

# **THE ALIGNMENT OF KNOWLEDGE STRATEGIES**

by

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## **Abstract**

This thesis is a collection of four manuscripts linked by the aim of extending strategic alignment thought into the knowledge management domain by explicitly including the concept of knowledge strategy into the discussion of strategic alignment. In the first paper, a set of common knowledge strategy dimensions was synthesized and used to link two existing knowledge strategy typologies. The key finding of the study was that the two typologies operated at different strategic levels, allowing for the creation of portfolios of the lower order types under each higher order type.

In the second paper, a model of strategic alignment between business, information system and knowledge strategy was presented and tested using survey data. It was found that the combination of aligned information and knowledge strategies with their associated business strategy resulted in higher performance for defenders, analyzers and prospectors and that the alignment of non-viable strategies led to worse performance than individual non-viable strategies alone.

In the third paper, case studies provided examples of alignment and misalignment which were used to populate a framework linking alignment and performance. Four explanations for firms' location in the model were provided, focusing on appropriate versus inappropriate alignment, conscious versus unconscious misalignment, antagonistic alignment versus misalignment, and strategic alignment versus misalignment.

In the final paper, the Strategic Orientation of Knowledge-Based Enterprises (STROKE) instrument was developed to capture the orientation of knowledge strategy employment in firms. During the development process, a new statistic was developed to aid in the validation of card sorts during the scale development step of instrument creation.

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In the house I share with my family, there has not been a horizontal surface not covered with papers or a vertical surface not festooned with sticky-notes for many years. By 'share' I mean occasionally appear for meals with a thousand-yard stare muttering to grade-school children about statistical assumptions and discriminant validity. Child labor concerns aside, Sarah and

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# Chapter 1

## Introduction

Interest in the alignment of business and IS arose due to the move of IS from back-office automation to strategic role in the firm (Henderson and Venkatraman, 1993). Considerable progress has been made in research on the organizational fit of information systems (IS) since both Boynton and Zmud's (1987) call for focused research in this area and Iivari's (1992) critique on the state of its cumulative tradition (Chan and Reich, 2007). However, even with two decades of managerial attention, strategic alignment remains a consistently significant management concern (Luftman, Kempaiah and Nash, 2006), suggesting that firms may still have not mastered alignment (Chan, 2002). Compounding the complexity of the alignment between business and information systems strategy is that, as this problem was being addressed by researchers, knowledge within organizations became of greater concern to industry. The rise of knowledge and knowledge-based enterprises can be seen in the attention given to the capacity of knowledge to generate value (Nonaka and Takeuchi, 1995; Spender and Grant, 1996) and in the development of knowledge strategies that are independent of business strategies (Bierly and Chakrabarti, 1996; von Krogh, Nonaka and Aben, 2001; Zack, 1999). Alignment of these knowledge strategies with the business and information systems strategies in the firm and their combined contribution to firm value and performance can then be seen as an important issue for research and practice.

The aim of this dissertation is to extend strategic alignment thought into the knowledge management domain by explicitly including the concept and construct of knowledge strategy into the discussion and model of strategic alignment. Four papers are presented that investigate different aspects of and approaches to this inclusion, driven by a primary research question:

RQ. What is the role and performance impact of knowledge strategy in strategic alignment?

## **1.1 Literature Review**

In order to situate the research question and papers which support it, a literature review is provided as background. This review covers the concepts of organizational knowledge, strategy – including business, information systems and knowledge – and alignment.

### **1.1.1 Organizational Knowledge**

Firms can be viewed as bundles of knowledge, where knowledge is an asset that serves as a source of differentiation and competitive advantage (Dierickx and Cool, 1989). The firm itself represents a response to the asymmetry in the economics of knowledge in that the acquisition of knowledge requires greater specialization than its utilization (Grant, 1996b). For example, complex tacit knowledge involved in new product development is an asset to the firm as it is difficult to imitate, leading to differentiation for the firm and higher performance levels (McEvily and Chakravarthy, 2002). Recognizing the importance of organizational knowledge, firms can be seen as having the fundamental role of integrating individuals' specialist knowledge, manifested as organizational capabilities (Grant, 1996a), where the primary task of management is to devise and establish the routines necessary to integrate this knowledge (Grant, 1996b).

Competitive advantage can be generated from knowledge, which can be viewed as a key strategic resource to be acquired, manipulated and applied (Zack, 2003). Specifically, knowledge generates value for the firm as it is often inimitable, unique and not tradable on markets (Zack, 1999). As scarce and inimitable resources, firm knowledge and organizational learning are considered the main contributors to the creation of value for the firm (Grant, 1996b; Kogut and Zander, 1992, 1996). For example, employee know-how has been reported as one of the most important firm assets and contributors to business success (Hall, 1993). A specific case of this type of asset is intellectual capital, which is intellectual material, both asset and capability – knowledge, information, intellectual property, experience – that can be put to use to create wealth (Stewart, 1997) and is a key factor in the productivity of firms in many industries (Quinn,

Anderson and Finkelstein, 1996). Sustainable competitive advantage is thought to result from the possession of intangible resources and intellectual capital such as patents, licenses, reputation and know-how (Hall, 1992). In summary, “better-coordinated, more-cooperative organizations that create, acquire, and... use knowledge more effectively should do a better job of converting inputs into customer satisfaction, and hence should be more profitable” (Hoopes and Postrel, 1999, p. 839). Even more succinctly, the effective use of knowledge is profitable.

### **1.1.2 Strategy**

Strategy has been defined as “the match an organization makes between its internal resources and skills... and the opportunities and risks created by its external environment” (Hofer and Schendel, 1978, p. 12). Chandler (1962) similarly defined strategy as “the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals” (p. 131). Such sweeping definitions are difficult to operationalize. To refine a view of strategy, Mintzberg (1987) identified five views of strategy as plan, ploy, pattern, position and perspective, corresponding to concepts of direction, competition, action, context and behavior. Strategies can be intended or realized (Mintzberg, 1978). Intended strategies are those that are official and may be written down, whereas realized strategies are those reflected in decision making, resource allocation, and activities conducted by the organization (Chan, Huff and Copeland, 1998). Intended strategies that get realized are termed deliberate strategies while those that fail to be realized are unrealized strategies; unintended strategies that get realized are termed emergent strategies (Mintzberg, 1978).

Strategies can be at the corporate or business unit level (Beard and Dess, 1981) where corporate strategies concern the selection of businesses to operate in and how business units should be managed, while business strategies concern the creation of competitive advantage (Porter, 1987). Finally, there is a distinction between a strategy’s content and the process by

which it was created (Sabherwal and Chan, 2001). In order to focus attention on the impacts of strategy on competitive advantage and its influence in alignment, this dissertation notes that neither the promulgated plan nor the process for achieving it are of issue. Instead, the view of strategy adopted is of a ‘realized patterns of action that influence resource allocation and activities conducted at the business unit level.’ In this section, strategy will be examined in terms of how it applies to business, IS and knowledge domains.

#### 1.1.2.1 Business Strategy

Business strategy can be defined as “a pattern in a stream of decisions” (Mintzberg, 1978). Following the view of strategy as pattern (Mintzberg, 1987) and as being realized (Mintzberg, 1978), “strategy exists in the cognition of managers but is also reified in what companies do” (Gavetti and Rivkin, 2007, p. 435). This focuses attention to conceptualizations of business strategy less about plans and planning and more about impacts. Within this view, there are many different ways to examine and categorize strategies. In their review of business strategy research, Chan and Huff (1992) identify several different approaches by which competitive strategy can be operationalized, including typologies and comparative measures.

At the business strategy typology level, Miles and Snow (1978) developed four business strategy profiles: defenders, prospectors, analyzers, and reactors. Defenders are stable organizations with predictable and narrow product domains offered at low prices. They devote attention to improving efficiency in their current operations as opposed to seeking out new ventures. Prospectors continually seek out new market opportunities and create change and uncertainty in their industries. The price of their flexibility and rapidity is a low operational efficiency. Analyzers operate in a stable domain, where firm operations are run efficiently, and in an opportunistic domain, where the firm seeks out new products and market opportunities. Reactors are unable to respond to change effectively or to induce change in the industry, making strategic adjustments only when they are forced to do so and lack a consistent strategy-structure

relationship. All but the reactor is seen as a consistent and viable strategy (Sabherwal and Chan, 2001). The measurement validity of Miles and Snow's (1978) typology has been generally supported (Shortell and Zajac, 1990). Additionally, adherence to one of Miles and Snow's (1978) prospector, analyzer or defender profiles has been shown significantly linked to higher performance (Doty, Glick and Huber, 1993).

Several other typologies have been suggested in the literature. Porter's (1980) generic strategies is one of the most popular and included: focused, cost leadership and product differentiation. Ansoff's (1965) model of business strategy is predicated on a combination of new or existing markets or products, with four strategy types: market penetration, market development, product development, and diversification. Hitt and Ireland (1985) identified a typology of grand strategy that included stability, internal growth, external acquisitive growth and retrenchment. Another alternate strategy formulation includes three types: operational excellence (best total cost), customer intimacy (best total solution) and product leadership (best product) (Treacy and Wiersema, 1995). Table 1-1 presents a selection of business strategy typologies.

Ansoff (1965)	Hitt and Ireland (1985)	Miles and Snow (1978)	Porter (1980)	Treacy and Weirisma (1995)
Market penetration	Stability	Prospector	Focused	Operational excellence
Market development	Internal growth	Defender	Cost leadership	Customer intimacy
Product development	External acquisitive growth	Analyzer	Product differentiation	Product leadership
Diversification	Retrenchment	Reactor		

Using a business strategy comparative measure approach, Venkatraman (1989a) developed six dimensions of the strategy construct – aggressiveness, analysis, defensiveness, futurity, proactiveness and riskiness. Aggressiveness involves a firm “improving market rates at a relatively faster rate than the competitors in its chosen market” (Venkatraman, 1989a, p. 948). Analysis is conceptualized as “the extent of tendency to search deeper for the roots of problems,

and to generate the best possible solution alternatives” (Venkatraman, 1989a, p. 948). Defensiveness is drawn from Miles and Snow’s (1978) work, reflecting the tendency to emphasize cost reduction and increased efficiency. In the original Strategic Orientation of Business Enterprises (STROBE) formulation (Venkatraman, 1985), internal defensiveness referred to cost cutting and efficiency whereas external defensiveness referred to the development of tight marketplace alliances (Chan *et al.*, 1998). Futurity focuses on “temporal considerations reflected in key strategic decisions, in terms of the relative emphasis on effectiveness (longer-term) considerations versus efficiency (shorter-term) considerations” (Venkatraman 1989a p. 948). Proactiveness is also drawn from Miles and Snow (1978), reflecting “participation in emerging industries, continuous search for market opportunities, and experimentation with potential responses to changing environmental trends (Venkatraman, 1989a, p. 949). Riskiness deals with “resource allocation decisions as well as choice of products and markets” (Venkatraman, 1989a, p. 949). Some studies (Chan, Huff, Barclay and Copeland, 1997; Sabherwal and Chan, 2001) use the inverse of this construct, defining risk aversion in terms of “reluctance to embark on risky projects” (Chan *et al.*, 1998, p. 277). Other studies use one of Venkatraman’s (1985) original dimensions – innovativeness – to capture the firm’s strengths in creativity and experimentation (Chan *et al.*, 1997). One alternative view of dimensions of strategy to Venkatraman’s (1989a) includes complex innovation, marketing differentiation, breadth of products and organization, and conservative cost control (Miller, 1987). A comparison of business strategy dimensions is presented in Table 1-2.

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**Table 1-2 – Business Strategy Dimensions**

Miller (1987)	Venkatraman (1989a)
Complex innovation	Aggressiveness
Marketing differentiation	Analysis
Breadth of products and organization	Defensiveness
Conservative cost control	Futurity
	Proactiveness
	Riskiness

---

Studies have also been conducted to theoretically and empirically link or compare typologies and dimensions. Comparing Porter's (1980) typology with that of Miles and Snow (1978), Segev (1989) found that all but Porter's stuck-in-the-middle and Miles and Snow's reactor types were internally consistent. Additionally, he found that the consistent types could be arranged in order from most proactive to least as prospectors, differentiation, differentiation-focus, analyzer, cost-focus, cost leader and defender. Many other variables were studied and overall defenders were closest to cost-focus, prospectors were closest to differentiation and analyzers were closest to differentiation and cost-focus (Segev, 1989). In similar work, the distinctive competences of strategic types varied, where defenders' competences were cost-management based (cost leadership), while prospectors' were product-management (differentiation) related (Snow and Hrebiniak, 1980). Combining typology and comparative measure approaches, Sabherwal and Chan (2001) explicitly linked Miles and Snow's (1978) typology with Venkatraman's (1989a) STROBE measures through cross mapping, based on review of the literature. They found consistent groups of STROBE dimensions reflected each of the three viable types. This research occurred in IS strategic alignment field and thus also contained analysis of IS strategy, which is investigated in the next section.

