been successfully derived and applied.

- **Validation and measurement of the direct and indirect impacts of IS-enhancements:** Although measures have previously been developed to measure both the direct or indirect impacts of IS-enhancements on competitive positioning,

no previous measurement instruments have been developed to compare and contrast the direct with the indirect impacts of the IS-enhancement on improved competitive positioning. This study makes an important contribution by successfully designing and validating a measure which enables the direct impacts of the IS-enhancement to be compared and contrasted with the indirect impacts of the IS-enhancement.

- **Combining both quantitative and qualitative data:** Much of the previous work relating to the application of resource based theory within the field of IS research has been conducted from a theoretical perspective. Moreover, where empirical work has been undertaken it has tended to either be based exclusively on quantitative or qualitative data collections. This study is unusual in that it presents a thorough empirical exploration of the domain, based upon mixed methods: an extensive initial survey, coupled with in-depth interviews to further validate and complement the statistical findings. Furthermore, the same respondents were used for the quantitative surveys as the qualitative survey, thus interviews could be linked back to specific questionnaire responses.

10.3.2 Theoretical issues

This study has expanded on the following theoretical issues:

- **IS capabilities and improved competitive positioning:** The study has expanded on previous work, representing a first empirical attempt to investigate the IS capability typology presented by Wade and Hulland (2004) and the impact of the IS capabilities on improved competitive positioning. With the results of the study presenting new empirical evidence that the improved competitive positioning that is derived directly from an IS-enhancement is largely dependent on the IS capabilities that the host organisation can combine and integrate. These findings suggest that future studies should focus upon broad typologies of complementary IS capabilities, rather than individual capabilities.

- **Direct and indirect impacts of IS enhancements on competitive positioning:** Many previous studies have either investigated the direct impacts of IS-enhancements on competitive positioning or the indirect impacts of IS-enhancements on sustained competitive positioning. This study expands on previous theory by representing a first attempt to compare and contrast the direct and indirect impacts of IS-enhancements on competitive positioning. With the identification that the indirect impacts of the IS-enhancement, through the leveraging of existing organisational resources/capabilities, or through initiating organisational change to leverage the contribution of the IS-enhancement have a more enduring impact on improved competitive positioning than the direct impacts. Further research should focus on developing an organisational typology of the indirect organisational resources/capabilities that leverage the IS-enhancement or are changed to leverage the contribution of the IS-enhancement.

- **Operating processes and management and support processes:** Many previous studies investigating the competitive implications of IS-enhancements have focused on what Ray et al. (2004) terms *'highly aggregated dependent variables'*, namely return on investment, return on assets and market share. This research has presented a first attempt to use a process typology to investigate the competitive impacts of an IS-enhancement. Although this research wanted to aggregate the business processes to give an overall degree of improved competitive positioning, it became apparent that operating processes and management and support processes differ in their sensitivity to IS-enhancements. Thus, further research could focus on the impacts IS-enhancements have on individual processes to identify how this differentiated sensitivity comes about.

- **Interaction of key variables:** A major theoretical implication of this study is the establishment of an empirical based framework linking the introduction of an IS-enhancement through to both improved competitive positioning and sustained improved competitive positioning. This is important because the findings of the study can provide meaningful empirical input towards future research investigating the relationships between IS capabilities and IS-enhancements, IS capabilities and improved competitive positioning, IS capabilities and sustained improved

competitive positioning and finally, the direct and indirect impacts of IS-enhancements on both improved competitive positioning and sustained improved competitive positioning.

10.4 Implications for practice

The findings of this study present interesting implications for managers. The most important of these are:

- **The importance of developing a coherent set of integrated IS capabilities:** The study informs business managers that organisations should do much more than simply identify and invest in information systems and technologies, they also need to develop and apply a coherent set of IS capabilities. Organisations need to firstly identify which IS capabilities they have. This can be done through self-assessment which requires the firm to assess their own strengths and weaknesses. Once the organisation has assessed their IS capabilities they must identify which ones need further investments and development, as an improved competitive position is not necessarily attributable to any single IS capability in isolation, but rather how organisations co-ordinate and integrate their capabilities.

- **The importance of indirect impacts of IS-enhancements on sustaining improved competitive positioning:** The study provides business managers with a better understanding of where the greatest degree of sustained improved competitive positioning might be derived. Whilst managers must be aware that IS capabilities are essential to the success of the IS-enhancements and can create sustained improved competitive positioning, to gain a truly enduring degree of sustained improved competitive positioning they must look beyond the direct impacts of the IS-enhancement towards organisational resources/capabilities that can leverage the contribution of the IS-enhancement. Once again managers must identify which organisational resources/capabilities have the potential to be leveraged by an IS-enhancement to create improved competitive positioning and sustained improved competitive positioning through self-assessment.

- **The development of an IS enabled sustainability framework:** Issues involving strategic IS are complex and there is a need for frameworks to aid executives and planners. The work in this thesis developed an IS-enabled sustainability framework which might provide a starting point for managers to identify where opportunities arise to gain improved competitive positioning and sustained improved competitive positioning from an IS-enhancement.

10.5   Limitations and suggestions for further research

All studies have limitations; hence, in assessing the findings, it is important to interpret the results in light of the limitations that may apply.

Firstly, it is important to note that this study is cross-sectional in nature. Cross-sectional data captures a situation or an event at a point in time and consequently has inherent shortcomings, which may be embedded in the data. Future research could employ alternative methods of data collection, for example, case studies in order to obtain more detailed information, such as the documentation of an IS-enhancements inception through to improved competitive positioning.