#### 1.1.2.2 Information Systems Strategy

IS strategy is long-term guidance concerned with "aligning IS development with business needs and with seeking strategic advantage from IT" (Earl, 1989, p. 63). This is differentiated from IM strategy, which deals with effectively managing IS resources, and IT strategy, which deals with developing technical policies and architectures (Earl, 1993). The difference has also been described in terms of supply and demand, where IS strategy is focused on what the business demands of IS, while IT strategy is focused on supplying particular technologies to support the firm (Hackney, Burn and Dhillon, 2000). IS strategy is a multidimensional construct and can be interpreted or defined in many ways (Hirschheim and Sabherwal, 2001).

A number of different typologies and dimensions of IS strategy have been proposed. Earl (1989) identified four types of IS strategy: delivery - IT is the means of delivering goods and services; dependent - business strategies increasingly depend on IT for their implementation; drive - IT potentially provides new strategic opportunities; and delayed - IT has no strategic impact in the organization. Using a typological approach, Das, Zahra and Warkentin (1991) drew on 14 different studies to create a typology of distinctive IS competences that includes lowest cost, differentiation, uniqueness, and flexibility. Drawing on Rackoff, Wiseman and Ulrich (1985), Sabherwal, Hirschheim and Goles (2001) used a typology consisting of low cost, differentiation, growth, alliance and innovation IS strategy components, combined in a similar fashion to Das *et al.* (1991). Croteau and Bergeron (2001) identified cost reduction, growth, advantage, and differentiation dimensions of strategic impact. Hirschheim and Sabherwal (2001) and Sabherwal and Chan (2001) defined similar typologies of IS roles in efficiency, flexibility or opportunism, and comprehensiveness. The efficiency IS strategy focuses on internal and interorganizational efficiency and long-term decisions; the opportunistic or flexible IS strategy focuses on market flexibility and quick decisions; and the comprehensiveness IS strategy balances the two, enabling comprehensive decisions and responsiveness (Hirschheim and Sabherwal, 2001; Sabherwal and Chan, 2001). IS strategy typologies are found in Table 1-3.

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**Table 1-3 – IS Strategy Typologies**

Das, Zahra and Warkentin (1991)	Earl (1989)	Hirschheim and Sabherwal (2001)	Sabherwal and Chan (2001)	Sabherwal, Hirschheim and Goles (2001)
Low cost	Dependent	Efficient	Efficiency	Low cost
Uniqueness	Drive	Opportunistic	Flexibility	Differentiation
Differentiation	Delivery	Comprehensive	Comprehensiveness	Growth
Flexibility	Delayed			Alliance
				Innovation

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In addition to typological approaches, a number of studies have examined dimensional approaches. Bergeron, Raymond and Rivard (2004) defined IT strategy in terms of two

dimensions: IT environment scanning and strategic use of IT. IT environment scanning denotes the firm's capacity to detect and react to technological change in its competitors; strategic use of IT denotes the firm's capacity to use IT to improve performance, quality and competitiveness of its products or services. Chan *et al.* (1998) adopted Henderson and Venkatraman's (1993) conceptualization of IT strategy in terms of information technology scope, systemic competencies and IT governance. Sabherwal and Chan (2001) conceptualized IS strategy based on the types of systems predominant in different strategic types. Specifically, they looked at the varying levels of dependence on operational support systems, market information systems, strategic decision support systems and interorganizational information systems.

Chan *et al.* (1997) provided direct IS analogs to Venkatraman's (1989a) STROBE formulation, identifying dimensions of IS support for: aggressiveness, analysis, internal defensiveness, external defensiveness, futurity, proactiveness, risk aversion and innovation. Following the same approach, Cragg, King and Hussin (2002) developed dimensions of IS strategy that supported their matching conceptualization of business strategies: IS support for pricing, quality product, product differentiation, product diversification, new product, new market, quality service, intensive marketing, and production efficiency strategies. An alternative view of IS strategy is seen in the formulation of a strategic IT management construct, which included dimensions of IT planning and control, IT acquisition and implementation, IT environment scanning and strategic use of IT (Bergeron, Raymond and Rivard, 2001). The strategic use of IT construct included differentiation among efficiency, productivity, profitability, timeliness and quality elements. Other research supported this view, including the conceptualization of the strategic impact of the IS department, which dealt with the use of IS to aid organizations in gaining competitive advantage and meet other strategic objectives (Croteau and Bergeron, 2001). A list of IS strategy dimensions is presented in Table 1-4.

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**Table 1-4 – IS Strategy Dimensions**

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Bergeron, Raymond and Rivard (2004)	Chan, Huff, Barclay and Copeland (1997)	Cragg, King and Hussin (2002)	Sabherwal and Chan (2001)
IT Environment scanning Strategic use of IT	IS Support for: Defensiveness Risk aversion Aggressiveness Proactiveness Analysis Futurity	IS Support for: Pricing Quality product Product differentiation Product diversification New product New market Quality service Intensive marketing Product efficiency	Operational support Market information Interorganizational Strategic decision support

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Denford and Chan (2007) identified a high degree of consistency between measures and descriptions of IS to support various types of organization and a convergence towards ideal types of IS strategy. Specifically, using Sabherwal and Chan's (2001) cross mapping between Miles and Snow's (1979) typology and Venkatraman's (1989a) STROBE dimensions, they demonstrated that consistent groups of strategy dimensions supported major strategic types (Denford and Chan, 2007). IS strategy research has a shorter history than that business strategy, but it has achieved convergence and depth in a short time. In contrast, knowledge strategy is a still developing field which has yet to coalesce.

#### 1.1.2.3 Knowledge Strategy

Knowledge can be a strategic asset as firms with superior knowledge can combine it with other assets, resources and capabilities in ways that their competitors cannot to generate value (Zack, 1999). In fact, "the sustainable competitive advantage of business firms flows from the creation, ownership, protection and use of difficult-to-imitate commercial and industrial knowledge assets" (Teece, 2000, p. 35). Every strategic position or decision taken by a firm "is linked to some set of intellectual resources and capabilities" (Zack, 1999, p. 131). An organization's competitive position creates a requirement for particular new knowledge; however, its existing knowledge resources simultaneously create opportunities and constraints, hence the

requirement to generate strategies to coordinate these competing demands (Zack, 1999). A knowledge strategy can be viewed as “the employment of knowledge processes to an existing or new knowledge domain in order to achieve strategic goals” (von Krogh *et al.*, 2001, p. 46), “the overall approach an organization intends to take to align its knowledge resources and capabilities to the intellectual requirements of its strategy” (Zack, 1999, p. 135) and “a number of key decisions related to knowledge that provide a context or strategic intent for the firm” (Casselman and Samson, 2007, p. 70). Each of these definitions recognizes the intentionality of the process in that strategies are selected to best deal with the organization’s situation.

Just as IS strategy needs to be differentiated from IM or IT strategies, knowledge strategy needs to be differentiated from knowledge management strategy. Knowledge strategy has been identified as one of three meanings used for knowledge management strategy, with a focus on knowledge-based competitive advantage versus either an approach to KM or the implementation of KM (Saito, Umemoto and Ikeda, 2007). Knowledge management refers to the portfolio of procedures and techniques used to get the most from a firm’s knowledge assets (Teece, 2000). While knowledge strategy deals with business outcomes and support for competitive advantage, knowledge management strategy deals with structural and technical issues. As an example, Zack’s (1999) knowledge strategies of exploration and exploitation focus on the application of knowledge within the firm, while Hansen, Nohria and Tierney’s (1999) knowledge management strategies of codification and personalization focus on the structuring of knowledge within the firm. Earl’s (2001) knowledge management strategy taxonomy supports this differentiation, as the focus and aim of each of the seven schools revolves around the management of knowledge rather than its application for competitive purposes. In contrast, Casselman and Samson (2007) identify seven components of knowledge strategy: internal organization, measurement and reward, boundaries, knowledge advantage, protection, disaggregation and investment intensity. In

addition to these dimensions, two examples of fully specified knowledge strategy typologies can be given to further illustrate the difference.

Bierly and Chakrabarti (1996) conducted a cluster analysis of the pharmaceutical industry based upon four knowledge strategy dimension trade-offs: knowledge source, radicalness of learning, speed of learning, and breadth of knowledge. Their results identified four distinct generic knowledge strategies among firms: loners, explorers, exploiters, and innovators. Loners were ineffective, with higher R&D expenditure ratios, slow technology cycles and low knowledge dispersion (Bierly and Chakrabarti, 1996). An explorer is a creator or acquirer of the knowledge required to be competitive in its strategic position (Zack, 1999). Explorers were found to have high levels of radicalness but were similar to other groups in other areas (Bierly and Chakrabarti, 1996). An exploiter has capabilities that exceed the requirements of its competitive position, allowing it to use its knowledge to deepen or broaden its position (Zack, 1999). Exploiters were seen to have low R&D expenditure and broad but shallow knowledge bases (Bierly and Chakrabarti, 1996). Members of the innovator profile closely integrate the best characteristics of explorers and exploiters (Zack, 1999). Innovators were the most aggressive and fastest learners, combining internal, external, radical and incremental learning (Bierly and Chakrabarti, 1996). A balance, equilibrium, or a cycling between exploitation and exploration is necessary and was empirically found to jointly and positively influence firm performance (He and Wong, 2004; Levinthal and March, 1993; Pearce, 2006). Zack (1999) identified innovators and explorers as being aggressive strategies, suggesting that they should outperform the more conservative strategies. In fact, innovator and explorer strategies were empirically demonstrated to be more profitable than loner and exploiter strategies (Bierly and Chakrabarti, 1996).

In a second knowledge strategy typology, von Krogh *et al.* (2001) identified two core knowledge processes: knowledge creation and knowledge transfer. The target of a process for knowledge creation is to enhance the potential for creating innovation, whereas the intent of

knowledge transfer is to use created knowledge to benefit the firm, which may include transfers with external partners (von Krogh *et al.*, 2001). Integration of these two dimensions results in four strategies: leveraging, expanding, appropriating, and probing. Leveraging can be oriented towards achieving efficiency in operations and ensuring that the firm internally transfers existing knowledge from various knowledge domains to improve innovation (von Krogh *et al.*, 2001). Leveraging is an effective strategy as to acquire similar knowledge as competitors have to engage in similar experiences. However this takes time and the processes used and replicated within the organization may be difficult to imitate due to their tacitness (Zack, 1999). The emphasis of expanding is on increasing the scope and depth of knowledge by refining what is known and by bringing in additional expertise relevant for knowledge creation – better understanding of key processes can allow for substantial cost-reduction, helps create new process and product innovations, and reduces risks by building up local competence (von Krogh *et al.*, 2001). Knowledge-based competitive advantage is sustainable through expansion because the more a firm already knows, the more it can learn (Zack, 1999). Appropriating is predominantly externally oriented on knowledge domains that do not already exist in the firm, capturing knowledge from external partners and managing risk by spreading effort (von Krogh *et al.*, 2001).

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**Table 1-5 – Knowledge Strategy Typologies and Dimensions**

Typologies		Dimensions		
Bierly and Chakrabarti (1996)	Von Krogh, Nonaka and Aben (2001)	Bierly and Chakrabarti (1996)	Von Krogh, Nonaka and Aben (2001)	Casselmann and Samson (2007)
Explorer	Probing	Knowledge source	Knowledge process	Internal organization
Exploiter	Leveraging	Radicalness of learning	Knowledge focus	Measurement and reward
Innovator	Expanding	Speed of learning		Boundaries
Loner	Appropriating	Breadth of knowledge		Knowledge advantage
				Protection
				Disaggregation
				Investment intensity

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The main vehicles for inter-organizational appropriation are strategic alliances, collaborations and joint ventures (Powell, Koput and Smith-Doerr, 1996). The probing strategy gives teams the responsibility to build new knowledge domains from scratch (von Krogh *et al.*, 2001). Table 1-5 presents a selection of knowledge strategy typologies and dimensions.

These three sets of strategies – business, information systems and knowledge – reflect both typologies and dimensions, forming the basis for the investigation of strategic alignment.

### **1.1.3 Alignment**

A number of different terms are grouped under the term ‘alignment’: fit (Venkatraman, 1989b; Gresov, 1989; Porter, 1996), alignment (Chan *et al.*, 1997; Sabherwal and Chan, 2001), linkage (Henderson and Venkatraman, 1993; Reich and Benbasat, 1996), bridge (Ciborra, 1997) and coalignment (Bergeron *et al.*, 2004; Drazin and Van de Ven, 1985; Venkatraman and Prescott, 1990). The concept of alignment is derived from contingency theory, in which models share the premise that “context and structure must somehow fit together if the organization is to perform well” (Drazin and Van de Ven, 1985, p 514). Both Venkatraman (1989b) and Drazin and Van de Ven (1985) note that different definitions of alignment spring from different perspectives and lead to different operationalizations. Adopting the Venkatraman and Camillus (1984) view of alignment as ‘content of fit’ and adapting Drazin and Van de Ven’s (1985) view to the current dissertation context leads to defining the alignment hypothesis as ‘strategies must fit together if the organization is to perform well.’

#### **1.1.3.1 Conceptualizations of Fit**

Fit has been conceptualized in multiple fashions. Venkatraman and Camillus (1984) identified and classified six such conceptual perspectives, based upon two dimensions: domain of fit (internal, integrated or external) and conceptualization of fit (as content of fit or patterns of interactions). This dissertation is concerned primarily with the elements to be aligned by and with

strategy, which reflects the requirement of strategy to deal externally with resources and performance and internally with coordinating various organizational elements to generate capabilities. As such, this dissertation falls into Venkatraman and Camillus' perspective of the integrated formulation-implementation school, in the vein of works by Hitt and Ireland (1986) and Miles and Snow (1978). The implication of this perspective is that strategizing processes themselves – planning and plans – are not the focus of this work, rather it is the realized strategies, forms and capabilities of the organization that are examined.

In a separate conceptualization, Drazin and Van de Ven (1985) interpreted fit in accordance with the selection, interaction and systems approaches to structural contingency theory. Extending this work, Venkatraman (1989b) categorized the concept of fit in a classificatory framework with axes of specificity and anchoring. Specificity refers to the level of precision in the functional form of fit, whereas anchoring is whether the concept is anchored to a particular criterion or is criterion-free. These two axes resulted in six interpretations of the concept: fit as moderation, mediation, matching, covariation, profile deviation and gestalts. Accurate conceptualization of fit is important, as “the key concept in a contingent proposition is fit, and the definition of fit that is adopted is central to the development of the theory” (Drazin and Van de Ven, 1985, p. 515). Bergeron *et al.* (2001) demonstrated how each of Venkatraman's (1989b) categories of fit when applied to a common set of data can yield different results. This implies that “each approach to fit is theoretically and empirically different, thus the need for a clear theoretical justification of the specific approach adopted by the researcher” (Bergeron *et al.*, 2001, p. 138).

#### 1.1.3.2 Strategic Alignment

Much early alignment research dealt with the alignment between the organization's strategy or structure and its environment (Miller, 1992; Prescott, 1986; Venkatraman and Prescott, 1990). Extending early research into the IS domain, the basis for much alignment

research in the IS discipline is the Strategic Alignment Model of Henderson and Venkatraman (1993). In this model, integration was defined in terms of the relationship between business and IT and fit in terms of the relationship between external strategy and internal infrastructure and processes. In total, six types of fit are possible within the model. IS alignment has been conceptualized as the fit between IS strategy and structure while business alignment has been conceptualized as the fit between business strategy and organization (Sabherwal *et al.*, 2001). Chan (2002) differentiated between IS strategic alignment, which focused on “the fit between the priorities of the IS function and those of the business unit” and IS structural alignment, which focused on “the degree of structural fit between IS and the business” (p. 98). Sabherwal *et al.* (2001) termed the two alignments across the diagonal “cross-dimensional alignment” (p. 181).

Information systems (IS) strategic alignment is a nebulous concept that has engendered much debate and many definitions (Chan *et al.*, 1997). It comes from the belief that there is a need to align business strategy and technology policy as a precondition for superior firm performance (Zahra and Covin, 1993). It is commonly described in terms of the ‘strategic fit’ and ‘functional integration’ between business and IT strategy and infrastructure (Henderson and Venkatraman, 1993). It has also been defined as “the alignment between business unit strategic orientation and IS strategic orientation” (Chan *et al.*, 1997, p. 132). Another well-known definition is “the degree to which the IT mission, objectives, and plans support and are supported by the business mission, objectives, and plans” (Reich and Benbasat, 1996, p. 56). IS alignment is conceptualized as the fit between IS strategy and structure while business alignment is conceptualized as the fit between business strategy and organization (Sabherwal *et al.*, 2001). Reich and Benbasat (1996) divided alignment into intellectual (“IT and business objectives are consistent and valid” (p. 57)) and social dimensions (IT and business personnel “understand and are committed to each other’s mission, objectives and plans” (p. 57)).

Strategic alignment is important due to its impact on business outcomes. Higher strategic alignment between business and IS strategy has been found to lead to superior performance compared to lower levels of strategic alignment (Oh and Pinsonneault, 2007). Additionally, alignment has been found to be a better predictor of perceived performance than realized business strategy itself (Chan *et al.*, 1997). Similarly results held in a study of small business IS alignment (Cragg *et al.*, 2002). Directionality of the relationship was tested where effective IS plan to business plan alignment presaged the use of IS resources and capabilities for competitive advantage, but the effectiveness of business plan to IS plan alignment was not found significant (Kearns and Lederer, 2000).

Other factors may influence the alignment process. The factors most related to strategic alignment are those directly related to IS management, such as shared knowledge between business and IS personnel and planning sophistication of the organization, and the credibility and success history of the IS department (Chan, Sabherwal and Thatcher, 2006). Other enablers can also be found in the social dimension of alignment, including senior executive support for IT, IT involved in strategy development, IT understanding the business, business-IT partnership, well-prioritized IT projects and IT demonstrates leadership (Luftman, Papp and Brier, 1999).

Alignment-based studies are often expressed in terms of typologies. For example, using Ansoff's (1965) strategies, firms using a market penetration strategy favored an IS strategy focused on reducing costs while firms using a diversification strategy favored an IS strategy oriented on increasing market share (Atkins, 1994). One of the most common business strategy typologies used in alignment studies is that of Miles and Snow (1978). Prospectors have been found to be aggressive in their pursuit of technology as a group, narrowing the differences between individual firms and making technology more of a cost for this group than a contributor to success; defenders are generally more conservative in their investments in technology, focusing on those areas directly related to their core business, and thus contributing to their

competitive advantage (Dvir, Segev and Shenar, 1993). Similarly, prospectors and defenders have been shown to differ in the extent to which they consider IS strategy in the development of business strategy, where prospectors' IS strategy is more responsive than that of defenders (Tan, 1995). Chan *et al.* (1998) found higher order Strategic Orientation of Information Systems (STROIS) groupings – future orientation, defensive orientation, analysis and risk aversion, and action – and noted the first three corresponded to prospectors, defenders and analyzers respectively and the last was common to all three. Hirschheim and Sabherwal (2001) identified three alignment profiles – infusion (alignment through business leadership), alliance (alignment through partnering) and utility (alignment through low cost delivery) – which corresponded with prospectors, analyzers and defenders.

Not all studies have found consistent results across types. Sabherwal and Chan (2001) used a profile deviation approach to find that alignment between business and IS strategies was associated with firm performance. Prospector and analyzers were both found to have significant impacts; however, the results for defenders were not significant. In their study of the alignment of business strategy and technology deployment, Croteau and Bergeron (2001) used Miles and Snow's (1978) typology for the former construct and a combination of strategic and structural factors for the latter: strategic impact of the IS department, management style of teams, technological architecture, technological scanning, source of IS development and IS performance evaluation. They found different aspects of technological deployment were of varying levels of importance for different strategic types. Technology deployment was found to be positively linked to prospectors and analyzers, negatively linked to defenders and not linked to reactors. Denford and Chan (2007) found support for a moderating effect of business strategy on the relationship between IS strategic alignment and business performance.

Alignment is not necessarily static but rather may also be viewed as a continual and cyclical process, as the natural state of a firm is for its various elements to be out of alignment

(Broadbent and Weill, 1993). Strategic orientation of firms may not remain constant, but can change in response to the deployment of IS systems in support of particular IS strategies that provide new strategic options to the firm (Segars, Grover and Kettinger, 1994). Similarly, firms that change business strategy may find their change in IS strategy is not along an ideal trajectory, either changing some parts of their strategy in conflicting ways (paradoxical decision), going too far in one or more strategy element (excessive transformation) or reversing changes to reassume an abandoned position (uncertain turnaround) (Hirschheim and Sabherwal, 2001). Additionally, there is often a lag between changes in desired strategy, which is intangible, and the capacity to change the embedded technology infrastructure, which is very tangible and enduring (Pralhad and Krishnan, 2002).

Neither the business-to-knowledge strategy nor the knowledge-to-information systems strategy alignment types are well represented in the literature. For the first type, the importance of harmonized knowledge and business strategies has been suggested in the knowledge strategy literature (Nicolas, 2004). Similarly, a relatively new view of strategic alignment focuses on the importance of aligning business and knowledge strategies, reflecting the importance of knowledge as a critical organizational resource (Snyman and Kruger, 2004). This follows earlier knowledge strategy theorizing, as Zack (1999) noted that business strategy provided the most important context for the development of knowledge management and knowledge strategy. Extending further into the IS domain, Chan, Denford and Jin (2009) conducted a study of knowledge and information systems strategy alignment, finding significant relationships between strategy alignment and performance. This area of strategic alignment research has many gaps and bears further investigation.

A summary of linkages among the various elements of strategic alignment is provided in Table 1-6. Business-to-IS strategic alignment has received the majority of attention in the alignment literature, including linkages with firm performance, antecedents and moderators, and

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**Table 1-6 – Strategic Alignment Linkages Identified**

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Linkage Identified	References
Business Strategy – IS Strategy	Atkins (1994); Denford and Chan (2007); Dvir, Segev and Shenar (1993); Henderson and Venkatraman (1993); Tan (1995)
Bus/IS Strategic Alignment – Performance	Chan, Huff, Barclay and Copeland (1997); Chan, Huff and Copeland (1998); Cragg, King and Hussin (2002); Croteau and Bergeron (2001); Oh and Pinsonneault (2007); Sabherwal and Chan (2001)
Bus/IS Strategic Alignment – Moderators	Chan, Sabherwal and Thatcher (2006); Kearns and Lederer (2000); Luftman, Papp and Brier (1999); Reich and Benbasat (1996, 2000)
Bus/IS Strategic Alignment – Time	Broadbent and Weill (1993); Hirschheim and Sabherwal (2001); Prahalad and Krishnan (2002); Sabherwal, Hirschheim and Goles (2001); Segars, Grover and Kettinger (1994)
Business Strategy – Knowledge Strategy	Snyman and Kruger (2004)
IS Strategy – Knowledge Strategy	Chan, Denford and Jin (2009)

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implications of time in dynamic versus static views. Business-to-knowledge strategy and IS-to-knowledge strategy have received far less attention and the combination of the three types has not been studied at all. This is gap in the literature which provided a significant opportunity for the dissertation research.

## **1.2 Research Scope**

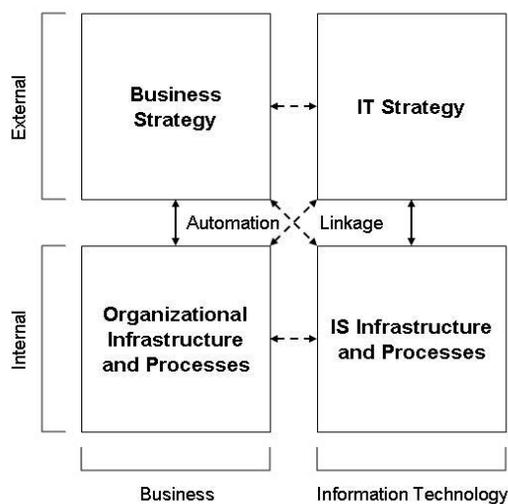
This section outlines the scope of the research within the dissertation. It includes a discussion of the research model that frames the four papers, the boundaries of the dissertation that focus the research and a brief introduction to the papers themselves.

### **1.2.1 Research Model**

The Strategic Alignment Model (Henderson and Venkatraman, 1993) is defined in terms of four fundamental domains of strategic choice as illustrated in Figure 1-1: business strategy (business scope, distinctive competencies and business governance), information technology strategy (technology scope, systemic competencies and IT governance), organizational

infrastructure and processes (administrative structure, processes and skills), and information technology infrastructure and processes (IT architecture, processes and skills). The model components are related in terms of two fundamental characteristics of strategic management: strategic fit (the interrelationships between external and internal components) and functional integration (integration between business and functional domains). Two notable changes to model terminology are adopted by this study with respect to terminology, both centering on the use of the overarching term ‘alignment’. First, following Ein-Dor and Segev (1982) and Chan (2002), functional integration is recast as strategic and structural alignments, identifying the different levels at which they operate. Second, following Chan *et al.* (1997) and Sabherwal *et al.* (2001), strategic fit is recast as business alignment and IS alignment, identifying the different foci on which they operate.