Secondly, a further limitation may occur as only one respondent was used from each company. In this research, the respondents were limited to managers, and whilst such practice is typical in IS survey research, it is by no means an ideal method of data collection. Therefore, a potential avenue for further research would be to use multiple informants such as an IS manager and a business manager so that triangulation could be performed.

The third limitation of this study is the '*single item*' approach used for business process and capabilities. As highlighted by Churchill (1979), the use of a single item approach can lead to deficiencies in context measurement. Despite adopting this approach, every effort has been taken to ensure that the item that was finally selected is phrased to represent the most critical aspect of the concept. Every piece of research is flawed (McGrath, 1982) and is a compromise. The key area of concern in this

research was to find an appropriate balance between: (1) number of responses that will be obtained, (2) scope of the questions asked and (3) reliability of the question itself. Ultimately, an appropriate compromise was achieved by adopting a design which: (1) retained the scope, (2) kept the length of questionnaire to two pages and (3) adopted single item constructs. However, reliability was still uppermost in the overall research design, but was handled 'outside' of the questionnaire. More specifically, it was handled by talking through the meaning of the questions with a wide range of experts.

Fourthly, the sample frame could be a source of potential sample frame bias as the companies used in the study were selected from professional and personal ties and therefore did not constitute a random sample. A potential avenue for further research would be to use a random sampling method.

Fifthly, the study focused on subjective performance measures, where respondents were asked to compare their firm's performance to similar ones in their industry. However, managers' perceptions may not capture the actual performance of the process in question. Therefore a potential avenue for further research would be to develop quantitative measures of performance for each of the business processes in the business process typology used in this research.

10.6 Concluding remarks

As resource-based theory gains wider acceptance among academics and research studies that empirically explore its application, in a wide variety of organisational contexts, will become increasingly important. However, to date, there have been relatively few studies that seek to empirically test key aspects of resource-based theory, in the context of information systems deployment. Consequently, this study seeks to help fill an important gap in the information systems' literature, and in so doing, provides many important new insights into the competitive impacts of information systems. For example, the study concludes that organisations should not expect to gain an improved competitive positioning, that is sustainable, from the application of a single capability; success is derived from the effective combination

and integration of capabilities. Moreover, sustainable improvements in competitive positioning are likely to be dependent upon the application of IS capabilities that are not easy for competitors to readily understand or replicate, Finally, if organisations are to gain a truly enduring sustained improved competitive position from an IS-enhancement, they must look towards organisational resources/capabilities that can leverage the contribution of the IS-enhancement, rather than expecting the direct impacts of the IS-enhancement alone to be sufficient.

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Appendix A

Web-based Questionnaire

(Displayed as if the responded had clicked on the process of 'designing and developing products or services' to reveal the drop down box containing requests A to E for that process. Furthermore, the IS capability of 'IS development' has been clicked upon to reveal the drop down box containing requests F to H for that IS capability.)

■ Loughborough
University

Improving business process performance through IS enhancements

Confidentiality Statement

The data obtained from this questionnaire will only be used by Loughborough and Aston Universities for the purpose of academic research, and no information will be attributed to any person or company without their prior consent.

Before starting the questionnaire please think of an information system (IS) enhancement (either a modification to an existing IS or the implementation of a new IS) that has been implemented within your organisation or an organisation you previously worked in and has resulted in improved competitive positioning (either getting you ahead of competitors, or enabling you to catch up with them).

Please name this IS enhancement.

Please briefly explain the function of the IS enhancement

Please relate all of your answers to this chosen system which will be

referred to as the 'IS enhancement' from now on. If you require further definitions of any key terms (words underlined), please click on the word to reveal the definition.

Would you like a copy of the study's findings? ⊂ Yes ⊂ No

If yes, please supply a name and either a postal or email address for receipt of the studies findings. Alternatively if you would prefer for there to be no link to your contribution, you can email m.j.terry@lboro.ac.uk to request a copy.

Name [   ]

Address [   ]

Section A: Background information

1. Which of the following best describes the sector in which your organisation primarily operates?

⊂ Agriculture   ⊂ Banking and finance   ⊂ Business services

⊂ Construction   ⊂ Education   ⊂ Energy supply

⊂ Health   ⊂ Leisure   ⊂ Manufacturing

⊂ Public Services   ⊂ Transport   ⊂ Wholesale and retail

⊂ Other   [   ]

2. Approximately how many people are employed in your organisation?

⊂ 1 to 99   ⊂ 100 to 249   ⊂ 250 to 499

⊂ 500 to 749   ⊂ 750 to 999   ⊂ 1000 to 2499

⊂ 2500 to 4999   ⊂ 5000 to 9999   ⊂ 10000 or more

Section B: Improved business process performance resulting from the IS enhancement

3. Please click on the following shaded <u>business processes</u> that where improved as a result of your chosen IS enhancement and fill in the drop down box that appears. For those processes that were not improved please click 'not applicable'. Further clarification of what each process entails can be gained by clicking the view help icon.

The process of designing and developing products or services   *View Help*   Not Applicable ☐

A: Please use scale A to indicate how you compared with your competitors with regard to this process **before** the implementation of the IS enhancement

B: Please use scale B to indicate how you compared with your competitors with regard to this process **after** the implementation of the IS enhancement

	Very competitively disadvantaged			Level Pegging			Very competitively advantaged
Scale A	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7
Scale B	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7

C: Please indicate the extent to which the degree of this improved competitive position can be <u>directly attributed to the IS enhancement itself</u>, as opposed to indirectly through the <u>leveraging of existing organisational resources/capabilities</u>, or through <u>initiating organisational change</u> to leverage the contribution of the IS enhancement. *Please click a single pair of values.*

	0%	20%	40%	60%	80%	100%
Direct IS contribution	○	○	○	○	○	○

	100%	80%	60%	40%	20%	0%
Indirect IS contribution	◌	◌	◌	◌	◌	◌

D: With regard to this process please indicate the appropriate length of time that you have been, or anticipate you will be able to sustain this improved competitive position.