**Figure 1-1 – The Strategic Alignment Model**



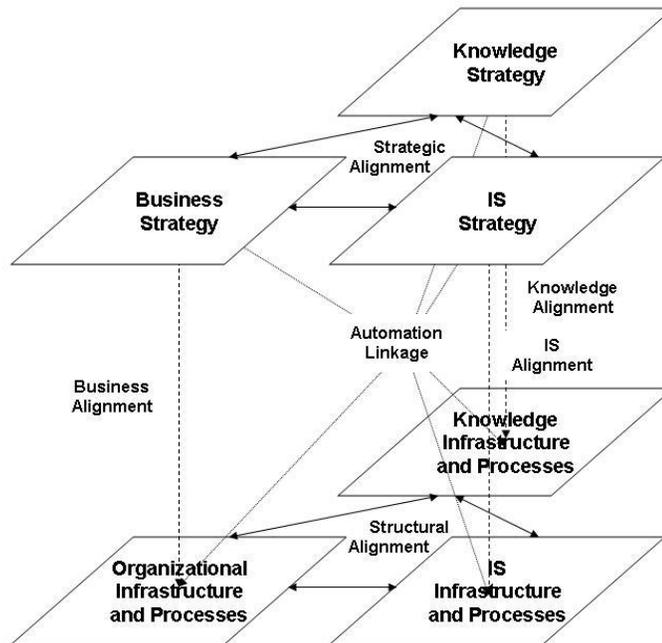
The Strategic Alignment Model has been used by many researchers either whole or in part. Burn (1996) and Sabherwal *et al.* (2001) both identified and operationalized each quadrant of the Henderson and Venkatraman (1993) model using as their basis the Miles and Snow typology. These are two of the most complete operationalizations of the Strategic Alignment Model in the literature. Specifically, in charting the dynamics of alignment over time, Sabherwal

*et al.* (2001) used Miles and Snow's (1978) business strategy typology, Rackoff *et al.*'s (1985) IS strategy typology, Brown and Magill's (1994) IS structure typology and a composite business structure typology. Bergeron *et al.* (2004) also operationalized each of the four quadrants, using a gestalt model of alignment between business strategy, business structure, IT strategy and IT structure to demonstrate how low-performance firms exhibited conflicted configuration patterns between model elements. Avison, Jones, Powell and Wilson (2004) extended SAM by incorporating process components to the model and differentiating between information/communication, information systems and technology components. Das *et al.* (1991) comprehensively reviewed the extant literature on IS planning and link the Miles and Snow typology to strategy content and strategy process. Hirschheim and Sabherwal (2001) used the Miles and Snow typology in their analysis of both IS strategy alignment and IS structural alignment. Croteau and Bergeron (2001) combined IS strategy and structure measures in their study, where strategic impact falls in the former category and the remainder of the measures falls into the latter. Chan *et al.* (1997), Chan *et al.* (1998), Cragg *et al.* (2002) and Sabherwal and Chan (2001) all looked exclusively at IS strategy alignment.

As illustrated in Figure 1-2, knowledge can be integrated into the Strategic Alignment Model at both the strategy and structural levels. At the strategy level, business and IS strategy alignment has been identified as resulting in higher performance in many studies (Burn, 1996; Chan *et al.*, 1997; Sabherwal and Chan, 2001; Bergeron *et al.*, 2001; Cragg *et al.*, 2002; Chan *et al.*, 2006). Business and knowledge strategy have been examined to a lesser extent. One such study proposes the criticality of aligning knowledge strategies with business strategy in order to create the information resources needed for competitive advantage (Snyman and Kruger, 2004). Additionally, it has been recently proposed that knowledge management emphasis is a contextual antecedent to business strategic alignment that is fully mediated by planning participation (Kearns and Sabherwal, 2007). Finally, the relationship between IS and knowledge strategies has been

recently investigated with findings indicating a complementary relationship between the two strategies in the generation of firm performance (Chan *et al.*, 2009).

**Figure 1-2 – The Knowledge Strategic Alignment Model**



At the structural level, several studies have examined the performance impacts of alignment between business and IS processes and organizations (Bergeron *et al.*, 2004; Burn, 1996; Chan, 2002; Sabherwal *et al.*, 2001; Tavakolian, 1989). Again, business and knowledge structural alignment has been studied to a lesser degree but is starting to attract research attention. The impact of aligning business and knowledge organization and processes has been modeled and linked to attaining managerial objectives and influencing intellectual capital measures (Diakoulakis, Georgopoulos, Koulouriotis and Emiris, 2004). Similarly, different types of knowledge management processes – from personalization to knowledge management systems (KMS) – have been shown to align most effectively with different phases of strategic decision making processes (Nicolas, 2004). The alignment of IS and knowledge processes has generally

been focused around research on KMS (Adams and Lamont, 2003; Alavi and Leidner, 2001; Gallupe, 2001; Staples, Greenaway and McKeen, 2001).

While the literature supports integration at the structural level, the focus of this dissertation is on the strategic level, or just the upper half, of the model in Figure 1-2. This leads to the following proposition regarding the part of the Knowledge Strategic Alignment Model to be examined:

Proposition. The alignment of business strategy, IS strategy and knowledge strategy will lead to higher levels of firm performance.

### **1.2.2 Dissertation Boundaries**

The Knowledge Strategic Alignment Model builds on Henderson and Venkatraman's (1993) Strategic Alignment Model by explicitly considering the impact of aligning knowledge strategy and structure. As an extension of this theory into the knowledge domain, it is a step in addressing advances in knowledge management, but not necessarily the only one. Various decisions made during the proposal and research process bound the scope of the dissertation.

First, by focusing on realized strategy (Mintzberg, 1978), intended strategy is not considered, leading to exclusion of the extensive IS planning literature (Earl, 1993; Segars and Grover, 1998; Teo and King, 1997). Second, while antecedents of alignment are important and contribute to alignment research (Chan *et al.*, 2006; Kearns and Lederer, 2003; Luftman *et al.*, 1999; Preston and Karahanna, 2009; Reich and Benbasat, 2000), they are not the focus of this dissertation. Finally, alignment can be looked at as a static state or a dynamic process (Sabherwal *et al.*, 2001). These positions are complementary rather than competing as they examine different aspects of alignment, operationalized as either cross-sectional or longitudinal. This dissertation does not dismiss the dynamic viewpoint, but primarily focuses on the taking the static view and cross-sectional measures of alignment. Finally, while structural alignment is suggested in the

Knowledge Strategic Alignment Model, it is not tested as part of the dissertation and is suggested as a future research topic in Chapter 6.

### **1.2.3 Dissertation Papers**

Four papers are presented as chapters in this dissertation, covering different areas of the integration of the concept of knowledge strategy into strategic alignment. As the format of the thesis is a dissertation by manuscript, each paper is designed to stand on its own merits, though a progression of the development of the idea of alignment and knowledge strategy can be traced through the next four chapters. As a result of the format, there are areas of duplication in the text, particularly in background and theory development, which form a common basis amongst the papers.

Chapter 2 focuses specifically on knowledge strategy in order to lay the groundwork for the ensuing papers' focus on alignment. The paper examines typologies and dimensions of knowledge strategy with the intention of identifying an appropriate classification scheme to employ in alignment studies. Through mapping of two knowledge strategy typologies onto a set of knowledge strategy dimensions, a relationship between the two typologies is established allowing them to be differentiated by their level of operation. This work leads to the selection of one of the knowledge strategy typologies for use in the subsequent strategic alignment study.

Chapter 3 extends the discussion of strategic alignment into the knowledge domain by developing ideal types of aligned portfolios of business, information systems and knowledge strategies. Conceptualizations of fit as profile deviation and covariation are used to analyze survey data in two separate tests of strategic alignment. Findings support the strategic alignment hypothesis that the alignment of strategies in a firm is associated with higher firm performance and that knowledge strategies are an important component of the strategy portfolio. Some mixed results are found where for certain portfolios, the theoretically aligned ideal portfolio underperforms other combinations of strategies, raising issues for the next paper.

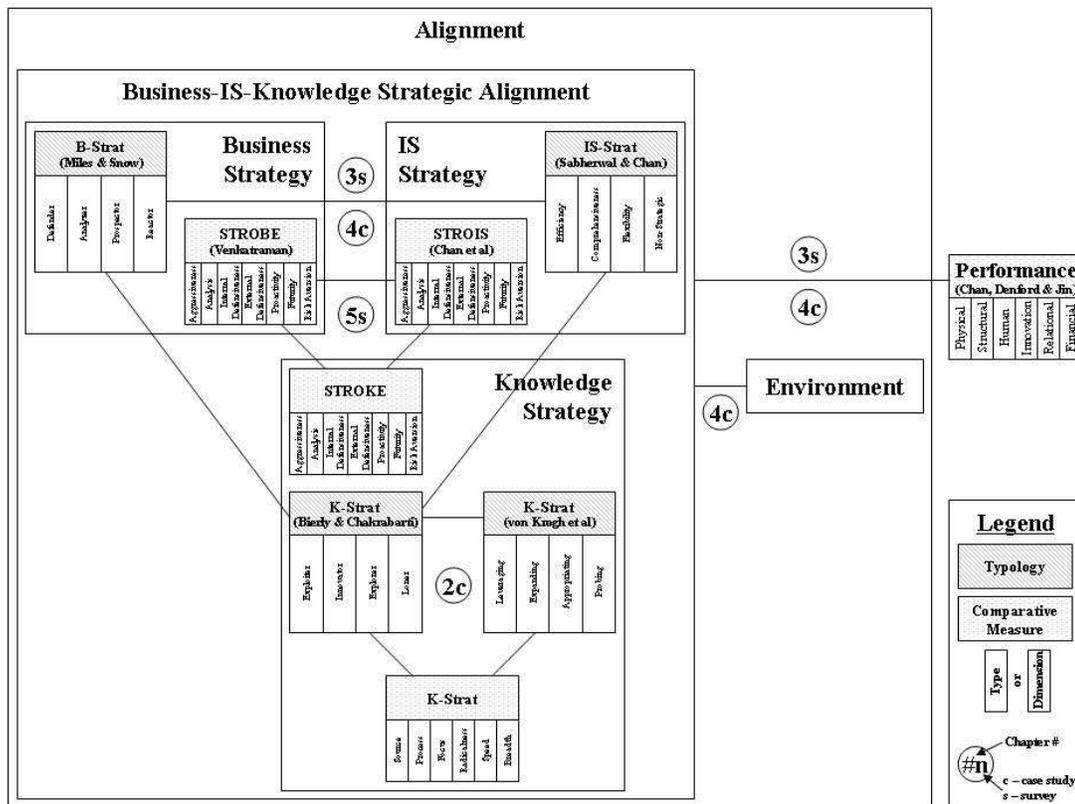
Chapter 4 examines issues of alignment, misalignment and performance in firms. The strategic alignment hypothesis would suggest that higher alignment between a firm's strategies should lead to superior performance compared with lower levels of strategic alignment; however this was not demonstrated under all circumstances in the second paper. Case studies are used to explore situations under which the strategic alignment hypothesis may not hold. A model is developed based on dimensions of alignment and performance; explanations for why firms may fall in each quadrant are proposed.

Chapter 5 traces the development of an alternate conceptualization of knowledge strategy, based upon two well-known business and information systems constructs. The development and validation of this new instrument are traced. As part of the instrument development process, issues regarding the rigor of existing scale development analysis techniques are raised. In response, a new validation measure is proposed and developed to complement existing techniques.

The dissertation concludes with Chapter 6 providing a summary of findings, contributions and future research opportunities stemming from the inclusion of the concept of knowledge strategy into the discussion of strategic alignment.

These chapters can be linked together in a framework as illustrated in Figure 1-3. As indicated in the legend, the constructs were employed at either the typology or comparative measure levels, with the associated types and dimensions noted. These constructs exist in areas of strategy, business-IS-knowledge alignment, alignment in general and performance. The linkages between constructs for each chapter are illustrated, as are the methods of study used to investigate each issue within the broader context of this dissertation. It is presented to provide the reader with a brief roadmap to the discussion which follows.

**Figure 1-3– Dissertation Roadmap**



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## **Chapter 2**

### **Defining Relationships between Knowledge Strategy Typologies**

#### **Abstract**

Empirical study of knowledge strategy requires operationalization of specific strategies. In this paper, six knowledge strategy dimensions are identified within the existing literature. Two existing knowledge strategy typologies are compared and mapped onto these knowledge strategy dimensions, generating a set of ideal strategy profiles. These profiles are then applied to eight case studies to explore whether these strategy types exist in industry. The results suggest that a hierarchy exists between two existing knowledge strategy typologies where one operates at the grand strategy level and the other at the operational strategy level. It is also suggested that consistent portfolios of operational knowledge strategies can support a firm's grand knowledge strategy.