1 year	2 years	3 years	4 years	5 years	6 years	7 years or over
◌	◌	◌	◌	◌	◌	◌

E: Please indicate the extent to which the duration of sustainability, of this improved competitive position can be directly **attributed to the IS enhancement itself**, as opposed to indirectly through the **leveraging of existing organisational resources/capabilities**, or through **initiating organisational change** to leverage the contribution of the IS enhancement. *Please click a single pair of values.*

	0%	20%	40%	60%	80%	100%
Direct IS contribution	◌	◌	◌	◌	◌	◌

	100%	80%	60%	40%	20%	0%
Indirect IS contribution	◌	◌	◌	◌	◌	◌

The process of acquiring and storing inputs required for products or services	***View Help***	Not Applicable ☐
The process of transforming acquired inputs into products or services	***View Help***	Not Applicable ☐
The process of marketing and selling products or services	***View Help***	Not Applicable ☐
The process of delivering products or services	***View Help***	Not Applicable ☐
The process of developing vision and strategy	***View Help***	Not Applicable ☐
The process of managing information technology & knowledge	***View Help***	Not Applicable ☐
The process of managing financial resources	***View Help***	Not Applicable ☐
The process of managing external relationships	***View Help***	Not Applicable ☐
The process of customer service	***View***	Not Applicable ☐

The process of developing and managing human capital

View   Not   ☐
Help   Applicable

Other Process

View   Not   ☐
Help   Applicable

Section C: Organisational IS capabilities that contributed to the success of the IS enhancement

4. Please click on the following shaded <u>Organisational IS capabilities</u> that contributed to the successful implementation of your chosen IS enhancement and fill in the drop down box that appears. If an IS capability did not contribute to the success of the IS enhancement, please click 'not applicable'. Further clarification of each capability can be gained by clicking the 'view help icon'.

Your organisations ability to develop and experiment with new technologies, which enable you to take advantage of emerging technologies and trends.

View   Not   ☐
Help   Applicable

F: Please indicate the degree to which this IS capability was a contributing factor in the success of the IS enhancement.

Low   High

   ◌ 1   ◌ 2   ◌ 3   ◌ 4   ◌ 5

G: Please indicate the ease with which your competitors could understand how the IS capability operates and contributes to the success of the IS enhancement.

Low   High

   ◌ 1   ◌ 2   ◌ 3   ◌ 4   ◌ 5

H: Please indicate the ease with which your competitors could copy this capability.

Low   High

   ◌ 1   ◌ 2   ◌ 3   ◌ 4   ◌ 5

Your organisation's ability to share information throughout the organisation through effective hardware, software and communication platforms
View Help   Not Applicable   ▯

The ability of your IS staff to understand and use the organisation's hardware, software and communications platforms.
View Help   Not Applicable   ▯

Your organisations ability to anticipate future changes and growth, to chose platforms (including hardware, network and software standards) that can accommodate this change and to efficiently manage the resulting technology change and growth.
View Help   Not Applicable   ▯

Your organisations ability to provide efficient and cost-effective IS operations on an ongoing basis.
View Help   Not Applicable   ▯

Your organisations ability to manage linkages between the IS function and stakeholders outside the firm i.e. the ability to work with suppliers to develop systems for the organisation.
View Help   Not Applicable   ▯

Your organisations ability to undertake strategic change due to changes in market conditions through the rapid development and management of IS projects
View Help   Not Applicable   ▯

Your organisations ability to ensure IS development plans are integrated with organisational functional plans and IS align with organisational needs
View Help   Not Applicable   ▯

Other Capability
View Help   Not Applicable   ▯

Please indicate if you would be willing to take part in a short telephone interview to explore your responses further.

⌐ Yes ⌐ No

If yes, please supply your name (if you have not already done so to request a copy of the study findings) and contact telephone number.

Name
▯

Telephone number
▯

Thank you very much for your time and cooperation. Your contribution to this study is greatly appreciated.

Submit questionnaire | Reset

Appendix B

Questionnaire Covering E-mail

(Covering e-mail sent to Loughborough University Alumni member. Although the highlighted lines changed slightly depending on the professional and personal ties being contacted, the remained of the covering e-mail remained the same.)

Dear Loughborough University Alumni member

I am currently conducting postgraduate research at Loughborough University, to explore how information systems can be used to improve business process performance, and ultimately enhance an organisations competitive position.

As you have close ties with Loughborough University as an alumni member I would be very grateful if you could assist me in my research by sparing around 10 minutes to complete a short questionnaire. I have designed the questionnaire to be answered by practicing managers, who use information systems in their working lives. However, if you feel you are not in a position to answer the questionnaire and you know of anyone else who may be able to complete it, perhaps work colleagues or friends, I would be very grateful if you could forward the questionnaire link to them.

The questionnaire can be started by clicking the link at the bottom of this page, and returned to me by clicking the "Submit Questionnaire" button at the end of the questionnaire. Your response will be treated in confidence, and no record will be kept to link a specific set of responses to the responding organisation or individual. A summary of the findings will be made available to all respondents who express a wish to receive it.

If you require further clarification, or have any comments or suggestions, then please contact me at (m.j.terry@lboro.ac.uk) or on 07801 444 166. Many thanks in advance if you have completed the questionnaire or forwarded it on.