#### **2.1 Introduction**

A knowledge-based economy focuses on issues of knowledge capital over more traditional assets and the capability of organizations to harness these knowledge assets. Competitive advantage can be generated from knowledge, which can be viewed as a key strategic resource to be acquired, manipulated and applied (Zack, 2003). In this environment “the sustainable competitive advantage of business firms flows from the creation, ownership, protection and use of difficult-to-imitate commercial and industrial knowledge assets” (Teece, 2000, p. 35). In fact, it has been argued that competitive advantage in the current environment stems more from the replication and deployment of knowledge assets than from market position

(Earl, 2001). It may well be the intellectual capital management challenges, not financial management issues, which ultimately limit firm growth and success (Macpherson and Holt, 2007; Soo, Devinney, Midgley and Deering, 2002). Given this requirement for active management of knowledge assets, a number of different organizational tasks and roles may be seen to exist supporting it.

A distinguishing feature of knowledge-orientation is the ability of a firm to take advantage of its knowledge assets through the capabilities firms develop for building, protecting, transferring and integrating knowledge (Gold, Malhotra and Segars, 2001; Teece, 2000). Firms' fundamental role can be seen as integrating individuals' specialist knowledge, which is manifest as these organizational capabilities (Grant, 1996a). The primary task of management is to provide the coordination necessary to integrate and use this knowledge successfully (Grant, 1996b). Because the context- and process-specific knowledge that tends to accumulate in firms' organizational routines is difficult to imitate, benefits from the development of this knowledge can accrue to the firm (Zack, 1999). As companies benefit from managing this knowledge proactively, rather than letting it drift, it is possible to conceptualize knowledge strategy independent of other firm strategies (von Krogh, Nonaka and Aben, 2001).

An organization's competitive position creates a requirement for particular new knowledge; however, its existing knowledge resources simultaneously create opportunities and constraints, hence the requirement to generate strategies to coordinate these competing demands (Zack, 1999). A knowledge strategy can be viewed as "the employment of knowledge processes to an existing or new knowledge domain in order to achieve strategic goals" (von Krogh *et al.*, 2001, p. 46) and "the overall approach an organization intends to take to align its knowledge resources and capabilities to the intellectual requirements of its strategy" (Zack, 1999, p. 135). While much of the discussion of knowledge strategy has focused on the general requirement for it and its benefits, efforts to classify specific knowledge strategies have been limited. Two such

typologies which have been developed take very different views of knowledge strategy (Bierly and Chakrabarti, 1996; von Krogh, Nonaka and Aben, 2001). The aim of this paper is to develop a better understanding of knowledge strategies by investigating how these two knowledge strategy classification schemes are related.

Through a multiple case study of eight firms drawn from three knowledge-intensive industries in Canada, we find that a hierarchy exists between two existing knowledge strategy typologies and that consistent portfolios of operational knowledge strategies can support a firm's grand knowledge strategy. The remainder of the article is composed as follows. The following section develops the theoretical background for the study, identifying the major knowledge strategy typologies and developing a framework of knowledge strategy dimensions. The next two sections describe the research methods and reports on the results and analysis. The paper concludes with implications for research and practice.

## **2.2 Theoretical Background**

The background of this study is based upon the relationship between the two knowledge strategy typologies to a set of underlying dimensions. First, the strategy typologies are introduced. Then, knowledge strategy dimensions are presented that will be used to link the typologies. Finally, the basis for typology development is discussed and how the dimensions can be used to link them.

### **2.2.1 Knowledge Strategy Typologies**

While there are knowledge typologies that describe knowledge capabilities (Gold *et al.*, 2001), schools of knowledge management (Earl, 2001) or types of knowledge (Alavi and Leidner, 2001), there are few studies that describe knowledge strategy. Two knowledge strategy typologies that have emerged from the knowledge management literature compete for attention. The first is set of generic knowledge strategy groups proposed by Bierly and Chakrabarti (1996) – explorers,

exploiters, innovators, and loners – that, while an extension of earlier organizational learning work (Argyris and Schon, 1978; Cohen and Levinthal, 1990; March, 1991), was the first to identify all four strategies as a coherent package. The second is a set of strategies proposed by von Krogh, Nonaka and Aben (2001) – leveraging, expanding, appropriating, and probing – that examines the firm’s orientation and focus in strategy development and application.

In the first typology, Bierly and Chakrabarti (1996) conducted a cluster analysis of the U.S. pharmaceutical industry based upon four knowledge strategy dimensions: knowledge source, radicalness of learning, speed of learning, and breadth of knowledge. Their results identified four distinct generic knowledge strategies among firms: loners, explorers, exploiters, and innovators. A loner was an isolate in terms of knowledge. Loners were ineffective, with higher R&D expenditure ratios, slow technology cycles and low knowledge dispersion. An explorer was a creator or acquirer of the knowledge required to be competitive in its strategic position. Explorers were found to have high levels of radicalness but were similar to other groups in other areas. An exploiter had capabilities that exceeded the requirements of its competitive position, allowing it to use its knowledge to deepen or broaden its position. Exploiters were seen to have low R&D expenditure and broad but shallow knowledge bases. Members of the innovator profile closely integrated the best characteristics of explorers and exploiters. Innovators were the most aggressive and fastest learners, combining internal, external, radical and incremental learning. Zack (1999) identified innovators and explorers as being aggressive strategies, suggesting that they should outperform the more conservative strategies. In fact, innovator and explorer strategies were empirically shown to be more profitable than loner and exploiter strategies (Bierly and Chakrabarti, 1996).

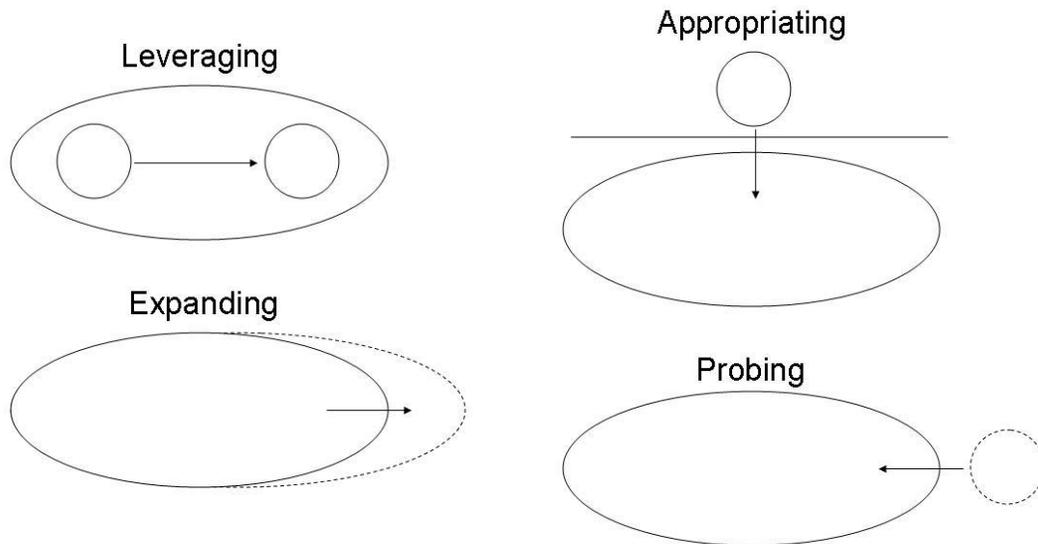
In the second knowledge strategy typology, von Krogh, Nonaka and Aben (2001) identified two core knowledge processes – knowledge creation and knowledge transfer – and examined their impact in one business unit of Unilever, an Anglo-Dutch consumer goods

company. The target of a process for knowledge creation is to enhance the potential for innovation, whereas the intent of knowledge transfer is to use created knowledge to benefit the firm, which may include transfers with external partners. Integration of these two dimensions results in four strategies: leveraging, expanding, appropriating, and probing (von Krogh *et al.*, 2001).

Leveraging can be oriented towards achieving efficiency in operations and ensuring that the firm internally transfers existing knowledge from various knowledge domains to improve innovation. Leveraging is an effective strategy as to acquire similar knowledge, competitors have to engage in similar experiences. However, this takes time and the processes replicated within the organization may be difficult to imitate due to their tacitness. The emphasis of expanding is on increasing the scope and depth of knowledge domains by refining what is known and by bringing in additional expertise relevant for knowledge creation – better understanding of key processes can allow for substantial cost-reduction, help create new process and product innovations, and reduce risks by building up local competence. Knowledge-based competitive advantage is sustainable through expansion because the more a firm already knows, the more it can learn (Zack, 1999). Appropriating is predominantly externally oriented on knowledge domains that do not already exist in the firm, capturing knowledge from external partners, moving that knowledge across the organizational boundary and managing risk by spreading effort. The main vehicles for inter-organizational appropriation are strategic alliances, collaborations and joint ventures (Powell, Koput and Smith-Doerr, 1996). While potentially valuable in quickly gaining expertise, appropriation can be difficult due to trade-offs between collective learning strategies within alliances (Larsson, Bentsson, Henriksson and Sparks, 1998). The probing strategy gives teams the responsibility to build new knowledge domains from scratch, identifying individuals interested in contributing to innovation as the ‘creative destroyers’ of the current organization (Boisot, 1995).

New knowledge is created outside of the firm's current knowledge domain and then brought into organization. These four strategies are depicted graphically in Figure 2-1.

**Figure 2-1 – Graphical representation of von Krogh, Nonaka and Aben strategies**



### 2.2.2 Knowledge Strategy Dimensions

The two sets of typologies were developed through different methods and refer to different underlying dimensions, making direct comparison challenging. To compare the typologies, each knowledge strategy typology was represented by using the six dimensions of knowledge strategy identified in the development of the two typologies. While six dimensions were selected from the literature, one dimension that appears frequently but was not included in this study is codification of explicit or personalization of implicit knowledge (Choi and Lee, 2002). This dimension is excluded because empirical support is lacking for a high or low rating to be tied to a particular strategy type in either typology, and is therefore not a useful dimension for the study. For example, an exploiter can use either explicit or tacit knowledge to generate value; similarly, a leveraging strategy can make use of either codification or personalization to transfer knowledge within the organization. The six knowledge strategy dimensions presented here are

based on empirical and conceptual work that supports clear differentiation between the different types within the typologies.

#### 2.2.2.1 Knowledge Source

The primary source of knowledge refers to where the organization gets its knowledge from, defined as internal or external (Zack, 1999). Internal learning occurs when new knowledge is generated and distributed within the organization; external learning occurs when boundary spanners bring in knowledge (Bierly and Chakrabarti, 1996). Internally generated knowledge tends to be unique, specific and tacitly held, and hence is difficult to imitate; externally generated knowledge tends to be more abstract, packaged and widely available, and hence may be more easily imitated (Zack, 1999). While it may have costs and risks, transfer with external partners is important for generating new ideas (Zack, 1999) and increasing the depth of knowledge held (von Krogh *et al.*, 2001). Knowledge source was divided into internal and external categories to address the fact that some firms balance internal and external learning.

#### 2.2.2.2 Knowledge Process

Organizational knowledge creation is “the process of making available and amplifying knowledge created in individuals as well as crystallizing and connecting it with an organization’s knowledge system” (Nonaka, von Krogh and Voelpel, 2006, p. 1179). Primary knowledge process refers to the core knowledge processes of creation and transfer (von Krogh *et al.*, 2001). Both processes are required as, while knowledge creation is a uniquely individual effort, the organization cannot benefit without being able to transfer it appropriately within the organization (Nonaka, 1991). The specific focus of the organization may be on the creation of new knowledge or the application of existing knowledge and the degree of balance between the two (Zack, 2003). Knowledge process was divided into creation and transfer, reflecting the tension between the two dimensions and the firm’s ability to master or fail at both.

### 2.2.2.3 Knowledge Focus

How an organization uses knowledge defines its strategy in terms of its knowledge focus (Zack, 1999). One extreme is exploration, where the firm focuses on creating or acquiring new knowledge in order to stay competitive. The other extreme is exploitation, where the organization uses slack knowledge resources to further develop a competitive position. There is a natural tension in an organization between assimilating new knowledge through exploration and using existing knowledge through exploitation (Crossan, Lane and White, 1999). However, Zack (1999) notes that these two positions are not mutually exclusive as certain knowledge areas may be exploited while others are explored. This central position, balancing the two in an organizational learning cycle, can be viewed as an innovation focus. The dimension was dichotomized into exploitation and exploration in order to reflect this balanced innovation position.

### 2.2.2.4 Radicalness of Learning

Learning can be defined as “a relatively permanent change in knowledge... produced by experience” (Weiss, 1990, p. 172). Radical learning challenges the basic assumptions of the organization whereas incremental learning gradually expands the firm’s knowledge base (Bierly and Chakrabarti, 1996). In general, the concept of absorptive capacity would indicate that to understand, evaluate and use outside knowledge, the firm must have a level of prior related knowledge (Cohen and Levinthal, 1990). This may limit the ultimate degree of radicalness of the ideas as an organization must recognize the potential value of new knowledge before it can be considered ‘learned’ (Huber, 1991). It has been suggested that there is a trade-off between the two types of learning as while incremental learning may be effective and profitable in the short-term, radical learning is needed for long-term success (March, 1991).

#### 2.2.2.5 Speed of Learning

The speed of learning is another dimension of knowledge strategy, and one that is closely linked to knowledge source. External learning is generally slower than internal due to the former's lack of internal championship, difficulty of interpretation, and barriers to acceptance (Bierly and Chakrabarti, 1996). A firm may be considered a social community that maximizes the speed and efficiency of organizational knowledge creation and transfer (Kogut and Zander, 1996). However, since organizational learning is not limited to a single level but rather occurs at individual, group, and organizational levels (Crossan *et al.*, 1999), the movement of knowledge across levels may impede the rate of learning. Speed of learning may also be affected by a firm's transformative capacity, which reflects its ability to acquire, assimilate, and distribute relevant knowledge to address organizational needs (Garud and Nayyar, 1994). Finally, replication is the codification and diffusion of knowledge within the firm; imitation is the undesired same process in a competitor (Kogut and Zander, 1992). Speed of learning in competitive markets is important as the most competitive knowledge position involves knowledge that is both codified, and that is most easily diffused, but still not diffused (Boisot, 1995). Faster learning extends the gap between a firm's ability to replicate its knowledge and its competitors' ability to imitate it. Slower rates of learning, however, have the benefit of letting a firm evaluate knowledge positions in the market, allow complementary streams of knowledge to develop together, and integrate knowledge more effectively once environmental uncertainty has been reduced (Bierly and Chakrabarti, 1996).

#### 2.2.2.6 Breadth of Knowledge

Breadth reflects how specialized or generalized the firm's knowledge is (Bierly and Chakrabarti, 1996). A narrow focus to develop a deep base of knowledge may lead to the development of core competencies; a wide focus to develop a broad knowledge base may lead to the combination of related technologies and knowledge. A firm's absorptive capacity is based upon its level of prior knowledge in the domain (Cohen and Levinthal, 1990); therefore

maintaining too narrow a knowledge base may prevent the recognition of new knowledge. However, maintaining too broad a base of knowledge may leave the firm without the requisite understanding to assimilate and synthesize that same knowledge (Garud and Nayyar, 1994). As with the other dimensions, a degree of balance is required between the two extremes.

### **2.2.3 Typologies**

The use and misuse of the classification terms ‘typology’, ‘taxonomy’ and ‘classification scheme’ has been debated in the strategy literature (Doty and Glick, 1994; McKelvey, 1975; Rich, 1992). While classification schemes and taxonomies both provide decision rules regarding how to classify an object, only the latter is empirically generated (Hambrick, 1984). While classification schemes and typologies both define their categories *a priori*, only the latter identifies ideal types (Doty and Glick, 1994). Finally, typologies are often either based on multiple dimensions (such as types in a conceptual two-by-two model) or based on polar types (such as opposites with intermediate types being a blend) (Bailey, 1994). A taxonomy whose entities fall either into multidimensional categories or along a polar-anchored range may be virtually indistinguishable from a similarly constructed typology, with the exception of the method of development. While taxonomies may be empirical and descriptive, they may be atheoretic, while typologies can be conceptually grounded in literature and theory (Doty and Glick, 1994).

The von Krogh *et al.* (2001) classification was generated as a classification scheme as, although it is grounded in a single empirical case study, it classifies knowledge strategy types based upon an observationally-derived and theoretically-grounded two-by-two matrix rather than upon rigorous quantitative analysis of data. The Bierly and Chakrabarti (1996) classification was generated as a taxonomy, as it is empirically grounded in a survey where the taxa were defined post-hoc for firm classification. For comparison in this paper, both classifications are adapted as typologies, since each class and taxa is recast as an ideal type, based upon the combination of

theoretic and empirical dimensions from the literature. Ideal types are extremes that cannot be found empirically in their conceptual purity, but can be used in comparison to ‘real world’ entities. A prerequisite for modeling or operationalizing an ideal type is having a precise definition of the type and of the dimensions the type is built upon (Doty and Glick, 1994), such as the six strategy dimensions identified for this study. Firms are then classified into the ideal type they most closely resemble, but are not assumed to be perfect representations of that type.

## **2.3 Research Methods**

To identify the relationships between the two knowledge strategy typologies, the study proceeded through the following three steps. First, previous research was consulted to determine the selection of dimensions to be evaluated. Second, based on the body of literature, the interview guide was created to capture each underlying dimension and global type. Third, the interviews were conducted at the participant sites, followed by the qualitative and quantitative analysis of the data.

### **2.3.1 Sample**

The case study has been suggested as being appropriate for answering research questions relating to the ‘how’ and the ‘why’ of a phenomenon (Yin, 1994). The case study method has been repeatedly cited as being effective in generating theory early in the research of a new topic (Benbasat, Goldstein and Mead, 1987; Eisenhardt, 1989; Dubé and Paré, 2003). This research is a multiple case study, following guidelines and standards established for case study research in IS (Benbasat *et al.*, 1987; Lee, 1989; Yin, 1994). The unit of analysis is the firm, drawn from the population of small and medium sized enterprises in the business services, legal services and educational services sectors. These industries were selected due to the expected degree of knowledge-intensity of firms operating in them.

Eight sets of interviews were conducted with the sites summarized in Table 2-1. At each case site, interviews were conducted with individuals responsible for the functional areas of executive, operations, finance, IS, human resources and marketing. Depending on the size of the organization, this ranged from between three and seven interviews per site. Thirty-eight interviews lasting between 30 and 90 minutes were conducted, resulting in over 700 pages of typed transcripts. Participants were sent copies of their transcripts to provide them with opportunities to clarify or expand discussion points. All transcripts were coded using NVivo 7 software based a coding guide derived from the construct list. It was anticipated that with these eight case sites, there would be sufficient depth of data collected to fully explore the eight knowledge strategy dimensions and achieve theoretical saturation. Glaser and Strauss (1967) identify this as the point at which there is minimal incremental learning from each case.

**Table 2-1 – Participating Firms**

Firm	Industry	Interviewees
CorrEd	Education Services	CEO and President, Senior Vice President Operations, Director of Administrative Services
ConEng	Business Services	CEO and President, Vice President Operations, Division Manager, Controller, System Administrator, Human Resources Manager
DistEd	Education Services	Dean, Vice Dean, Program Director, Site Coordinator, Manager of Curriculum Delivery, Manager of Business Planning, Manager of Administration
DevEd	Education Services	CEO, Director of Finance and Business Services, Associate Director of Client Services
LegServ	Legal Services	CEO, Director of Finance and Corporate Services, Director of Information Management, Information Technology and Modernization
PubLib	Education Services	CEO, Director of Customer Services, Director of Corporate Services, Director of E-Services, Manager of Marketing, Manager of Human Resources
ManuServ	Business Services	President, General Manager, Manager of E-Business, Manager of Marketing
PubEd	Education Services	Director of Education, Superintendent of Education, Superintendent of Student Services, Superintendent of Finance and Administration, Manager of Information Systems, Curriculum Coordinator

### **2.3.2 Measurement**

Interviews were semi-structured and based upon an interview guide. The interview questions were derived from the descriptions of the six knowledge dimensions from the literature and can be found in Appendix A. The questions were trialed on two doctoral candidates and one faculty member prior to the conduct of the interviews.

Analysis was conducted at the individual case and cross-case levels. For individual cases, a case summary was written providing key observations on each knowledge dimension and typology. The last step in the individual case analysis, and the first step in the cross-case analysis, was to convert the thick description into a single level of performance (low, medium, or high) for the dimensions of knowledge strategy (Miles and Huberman, 1984). This was done individually and then adjusted in comparison with the other firms. The majority of the cross-case analysis was based on examining the linkages between the knowledge strategy dimensions and typologies, and supporting them from the case documents.

Case studies can be assessed on three major types of validity – internal, construct, and external – and reliability, as suggested by Yin (1994). Internal validity was enhanced through the use of a pattern matching strategy within and between cases and through the implementation of natural controls through multiple heterogeneous cases in a limited set of industries. Construct validity was addressed through the chain of evidence that a qualitative package such as NVivo provides, the review of transcripts by informants, and the use of multiple sources of evidence including interviews, documentary evidence and observation. External validity was enhanced through the use of cross-case analysis and through the confirmation that observations fit across the eight organizations. Reliability was aided by the production of interview documentation and the organization of documentary evidence through the structures provided by NVivo.

The relationship between the two typologies and the firms were determined through an investigation of their degree of fit. Venkatraman (1989) categorized the concept of fit in a

classificatory framework with axes of specificity and anchoring, resulting in six interpretations of the concept. These are fit as moderation, mediation, matching, covariation, profile deviation and gestalts. Given each typology and firm is assessed on six dimensions of knowledge strategy, a profile deviation approach between observed and theoretical configurations is appropriate due to the complexity of paths generated by the interactions and moderating effects found in a fully-specified multivariate model (Drazin and Van de Ven, 1985; Gresov, 1989; Sabherwal and Chan, 2001; Tosi and Slocum, 1984). Profile deviation classification is defined as the degree of adherence to an externally specified profile and is criterion specific, allowing direct comparison between firm and idealized profile, but being low in specificity, it does not require a precise functional form of the fit relationship (Venkatraman, 1989).

### **2.3.3 Results**

Results are presented in two parts, reflecting the qualitative and quantitative analyses of the data. The former focuses on the within-case analysis while the latter is the vehicle for the cross-case analysis.

### **2.3.4 Qualitative Analysis**

For each firm, a synopsis is given, the Bierly and Chakrabarti (1996) typology is applied and then the von Krogh *et al.* typology is applied.

#### **2.3.4.1 CorrEd – Correctional Education**

The firm focused on the design and delivery of education programs to incarcerated adults. There were six people working in the head office in Ontario, with a regional coordinator position established in the Prairies. Having reached maximum growth through penetration of the Canadian market, the firm was focusing on expanding in two ways. The first was a geographic expansion from Canada to the United States within the same primary service line – this growth strategy required the expansion of their knowledge dealing understanding another correctional service,

with the entry point being a state whose system, values and correctional philosophy were most closely aligned with Canada's. The second growth strategy was based upon creating a new service line – mediation – that would require the creation of a new knowledge domain for the firm through partnering with other training establishments.

This firm showed an exploiter's focus on the existing knowledge domain supporting current activities, as one manager noted, "I think the majority of resources go into maintaining the existing business, and making sure that those customers are well served.... If we start neglecting that we're in real trouble." The firm's expansion into research on correctional education and development of mediation as a new area of business showed incremental growth that did not challenge the basis for the organization. While development of knowledge on mediation was externally focused, the firm conducted its own research on correctional education. As the CEO noted, this research would "change the way we do business in terms of design and probably delivery over time, because we'll find through research in design that certain methods will work better than others, which will make us more valuable to our clients [and] change what our clients ask for." These innovations would then be reinvested back into the core business.

Working in the correctional system imposed a degree of isolation on members of this firm, so a strong leveraging strategy was important for success. Key areas of knowledge requiring distribution were changes in institution policies and transfer of best practices between sites, carried out through a combination of e-mail and site visits. The development of the mediation line of business, which the CEO viewed as an extension of teaching and communicating skills, was an example of an expanding strategy in this firm. Some of the knowledge gained in this effort was through appropriation, where the firm had partnered with other organizations with greater experience in this area. The organization was generally too small and preoccupied with the current business line to be able to form a cohesive probing strategy to generate the mediation business line internally.

#### 2.3.4.2 ConEng – Construction Engineering Services

The firm was a northern Ontario-based services and construction company that did work in the commercial, industrial, mining, and aggregate sectors. It had formed joint ventures with larger companies to do major projects outside the local area. In addition to the company headquarters location, the firm had field offices in two other northern communities and a Toronto-area ‘staging’ office to develop the southern Ontario market. The growth strategy of the firm was based on geographic expansion and on vertical integration. The field and staging offices were established to extend the reach of the firm, replicating knowledge from the head office. This was aided by the implementation of a document management system and mobile tools designed to improve knowledge dissemination, search and retrieval for managers and front-line workers. The vertical integration strategy could be seen in the creation of new knowledge areas and capabilities, such as pre-cast concrete production, that were used to reduce dependence on sub-contractors and increase profitability of a project.