Yours sincerely,

Mark Terry

Please click the link below to start the questionnaire
http://www-staff.lboro.ac.uk/~bsmjt/questionnaire.htm

Appendix C

Interview guide for follow up interviews

Introductory Questions

Should already have this info. if they return a copy of the questionnaire before the interview

1. What sector do you operate in, or what sector did the organisation you are referring to operate in?   □

2. Roughly how many people does your organisation employ or did the organisation employ that you are referring to?   □

Information on the IS-enhancement

3. Please explain a little about the IS-enhancement you based the questionnaire on? □

Explore the following questions further if they are not covered:

- What sort of system is it, i.e. is it packaged or tailor made?   □

- Was it outsourced or developed in-house?   □

- Was it a new IS or an extension to an existing IS?   □

- Indication of its size, company wide departmental etc.   □

- Was the IS-enhancement implemented specifically to try and catch up with competitors or get ahead of them?   □

- Do your competitors have a similar system in place or was it an innovative use of a system? □

- Would you say that the IS-enhancement is a commodity item, for example is the IS-enhancement readily available to any one that would want to implement it?   □

- Did the project team implementing this IS-enhancement have the full support of top management? □

Business processes

- Please explain how the business process in question was improved and how did the IS-enhancement facilitate this improvement? ☐

- Please explain the nature of the improved competitive position of business process performance and how did the process improvement facilitate this? For example what is it that you are better at doing now that has narrowed the competitive gap with competitors or increased the competitive gap with competitors? ☐

Source of improved competitive positioning

- Please indicate the extent to which the degree of this improved competitive position can be directly attributed to the IS-enhancement itself, as opposed to indirectly through the leveraging of existing organisational resources/capabilities, or through initiating organisational change to leverage the contribution of the IS-enhancement.

Direct (immediate)

- Please explain what the direct effects of the IS-enhancement where on the improved competitive positioning and how they contributed to the improvement in competitive positioning. For example did it reduce costs time etc? ☐

- If you where implementing the IS-enhancement to catch up with your competitors did the direct affects give you competitive parity or did they enable you to improve your competitive position above competitive parity? ☐

- If you have implemented an innovative IS-enhancement, if your competitors where to implement a similar system would they see the same direct effects as what you have, resulting in competitive parity? ☐

- If your competitors where to implement a similar IS-enhancement would you still be at an improved competitive position? ☐

<u>Leveraging existing organisational resources/capabilities (immediate)</u>

- Please explain what the existing organisational resources/capabilities were, how they leveraged the IS-enhancement and how this contributed to the improved competitive position of business process performance? ☐

- Was it these organisational resources/capabilities that were leveraging the IS enhancement that enabled you to get a competitive advantage above competitive parity, or where they enabling you to gain competitive parity? ☐

<u>Changes leveraging the IS-enhancement (immediate)</u>

- Please explain what the changes to organisational resource/capabilities or processes were, how they leveraged the value of the IS-enhancement and how this contributed to the improved competitive position of business process performance? ☐

- Was it these changes that enabled you to get improved competitive position above competitive parity or were they just essential to gain competitive parity? ☐

Sustainability:

Please explain what the nature of this sustained improved competitive position of business process performance was? ☐

Please indicate the duration that you were able to sustain this improved competitive position of business process performance for? ☐

Please indicate the extent to which the duration of sustainability, of this improved competitive position can be directly attributed to the IS-enhancement itself, as opposed to indirectly through the leveraging of existing organisational resources/capabilities, or through initiating organisational change to leverage the contribution of the IS-enhancement? ☐

<u>Direct (long term)</u>

- Please explain what the direct effects of the IS-enhancement were on the sustained improved competitive positioning and how they contributed to the sustainability of this improvement in competitive positioning? ☐

- Why is it that your competitors could not replicate these direct effects of the IS-enhancement on sustainability? ☐

Long term leveraging existing organisational resources/capabilities

- Please explain what the existing organisational resources/capabilities where that lead to the sustained improved competitive position and how they leveraged the IS enhancement to lead to this sustained improved competitive position?

- Please indicate the degree to which these resources/capabilities where non-transparent and non-replicable to your competitors? □

Changes leveraging the IS enhancement (long term)

- Please explain what the changes to resources/capabilities or processes were that lead to the sustained improved competitive position and how they leveraged the IS-enhancement to lead to this sustained improved competitive position? □

- Please indicate the degree to which these changes were non-replicable and non-transparent to your competitors? □

Capabilities:

For the capability in question:

- Please explain a little bit about this IS capability and how it contributed to the success of the IS-enhancement? □

- Please identify if this IS capability directly contributed to the improved competitive position of business process performance or was it just an essential component to the success of the IS-enhancement? □

- Please indicate if this IS capability directly contributed to the duration of sustained improved competitive positioning of business process performance or was it just an essential component to the success of the IS-enhancement? □

- Please indicate the degree to which this IS capability is non-transparent and what makes it non-transparent? □

- Please indicate the degree to which this IS capability is non-replicable and what makes it non replicable? □

- Is it the non-transparency and non-replicapabiltiy of this IS capability which is enabling it to contribute to the sustained improved competitive position of business process performance? □

Can I get back in contact with you if I need to ask any follow up questions?

Have you any documentation on the system that I could use for the purposes of my research?

Appendix D

Name and brief description of IS-enhancements identified by interviewees

Respondent no.	Summary of System
1	EPOS: An EPOS system introduced across a national group of independent retailers, to improve the quality of information by collective purchasing over the group.
2	Corporate benchmarking: To enable the company's costing to be viewed against European competition specifically their machine profiles.
3	Video conferencing system: Started using it as part of our business unit strategy
4	MI Database: To enable accurate performance management information to be produced at an individual employee level.
5	CLAIM: Each employee has to input accurately the time they work and allocate it to a claim code. Each claim code has activities underneath it and is allocated to what we refer to ODB which is a finance code and there for you can allocate each hour of every bodies time to a budget therefore being able to manage the cost of all of your individuals.
6	3D CAD system: It was to enable us to react more rapidly to customer requirements for rapid design.
7	Collaboration Solution: The collaboration solution is about collaborating and automating the process involved in the creation of documents, the collaborative effort involved in finishing the documents, the storing of the documents in a 'corporate memory' and the automation of significant of the aforementioned.
8	Treasury management system: Replacing an entirely paper based environment, has enabled daily cash management and dealing; transaction processing and recording; instruction to banks and operation of a robust risk control framework to be automated.
9	3D CAD Project: To improve design response time and presentation of design in order to shorten timescale from quote to order placement.
10	Data Warehouse: The development of a corporate data warehouse for the provision of consistent information across the organisation.
11	EDM: Electronic Document Management.
12	SAP R/3: It provides the organisation with all financial transactions internally and externally.
13	Shipping System: Create accurate customer container loading documents for a busy logistics organisation with multiple supplier parts in each container.
14	RMS: An advanced, bespoke, financial risk management system: It allows our organisation to compile information across all positions and strategies traded by 26 different trading groups. Valuing and running risk scenarios against assets securities, as well as their derivatives.
15	Program to control flow
16	ICE: Intellectual Capital Exchange – a knowledge management system for the consultancy group.
17	IVR TAP: IVR is a system that controls when you dial up a call centre or a company and you get a press 1 for this press 2 for that type option. In this case we have it attached to a data base which contains a lot of customer information so customers are asked to identify themselves through their card number because this is a system that we run for a bank and then the IVR determines whether we are going to handle that customer with a real person or within in the system.
18	Paperless Production System: To remove paper generated work orders and BoMs from the shop floor.
19	EBS: SAP implementation covering all core business processes including 'Order to Cash' (contact centre order capture through to goods issue, invoicing and payment receipt) and 'Procure to Pay' (purchase order through to goods receipt and payment made).
20	BRIO: Data mining tool, that is user friendly and does not require individual IS support for report writing
21	Doc Viewer: At my desk I could view any drawing or document.
22	Data warehouse system: mainly designed to give structure to an unstructured

	process.
23	KM database: A database to capture internal know how – that is advice documents, briefings, cases barristers opinions, memos, letter, precedents, transaction documents etc.
24	IDDS: Centralised, web based, document storage and distribution system
25	Intel Premier Support: A customer-facing web based tool, which allows customers (large OEMs) to submit questions and design-in issues. The 'cases' are then picked up by the Application Design-in Centre organisation and assigned to an appropriate resource; who works to resolve the 'case' keeping the submitter informed of the status (via the tool) and communicating with the customer during the process of that 'case'. The tool also grows as an interactive knowledge base as more 'cases' are submitted and resolved'.
26	Brassring Recruitment System: Brassring is a web based recruitment system that allows us to post vacancies on the internet, as well as track candidate progress through our interview cycle. It also acts as a database on which we can store and search.
27	Navision: Microsoft Navision implemented following acquisition of 100 strong company.
28	CMSI: New customer service program where all confidential related information as far as customers lending (banking) transactions were being stored and displayed to the user.
29	Metering Database: To separate the collection process from legacy mainframes to put the overall group on a position where it would be able to sell of the metering business to concentrate on their own core business as a generator, network provider and as a power supplier.
30	Implementing a new J D Edwards system: Provides better flow of sales/works orders, better visibility of supply chain, improved management reporting and lower operational costs.
31	Installing CRM: Installing and networking CRM across the sales organisation
32	Extension to SAP: an extension to an SAP system at RR and what they did was when they did the first wave of their implementation they decided it was to big and complicated to try and take out all of the old legacy systems in one go. So what they did was bridge an interface to some of the legacy systems that they thought were a little bit too messy with a view that they would come back and sort this once they had the core bits in and that time has come so they are back in replacing some of that capability now.
33	E DOC: The program provides a database of stored documents and provides a means to retrieve those documents.
34	Timetabling package: To enable us to make more effective use of our resources
35	Mobile Connect Card: To enable remote PC working with access to office based systems without need for static landline connection.
36	Slimfast: New corporate web site.

Appendix E

Full Transcript of One Interview

F: Can you start off by telling me a little bit more about the IS enhancement you mentioned within the questionnaire?

R: I will start with the organisation itself; the organisation was a central purchasing consortium for a group of independent retailers, which there were 250 to 300 or so different shops. Each one of them was placing its orders with the purchasing consortium, which would then go off and make the purchases. The EPOS system that was introduced, EPOS is basically electronic point of sale so it allows you to scan an item through a till and it records it in a database so you know what has been sold. So when each separate shop sold a product it would automatically inform the purchasing committee of what had been sold, what had been bought by their customers. That allowed the purchasing group to make better purchasing decisions and also get better promotions and basically understand their customers better.

F: Could you go through again how it was done before, each shop would put an order in individually?

Marcus: So each shop would sell what it wanted to in say a month, then at the end of the month they would make the choice about what products they wanted to reorder. They would just place an order within the central group who would then collectively buy for the whole group. What that meant was that although the sales were there the central purchasing group didn't understand how many products were being sold. They had the figures available to them but they weren't very accessible and as a result the central group was at the mercy of its suppliers. By implementing the EPOS system it basically changed the power position within the value chain.