Knowledge management was focused on efficiency in this firm, making it closest in orientation to an exploiter. Two quotes by the CEO of the firm captured this orientation:

“We were looking at some high rise development – a different way of building high rises – but we’ve kind of put that on the back burner right now because I found that we’re starting to lose focus. We’re getting involved in things that aren’t our core competency and I’m trying to stay within our core competencies and not try to go too far – develop what we have. If we’re going to be innovative we should try to be innovative to improve our core competencies, not jump out of the field and try to do something else completely different.”

The result was a high degree of attention to the overall system and processes of the firm:

“Everybody’s always looking for the miracle or the quick fix but there’s no quick fix - it’s a series of little things that all combine together to make the whole. If

you have good computer systems, you hire the right people, and you've got the right systems, you put all that together and you've got a winning formula.”

The firm demonstrated good use of all of the von Krogh *et al* strategies, but tended toward the more conservative leveraging and expanding strategies. The most prevalent strategy used was leveraging, which was evident from the emphasis placed on the firm's document management system for capturing explicit knowledge. The firm had expanded its knowledge into new areas such as pre-cast concrete to vertically integrate and sewage and water to horizontally extend their capabilities. When the firm lacked capabilities and did not have the capability to develop them, they were active in appropriating knowledge from joint venture partners. The firm used the probing strategy and experimented with designing new processes in the past. This worked well with creation of a new type of caisson (a watertight structure used to work on underwater bridge piers), which led to successful patents, but was less effectively in developing a slip-forming capability, which failed and required an outsourced solution.

#### 2.3.4.3 DistEd – Distance Education

The firm was a distance education division that was part of a small Ontario university. Students on campus numbered less than 3,000, but there were 6,000 to 8,000 students in distance education, with the majority of these in a non-degree professional development program. The distance learning initiative was less than ten years old and grew rapidly in this time to a level of approximately 50 full-time staff drawing on a pool of over 200 academics as instructors. The division faced significant and systemic financial, human resource and IS limitations – specifically critical under-funding, over 50% annual turnover, and inadequate course delivery tools. The division used a strategy that attempted to avoid these obstacles through the cultivation of internal support from the faculty and the creation of external partnerships with other universities.

The limitations faced by the organization led it to being a loner – not by choice, but by circumstance. The frustration with the human resource issues of the organization and its impact on knowledge was clearly stated by one manager:

“In instructor services it takes two terms for people to get good at what they do. So if you're turning over every six months, the person is just learning their job and getting to the point where they are becoming very competent and they're gone. Now they try and pass on the information to the new people through a handover in a couple days, but they are not going to get it all. You hope that the turnover isn't 100% at the same time, because you lose a lot corporate knowledge. There's very little else that you can do in terms of managing information.”

Similarly, problems with information management – both manual and automated – challenged the decision-making capability of the organization. One senior manager noted, “we glean whatever information we can from the situation at the time, but we are far from having any kind of a comprehensive information gathering and synthesis leading into a decision-making process.” When faced with problems, another manager noted, “we tend to circle the wagons and look internally... we don't go externally very often. The biggest reason is the fact that our information and the way that we capture stuff... the [university] information system, is poor.” Finally, the systemic problems with grafting a distance education division onto a long-standing organization and under-resourcing it led to issues with the division meeting its mandate. As an example, one senior manager noted, “the curriculum decisions have been complete ad-hocracy. It's been what's doable, what springs from the [non-degree professional program], and horse-trading in individual departments.”

The organization was involved in the Canadian Virtual University, which is a group of Canadian universities and leaders in distance education and online learning. Appropriation from

this network was an important strategy and as noted by one manager, “we share everything from how much we pay professors, how we do our development of courses, and we try to learn from others who have new and innovative ways of making the business more attractive to the faculty.” The Dean noted how this knowledge strategy supported the business strategy where “the model we are trying to go for is one which is competitively priced – optimally priced – to consider what it cost you, that draws on the whole market, that draws international students, and that establishes a brand presence of very high quality Canadian education.” These partnerships were one area in the organization that was not constrained by circumstances. The organization effectively leveraged its curriculum by reusing undergraduate course material in its professional development delivery, however, administratively there were difficulties in leveraging because of the high turnover in administrative staff and the highly tacit components to those jobs. Knowledge creation, as seen in either the expanding or probing strategies, was problematic in the organization due to insufficient resources to devote to the task and a rapidly growing mandate and student base that consumed the majority of those resources. While senior managers may have had a number of ideas that would see an increase in new knowledge, the ability to implement these plans was severely limited.

#### 2.3.4.4 DevEd – Developmental Support and Education

The firm was a non-profit organization that provides living and support services for adults and children with developmental disabilities in southern Ontario. Adult services included residential services, activity and educational programs, community outreach and employment services. Children’s services included a day-care that provides childcare for community children including those with developmental disabilities, a summer camp program, a preschool resource program and an academic enrichment program for preschoolers. They employed approximately 130 staff and had 70 volunteers. The organization was very conscious of its environment and the opportunities presented within it. Having developed an early-education facility and a regional

program for a specific disability, they were adept at identifying niches and creating new knowledge to establish positions in them, either by themselves or with partners. The current major environmental issue for the organization was the forecasted decrease in governmental funding, leading to strategic direction to find alternative means for generating funds to provide services.

The CEO noted, “research, training, innovation, connecting and rewarding are all part of what we do and need to do more of to continue to be on the cutting edge of our field,” making this firm an explorer. As noted by one manager, the organization had “systems in place that can help us move quickly if new initiatives come up with funding attached,” as seen in their diverse portfolio of community support activities, from after school programs to behavioral intervention programs in daycares, to the establishment of a regional capability to deal with a rare behavioral disorder. Senior management maintained a robust network of contacts in different areas, demonstrating their outward exploration focus. As noted by the CEO, “our Director of Finance is tied into the healthcare system and long term care facilities; our Director of Client Services is tied into the dual diagnosis field as well as many more; and I have contact in many different fields other than developmental services.”

The importance of the probing strategy could be seen in the development of a Canadian capability to deal with a disorder that could previously only be treated in the U.S. The CEO noted, “we are about to launch a mini-treatment facility... [that] will be the first in the province, and we will be learning a great deal as we go along.” As part of this strategy, the organization created a network for the disorder, published a handbook for frontline staff, provided curriculum for a training program and co-hosted a conference. Appropriation was another major strategy of the organization, sending members to regional institutes, colleges and universities to gain knowledge and creating organizational links with those same institutions to maintain the flow of information. As the CEO noted, “all of these collaborative ventures added to our knowledge base

and added to our reputation as an agency interested in partnerships and the creation of new ideas and ways of doing things.” The expanding strategy was used to extend their experience dealing with children with intellectual and behavioral disabilities from the support domain into the education domain of daycares and elementary schools. Additionally, when faced with a shortage of local behavioral specialists, individuals were chosen from the organization to undertake special training and develop the capability in-house. Leveraging was the least well-developed capability in the organization, as knowledge appeared to exist in pockets.

#### 2.3.4.5 LegServ – Legal Support Services

The firm employed approximately 600 people supporting four major legal client groups. The Ontario-based headquarters of the organization was spread between four buildings and it had 12 regional offices. It was an amalgamation of two different organizations combined in 2003 and was nearing the end of its consolidation efforts. The organization used the amalgamation as a means to spearhead a modernization process and implement standardized practices across the firm. As the legal profession was very sensitive to tradition and precedence, circumscription and a slow rate of change were key to the organization’s strategy, but both improvements and standardization were proving to be relentless forces. Growth was focused on deepening and standardizing the quality of services for organizations clients rather than increasing the range of services available.

This organization was very efficiency focused, where innovation focused on internal process refinements through modernization committees in every office. Knowledge was mostly generated internally, from the client service personnel who dealt with the variety of client groups. The slow speed of change but ultimate necessity was noted by one senior manager, “the legal environment generally is based on traditional values.... Challenging that, sometimes some would say, ‘but we’ve always done it that way.’ Well, there’s one reason why we should be looking at this.” Similar to DistEd, this firm was constrained by its circumstances, but unlike the distance

education organization, it enjoyed a stable environment, had come to terms with its constraints and found effective methods of dealing with them.

The leveraging strategy was of particular importance to this organization as consistency and accuracy in the provision of service was of paramount importance. While there was much documentation of procedures, there were large tacit components to this knowledge regarding their interpretation and origins that were passed directly through mentoring and development programs. Due to the conservatism of the profession, incremental approaches for new knowledge generation characterized by the expanding strategy were much more suitable for this organization than the more radical probing strategy. In fact, the innovations had been slowly but steadily accumulating in the organization based on this expanding strategy and through judicious use of an appropriating strategy, once successful precedent was set by other organizations.

#### 2.3.4.6 PubLib – Public Library

This organization was a southern Ontario public municipal library with five branches and over 100 full-time equivalent positions. It offered a wide variety of informational services, both traditional paper-based and electronic, and shared facilities with cultural and sporting users. The library maintained a set of programs that cater to individuals from pre-school age to senior citizens and had a long-term focus on service excellence and technological innovation. The library was very conscious of maintaining their core services while expanding into a new e-services domain. A key part of this strategy was to become a technology leader in the industry and use this position to create networks and set standards. In this way, the library positioned itself as an information provider and lynchpin of the community, rather than a mere lender of books.

The organization was an innovator with leading edge use of technology integrated with traditional print-based products and face-to-face services. The long-tenure CEO set the conditions for this orientation, noting that “we’re in an industry that relies on knowledge [as] change is always happening and technology is always pushing us.” Rather than letting technology push

them, the organization chose in the early 1990s to look ahead at the future of information management. On the technology side, they were one of the first libraries in Canada to install fiber, joining early distributed network, and developing open-source library software for their own use and that of other libraries across Canada. On the vision side, they repositioned the library as a community hub while maintaining their core services, established the library as an electronic publisher for the community, and marketed the library as the preferred information portal for both print and electronic media.

The organization had a very strong probing orientation, creating knowledge areas in digital information management to support the business vision of the CEO. Developing the library software and systems that would become standards in many regions across Canada was an example of this behavior. The learning culture of librarians and an encouragement at the highest levels of the library system ensured that the existing knowledge of the organization relentlessly grew as part of an expanding strategy. They were diligent in creating links into community groups to host databases, into publishers to access content, and into library consortia to set standards for tools and best practices. Equally strong was their appropriating strategy, which depends on networks of librarians in other organizations to bring knowledge into the library system. As the CEO noted, “librarians do share information at the drop of a hat so we have got a historically long standing relationship with all of the libraries [in the region].” Much of the knowledge in the organization was tacit and difficult to codify, making transfer through a leveraging strategy difficult. This important tacit knowledge was passed in face-to-face sessions including routine staff meetings, mentoring and group seminars.

#### 2.3.4.7 ManuServ – Manufacturing Outsourcing Services

The firm provided outsourced support to primarily automotive manufacturers. It offered a wide range of services, from fire and security, through cleaning, to semi-product manufacturing in primarily the automotive industry. While based in Ontario, it was a multinational firm with

operations in the United States and Mexico. The firm was very oriented towards expanding existing client relationships through the provision of new service lines. The fire and security service was based upon the development of work-force management techniques in the cleaning business and a presence in automotive plants combined with expertise in mission-critical software development and process engineering learned from the semi-product manufacturing industry. The firm was particularly adept at identifying underperforming processes in client firms and making those processes more efficient and cost effective through selecting the right experts to design and implement revised, outsourced systems.

The convergence of entrepreneurial spirit and process control made this firm an innovator, effectively balancing exploitation and exploration. Several managers noted the importance of application of IS and process design expertise for efficiency, where “the reason that [the firm] exists is because information systems are making visible areas of cost control that weren’t visible before” and “we are understanding our customer and developing systems that reflect where they are trying to go or where we think they are trying to go.” The entrepreneurial spirit was seen in the description of the company as “opportunity seeking,” having an “openness, willingness, and drive to get something done” and a degree of “aggressiveness.” The CEO outlined the orientation of the firm, stating:

“I help [the customer] get to that next level innovation because that is really what we are about. If we don’t have innovation we are not going to make money.... The reason we make extraordinary profits [is that] we are constantly defining how we do business, who we are, what we are. I guess that is what our innovation is. I don’t create a new device. I don’t create a new patent. I create a different way of doing business that is innovative.”

The CEO captured the probing strategy of the organization in a description of developing a new service area. “The reality is that I wanted that business.... We didn’t necessarily have an

understanding. We assembled a team. Each of us took a role in the research and understanding of it.” It was also captured in the creation of a ‘Futures’ group that was used to create new process and software to address emerging business needs including real-time process control and work scheduling. The firm was very adept at finding new applications for existing generic processes and software, expanding knowledge around the application area. Many times the processes they used were neither proprietary nor invented by the company, but were newly introduced to the automotive industry. In developing new capability areas, the firm did not hesitate to search for knowledge external to the firm – either in organizations or individuals – and appropriate it. The semi-product manufacturing capability was developed in this way, working closely with the company outsourcing the capability to the firm and hiring key individuals with industry and process control experience. With a widely dispersed operation, the firm relied heavily on technology in its leveraging strategy and was an early adopter of the Internet as a communications means. As the CEO noted, “early on we leveraged the web. It is kind of interesting if you look at the growth of our company, it has been growth with the Internet.”