R: Can you identify if the EPOS system was tailor made or packaged?

Marcus: It was a bought in packaged system but the organisation not only bought that system in but they also set up a department at the head office to deal with collecting and analysing all of the data because there was a lot of it. I think they had more shops than Boots did.

F: Can you identify if the EPOS system was developed in house or outsourced.

R: The IT side of it?

F: Yes

R: It was developed by an outside company; they implemented all of the hardware and software.

F: So in terms of scale of the EPOS implementation did all the shops in the purchasing consortium implement the EPOS system at the same time?

R: No, you had an opting group, there were three waves throughout the year. The first wave was around a third, they introduced it initially and then the other ones implemented it based on the success of the first group. The shops that implemented the system got much better deals and all of the benefits from the technology where focused only on members that implemented the EPOS system. The companies that did not have the EPOS did not get the improved purchasing deals.

F: Was the IS specifically implemented to try and catch up with your competitors?

R: It was partly that the competitors were getting better deals but the reason why competitors were getting better deals was because they had a better position with regards to the suppliers. So just say you had a chain of shops that were competing against someone like Boots. The difference was that Boots would have integrated purchasing, so they would know overall across the group how much was being bought of a certain products. We didn't know that and we new that as well. So when we were negotiating with suppliers, we went and said "we want to buy roughly a certain amount of sandwiches", we were not able to tell them as accurate information as our competitors were. Therefore are competitors could haggle much better deals and argue with a number of different suppliers at the same time and have much better information which they could act on. Once we identified the information was lacking, that is when we decided to go through with the EPOS system.

F: Would you say your competitors already had EPOS system in place at the time?

R: Some did, but not all of them because are competitors where a mixture of different groups. Some were in some ways the big convenience stores, but also there where the small news stores which do tobacco and corner shops.

F: Would you say an EPOS system would be classed ac a commodity item, would it be accessible to any company that would want to implement it?

R: The EPOS system itself is accessible to every one but the benefits they get would depend on the nature of the company and the scale of the company. If a small corner shop was to implement EPOS they would get little benefit from it but a company such as TESCO get enormous benefit because EPOS pulls together separate units, so the more units you have that are independent of each other the better the benefits are from joining them up. The reason why we got the advantage we did from it is because our organisation is a purchasing consortium, so its sole job was to integrate separate businesses. So you had a load of independent retailers who were separately buying and our job was to integrate them and EPSO was the means of doing that.

F: In terms of top management support of the project would you say they were supportive?

R: They weren't initially supportive of EPOS; there were a number of other changes going on with that group at the same time. There was strong support for that, which was basically a re-branding exercise and EPOS was bundled in as part of it. Once the results started coming through, then we had wide scale support for EPOS. The interesting thing was that initial response to EPOS, the positive feedback as fare as the company went did not come from the senior management it came from the share

holders, the share holders where also the customers. They were getting money in there pocket and it was noticeable on their bottom line, they saw a noticeable change within a few months, because of that basically the management team had to support it.

Processes

F: You mention the process of acquire inputs required for products or services, you mentioned you were behind competitors beforehand and ahead of competitors after the implementation of the EPOS system. Could you go through again why you where at a competitive disadvantage.

R: Its because they were separate units and they did not have the economies of scale because effectively they where all tying to buy as an individual small retailer. They were not truly getting the power of collective purchasing. Some one like SPAR would be buying collectively and they would have very good information flows through their organisation. So the head office at SPAR would know exactly what is being bought at anytime. Our head office did not have a clue. That was the reason for the before situation. Afterwards, the reason why we where ahead of are competitors was because the sole basis of our organisation was based on collective purchasing. They did not actually own the shops them selves, they were individual retailers. So our role was to try developing economies of scale through integrating separate retailers, so the IS specifically enhanced what that company was doing.

F: Was it the ability to take advantage of your economies of scale that was allowing you to get ahead of your competitors?

R: Yes but not only were there economies of scale but the organisation was very light because it did nothing other than try and integrate. So it did not have all the other added cost of head offices that other retail chains had. So someone like SPAR would have big promotions teams. We did not have that our sole purpose was to try and get better deals in terms of purchasing and that's what it achieved.

F: I will gust read through the next question as it was quite complex it was please indicate the extent to which the degree of the ICP can be directly attributed to the IS enhancement. itself, as opposed to indirectly through the leveraging of existing organisational resources/capabilities, or through initiating organisational change to leverage the contribution of the IS enhancement. You put 40% direct and 60% indirect, could you just briefly explain your reasoning behind these figures.

R: The reason for the indirect affects was because it was basically leveraging the organisation. The organisation had the trade going through it but it wasn't aware of exactly how much trade it was going to have at any one time, or where it was going. So the system allowed it to identify were there flows where and take advantage of it. In terms of direct there was a little bit of advantage coming from it because there were some promotions, for example, there was a Cadburys promotion being done and there were problems in certain places with that. In a big promotion across the country you would get areas where there would be problems with deliveries or distribution and things like that. The EPOS allowed use to identify these a lot easier. For example, in fresher's week you had loads of shops all phoning through about things, so it was very

4

difficult to prioritise where the problems were. So instead of us having to rely on shop managers having to phone up and complain and be in a queue, we could see where the problems were before even the shop could, we could then get onto the suppliers. The analysis was done as it happens. The direct would have come through having faster information because of the EPOS itself. So when a shop would sell a particular product the information gets sent back directly to the main office. They would have faster turnaround in terms of information, resulting in them being able to react faster to any problems in the store. This reduced costs substantially but this would only really be reducing the advantage that shops with EPOS systems had, it wasn't really contributing in terms of giving use advantage or a sustainable advantage over our competitors. The advantage we got from EPOS above our competitors was really coming from the indirect affects.

F: Would this improved competitive position be ongoing?

R: Yes defiantly, initially it was basically free to use the service in terms of subscription. The individual retailers did not have to make a direct payment, it was basically a stealth tax taken on top of there purchasing. 1 year in they got charged £1000 to be part of the consortium and the second year in they got charged £2000 on top of the cut and they still went with it. So there where noticeable ongoing benefits to the individual retailers.

F: Ill just read through the next question to refresh you memory once again, it was please indicate the extent to which the duration of sustainability, of this improved competitive position can be directly attributed to the IS enhancement itself, as opposed to indirectly through the leveraging of existing organisational resources/capabilities, or through initiating organisational change to leverage the contribution of the IS enhancement. You identified 100% indirect, could you just explain your reasons behind these figures.

R: My feeling is that anyone could replicate the actual piece of software or near enough so that wasn't really having all that much of a contribution to sustainability. The indirect affect and what our competitors would find very difficult to replicate was the mix of the EPOS with the organisational structure that was in place because it was a very unique company structure in what its mission was there to do. There was no similar structure with any of our competitors so that type of EPOS levered up what the business was doing. The indirect affects of the EPOS on sustainability was that it enabled us to leverage our economies of scale and the company structure, which is something our competitors could not replicate.

F: Are these the reasons why you identified you would be able to sustain the improved competitive positioning for 7 years?

R: Yes, these are the reasons why I identified 7 years for the duration of sustainability because our competitors can't copy our company structure or our purchasing power, maybe they could one day but I very much doubt it, so as far as I can see the advantage we have gained would be ongoing'.

F: In terms of sustainability it wasn't coming from the EPOS at all

R: Yes

F: In terms of the economies of scale will your competitors every really be able to compete with you on a scale level?

R: It was to combination of economies of scale divided by the overheads of our office function. We are the third biggest purchasing consortium in Europe.

F: Can we move onto the process of marketing and selling products and services, can you just go through how the system improved your competitive position with regards to this process?

R: Along with introducing EPOS I mentioned there was a re-branding exercise going on as well. One of the features of that was a promotion deal. We wanted to have a set of promotions in the shops, that was part of having danglers and condoles which is on the end of the isle where they tend to put promotions. We had a number of promotional mechanisms, which we introduced into shops. What we were able to do was by putting a different set of promotional mechanisms in each shop, we could run the same promotion over the whole group, but put a different mechanism in different shops, i.e. different layouts. What we were able to do is compare pre promotion sales with post promotion through the sales data we had streaming in. We could then move the systems that worked well in some areas of the country to other areas of the country that the promotions were not working. We were able to do a large number of different promotions and see which ones worked and then transplant the ones that worked well across the UK very quickly. Within a week we could spread the ones that worked correctly across the UK

F: So in each shop they could try a slightly different advertisement and then see which ones worked?

R: So for example you may have 2 isles in two different shops. One shop we would put 2 conderalens and 2 dump bins, for example, and in the other one we would put for gondarelens of proposition and another one we would put 4 bump bines 1 at each end of the isle. By looking at slight variations we could work out what worded and what didn't. Lots of places do that but it's a matter of how quickly you can transplant the ones that worked and get ride of the ones that didn't.

F: So the speed at which you could make these changes are what is getting you an improved competitive position above your competitors, you mention 60% 40% coming directly from the IS?

R: Yes, Part of the reason we could have that amount of variance in there is because we actually turned round a problem and tried to make it into a useful thing. Someone like SPAR send a central instruction from head office saying all shops are going to do this, because the shops in our consortium were independent retailers, they all wanted

to do there own thing, so we would have to ask them as apposed to tell them. So what we actually did was we could ask them to introduce variation, they could come up with there own variance and then we just analysed it and told them what was working and what wasn't working. When faced with the prospect of making more profit the shop management would introduce it, whereas in the past the central office had argued with the individual retailers. Without the EPOS system we would not have been able to see what did and dint work so I would really say this was a direct affect. In terms of the indirect affects I would say it was really resulting from a culture change. Previously the individual shops did not tend to experiment all that much with promotions, the individual store managers were not all that aggressive at looking at different ways of doing things. But by sharing all that information around it made staff a lot more aware of different options that had been tried by different stores mainly because there was variation introduced. By feeding the system with information and also having to deal with the output of the information it forced them to think about what they where doing.

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F: You say it was sustainable for three years, any reason why it wasn't longer.

R: I think part of the advantage was a relative advantage compared with are original position because the organisation both centrally and individually didn't have the knowledge of how to run effective proportions. Prior to that people like Cadburys would come in and organise the promotions for them. What you ended up with is that Cadburys would work out the best positions to lay out there chocolates and all the other products would suffer. You would wipe out your sales on every thing else; the suppliers would just do what worked for them. During that 3-year period the shops basically learnt how to organise promotions.

F: Can we move onto were the sustainability was coming from the direct or indirect affects of the IS enhancement.

R: I wouldn't say is was really coming from the EPOS system, I guess it was coming from the change in culture. I think the one big difference between our organisation and the others was that we had a bottom up nature as apposed to a top down. So some one like SPAR, their central office tend to have a lot more say as to what goes on in stores than the individual stores do. In our consortium it was completely the opposite way around. So all the shops could try their own promotions, they would not have a central office telling them what to do, so we where able to introduce more variance in terms of promotions.

IS capabilities

F: You mention your organisations ability to share information through the organisation, could you tell me how that contributed to the success of the IS enhancement?

R: That was a different thing we did, we set up an extranet, you know you have intranet which share information internally within a company an extranet does the same as that but you have access for external stake holders. We were in an interesting

position because our shareholders generally were the same as the customers. What we did was set up an extranet where the individual shops could log into the central offices to see what there deals were, what there promotions were, what there discounts were and what that allowed was for the shops to see the financial affects of an action of what they did a lot quicker. A lot of the time a shop manager would just be told to sell batteries or something but they wouldn't see the difference it gave to there bottom line buy putting it in a certain place rather than another. So by sharing the information they basically learnt what did and didn't work a lot more accurately.

F: in terms of transparency and replicability you mention 4 so your competitors could copy this.

R: They could introduce an extra next would they know what that extra net was like no. I suppose our competitors could find out we where using an extranet, but it was never really discussed with suppliers, which would be the normal way competitors would find out about something like that. As for could it be replicated, it could be but it would not have the same affect because of the organisational structure that we had. Just say you had someone like SPAR, I am sure they have an intranet system where individual shop managers have all sorts of reports coming through to them about how the business is doing so in that respect they probably would be able to replicate it. The difference is that there, the shop manager is finding out about there own performance, which they are accountable to, to the head office. Whereas with our organisation structure they where finding information out from the central office but they where accountable to their student union rather than to use, we where like a third party just sending the information back to them

F: How much did the extranet implementation contribute to the ICP?

R: It wasn't really essential, they key part was the information handling and having a faster turn around of information. It was interesting actually because the extranet wasn't critical in the IT system but is was critical to the success of the overall system. It was not because of any of the IT based stuff, it was because of the increased confidence in the system, and they had the information there and then. Information in terms of how they where doing, we could get them very bottom line information. We could say this promotion has increased the number of people coming through your shop in the last week by say 10% or something like that. We could give them very precise figures. I am not sure if they got one piece of information one week or a different sort of information the next week if that would alter what they where doing in terms of the business. But were it did alter things was that in terms of the individual unions they had a lot more confidence in the overall system because they felt they where getting up to the minute information, whether that helped or not I doubt it but is was essential in terms of building and maintaining confidence of the membership.

F: So it wasn't really getting you ahead of competitors.

R: It was for the overall success of the project, it was a very indirect thing, it was also permissive, and by having it in there it allowed the system to work as opposed to improving our competitive position.

F: How much would you say this capability contributed to sustainability?

R: Its not all that much of a success on the EPOS system it was a very indirect affect in terms of building confidence in the system.

F: You also mention your organisations ability to provide efficient and effective IS operations on an ongoing basis.

R: Yes: that basically came down to looking at the comparison between the central purchasing that was done in our shops and another student union, which I cant name, which actually introduced EPOS a few years earlier and it was disastrous. The system itself was fine, but we had massively increased staff costs, £25 000 increase in staff costs in terms of having some one to administrate the system that wasn't there before. So although the quality of information was better the staff cost way outweighed the benefits that were got. If each one of the retailers introduced EPOS separately they would all have a similar cost. So what we did instead was to centralise those costs, so none of the individual retailers had that added cost. In affect we our a central office which provides centralised purchasing, maintenance of hardware and software and analysis of data. Those skills wouldn't be in the individual shops them selves because they were to small, where as centrally you can get much better economies of scale.

F: Would this be hard for your competitors to replicate:

R: Some competitors like SPARR would have a centralised function anyway so they would have those advantages. So by introducing it you aren't getting an advantage over SPAR you are decreasing the advantage they have. Where as some like GT news you are getting an advantage over them because their organisation is not set up in that why. Organisations that are centrally controlled would probably be operating in the same way, where as GT news would be in an opposite situation because for an individual newsagent to put together an EPOS system it would be very expensive, the costs could not really be shared because they are not centralised enough.

F: Did this give you competitive parity with your competitors?

R: It gave use an advantage over the corner shops because before hand we were like corner shops but by it centralised it gave us similar power of the big chain with out all of their infrastructure costs.

F: Would you say you learnt through your previous experience of implementing an EPOS system within other Universities?

R: Yes defiantly, the first EPOS system we implemented we had major problems with, it was a good technology but the fit was completely wrong. The technology did not fit the needs of the organisation at that time it wasn't thought through properly enough. So all those problems where turned aground when it can to doing it nationally. The initial system I think cost use around £40 000 initial capital cost and then it was about £25 000 direct staff costs a year and maybe a further £5 000 of other staff who had an increase in workload, so lost opportunity cost. Other staff would have to do additional work because of the information that system produced, things like when the system went down we would have to deal with it. Those are substantial costs and when you look at the shop, it would be making a profit of 70 000 a year and

that really does eat into the profits. You are looking at nearly 30% to 40 % of your profits where wiped out by an IS, where as on the national deal I would say the opposite happened and there where major advantages because the IS was a very different type of system. The national deal was more about getting the information so we could negotiate better with are suppliers and to change are position.

F: What did you do when you realised the EPOS system was costing you a lot of money.

R: It was quite tricky, we managed in the end because the big cost came from a member of staff looking after that system so basically there skills developed and they also took on management roles, it started easing up on the costs, as that members of staff got more productive. The costs were eventually wiped out through increases in productivity but it was across a few years.

F: Did this allow you to get ahead of your competitors?

R: I guess it could have done but I guess the big chains would have got in external consultants and paid for that, by having that knowledge it enabled us not to have a competitive disadvantage when implementing the system due to unnecessary costs and saving money.

R: The most costly mistakes are the one you gain most from but its all a matter of whether you come across the same problem again. If the opportunity comes up you have the opportunity note to make the same mistake again.