#### 2.3.4.8 PubEd – Public School District

The firm was a public school district on the Prairies with over 40 primary and secondary schools within its jurisdiction. The district was an amalgamation of several smaller districts and came into being effective the end of 2005. The senior management of the new district was drawn from the previous organizations with the integration of personnel, processes and facilities being an ongoing concern. They described themselves as being open to innovation, both internal and external, but as operating in a conservative and traditional field. Integrating schools from the different former school boards required a focus on policy, standards and a shared understanding that defines the current strategy position.

The organization was very much an exploiter, working in a conservative industry with set expectations of the primary clients – parents and students. As one superintendent noted,

“education is a naturally conservative institution because everybody’s gone to school and have certain built-in beliefs and assumptions around what good learning is... you don’t really turn that kind of an institution on it’s ear so [change is] incremental.” Knowledge was more used to improve existing offerings than to create new ones. One manager noted, “we don’t really conduct a lot of internal research on new things.” A central concern of the school division was to develop professional learning communities, which were communities of practice for particular subject levels as a vehicle to improve communication, pass best practices and initiate new programs.

The leveraging strategy of the organization could be seen in these professional learning communities, as their intent was to efficiently distribute knowledge and leaven it across the widespread district. The strategy was also important administratively as a new policy and procedures manual was being prepared to standardize following amalgamation. The orientation of the organization to expand their knowledge could be seen in one superintendent's comment that “we’re a learning institution so I think capturing knowledge... the staff has to be learning in order to provide that learning environment.” This was very oriented at the individual teacher level, where, as another superintendent noted, “if they’re not getting the results that they want as far as their professional practice that they would go into an action research model in which they would... identify personal, professional goals for improvement and then go out and seek professional development opportunities or research opportunities to try to apply within the teacher’s classroom.” The use of an appropriating strategy was focused primarily on Universities and the provincial Ministry of Education. The Director of Education noted, “if we feel that we don’t have the expertise then we would bring the expertise in so there’s a seconding somebody for a period of time out of a classroom to help other teachers across the system or bringing somebody in from a consultant... or educational institutions.” Several individuals noted the lack of a centralized or coordinated development capability, leading to conclusions that there was a low use of the probing strategy.

### 2.3.5 Quantitative analysis

Having identified what knowledge strategies were in use by firms through qualitative analysis and with a wealth of data on the individual firms and their knowledge strategies, a more quantitative approach was used to determine the relationships between the strategies. The first step in the quantitative analysis was to create theory-based expectations of cross-mapping between the typologies. The approach selected was to identify the relative importance of von Krogh, Nonaka and Aben strategy to an idealized firm choosing one of Bierly and Chakrabarti's strategies. Four dimensions were expanded to reflect that they do not exist on a single continuum, but rather can have simultaneous high or low values on each factor, yielding a total of ten dimensions to be evaluated. Based on a review of the literature, the author and his supervisor independently coded the categories and resolved differences for the dimensions, resulting in Table 2-2. Appendix B summarizes the literature on which each decision was made.

Based on the theoretical profiles in Table 2-2, ideal values were set for each dimension to 1, 0, and -1 for high, medium, and low, respectively (Sabherwal and Chan, 2001). The Euclidean distance between strategies was calculated and an ideal profile determined, expressed in terms of each typology mapping on the other, as shown in Figure 2-2. The distance between typologies was calculated by taking the square-root of the sum of squares of the differences between the numeric values of two strategy profiles for each of the ten dimensions. The complete set of distance values is reported in Appendix C.

In the top half of Figure 2-2, Von Krogh, Nonaka and Aben's strategies are presented in descending rank order of importance, and the size of the font is indicative of the Euclidean distance from the Bierly and Chakrabarti strategy. For example, while leveraging is the most important strategy for loners relative to the other strategies, in absolute terms it is still not particularly close to the loner strategy, which is generally unfocused; hence it has a medium-sized font. In contrast, the intentional selection of a leveraging strategy by an exploiter is reflected in

**Table 2-2 – Typology Knowledge Strategy Profiles**

	Bierly and Chakrabarti (1996)				von Krogh <i>et al.</i> (2001)			
	Loner	Exploiter	Explorer	Innovator	Leveraging	Expanding	Appropriating	Probing
Source – Internal	MED	MED	HIGH	HIGH	HIGH	MED	LOW	MED
Source – External	LOW	HIGH	MED	HIGH	LOW	MED	HIGH	MED
Process – Creation	LOW	MED	HIGH	HIGH	LOW	HIGH	LOW	HIGH
Process – Transfer	LOW	HIGH	MED	HIGH	HIGH	LOW	HIGH	LOW
Focus – Exploitation	LOW	HIGH	LOW	HIGH	HIGH	HIGH	LOW	LOW
Focus – Exploration	LOW	LOW	HIGH	HIGH	LOW	LOW	HIGH	HIGH
Radicalness of Learning	LOW	LOW	HIGH	HIGH	LOW	MED	MED	HIGH
Speed of Learning	LOW	MED	HIGH	HIGH	HIGH	MED	MED	MED
Breadth of Knowledge	LOW	MED	HIGH	HIGH	MED	MED	HIGH	MED
Depth of Knowledge	LOW	LOW	MED	HIGH	MED	HIGH	MED	HIGH

**Figure 2-2 – Mapping of Ideal Knowledge Strategy Profiles**

		Bierly and Chakrabarti			
		Loner	Exploiter	Innovator	Explorer
von Krogh, Nonaka and Aben	Leveraging	Leveraging	Leveraging	Probing	Probing
	Expanding	Expanding	Expanding	Expanding	Appropriating
	Probing	Probing	Appropriating	Appropriating	Expanding
	Appropriating	Appropriating	Probing	Leveraging	Leveraging

		von Krogh, Nonaka and Aben			
		Leveraging	Expanding	Appropriating	Probing
Bierly and Chakrabarti	Exploiter	Exploiter	Exploiter	Explorer	Explorer
	Loner	Loner	Innovator	Exploiter	Innovator
	Innovator	Innovator	Explorer	Innovator	Loner
	Explorer	Explorer	Loner	Loner	Exploiter

both the relative preferences, as indicated by being first in rank order, and in absolute proximity to the exploiter strategy, as indicated by the large font. In the bottom half of Figure 2-2, the mapping is reversed so that the Bierly and Chakrabarti strategies are presented in descending rank order of importance, and the size of the font is indicative of the Euclidean distance from the von Krogh, Nonaka and Aben strategy.

The second step in the quantitative analysis was to identify the knowledge strategy profile of each firm based upon the narrative description from the case studies. Each interview and case summary was reviewed for indicators that matched the strategy dimensions based on interviewee responses. Perceptions of interviewees were considered acceptable measures as prior research has shown that managerial assessments of performance are closely correlated to objective performance indicators (Dess and Robinson, 1984). Firms were categorized as low, medium or high individually for each dimension and then compared at a cross-case level to confirm consistency.

The final step of the process was to take the firm profiles in Table 2-3 and convert them to numerical values, using the same 1, 0, and -1 classification for high, medium, and low levels used for the ideal profiles. The Euclidean distance between each firm's profiles and the ideal profiles for both of the two knowledge strategy typologies was calculated. Each firm was assigned a classification under the Bierly and Chakrabarti typology based upon the closest proximity and then the von Krogh, Nonaka and Aben strategies were rank ordered and sized in the same manner as done for the ideal profiles, as illustrated in Figure 2-3. Comparing the firm profiles to their corresponding ideal profiles, seven of the eight firms can be seen to concur with the expected rank order. In DistEd, the organization's mismatched profile as a loner was the sole exception. The ideal loner is an isolate, with a low reliance on the appropriating strategy, however while the other three strategies were in the anticipated order for DistEd, appropriation jumped from least to most heavily relied upon. It should be noted that the importance of an appropriating

**Table 2-3 – Firm Knowledge Strategy Profiles**

	CorrEd	ConEng	DistEd	DevEd	LegServ	PubLib	ManuServ	PubEd
Source – Internal	MED	HIGH	LOW	MED	HIGH	MED	HIGH	HIGH
Source – External	MED	HIGH	MED	HIGH	LOW	HIGH	HIGH	LOW
Process – Creation	LOW	LOW	LOW	HIGH	LOW	HIGH	HIGH	LOW
Process – Transfer	HIGH	HIGH	MED	MED	HIGH	MED	HIGH	HIGH
Focus – Exploitation	HIGH	HIGH	MED	MED	HIGH	MED	HIGH	HIGH
Focus – Exploration	LOW	MED	LOW	HIGH	LOW	HIGH	HIGH	LOW
Radicalness of Learning	LOW	MED	MED	HIGH	LOW	HIGH	HIGH	LOW
Speed of Learning	HIGH	MED	LOW	HIGH	LOW	MED	HIGH	LOW
Breadth of Knowledge	MED	HIGH	MED	HIGH	LOW	HIGH	HIGH	MED
Depth of Knowledge	HIGH	MED	LOW	MED	HIGH	MED	MED	MED

**Figure 2-3 – Firm Strategy Mapping on Typologies**

CorrEd	ConEng	DistEd	DevEd
Exploiter	Exploiter	Loner	Explorer
Leveraging Expanding Appropriating Probing	Leveraging Expanding Appropriating Probing	Appropriating Leveraging Expanding Probing	Probing Appropriating Expanding Leveraging
LegServ	PubLib	ManuServ	PubEd
Exploiter	Explorer	Innovator	Exploiter
Leveraging Expanding Appropriating Probing	Probing Appropriating Expanding Leveraging	Probing Expanding Appropriating Leveraging	Leveraging Expanding Appropriating Probing

strategy for this firm was a conscious decision as it represents an attempt to avoid the resource constraints that hampered the effectiveness of the organization. Hence, while DistEd had the strategy dimensions that most closely aligned its realized strategy with the loner profile, the

intended strategy may have be that of an exploiter or innovator as seen in its choice of strategies to deliberately enact (Mintzberg, 1978).

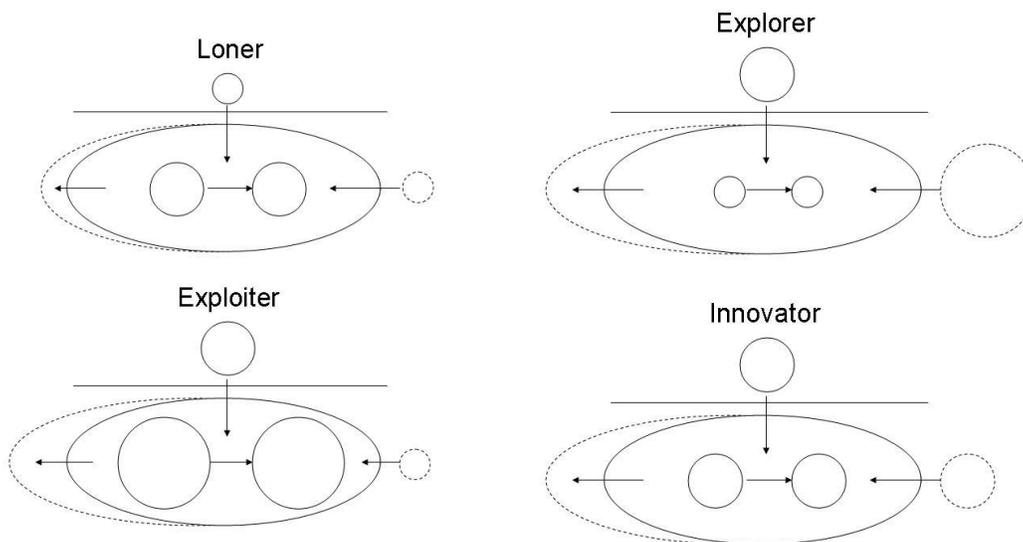
## **2.4 Discussion**

An important implication of the analysis can be found in the conceptualization of the relationship between the typologies. The relationship between the two knowledge strategy typologies can be envisioned by considering how one would group each within the other. In the case of grouping the four Bierly and Chakrabarti types under each different von Krogh, Nonaka and Aben category, it would be phrased in terms of expected employment. For example, under the leveraging strategy category, one would expect to see leveraging strategies employed most frequently in exploiters and least frequently in explorers. In the case of grouping the four von Krogh, Nonaka and Aben categories within the Bierly and Chakrabarti typology, it would be phrased in terms of anticipated use. For example, in the explorer category, one would anticipate frequent usage of probing strategies but rare usage of leveraging strategies. Expressed in another manner, it appears that an innovating strategy can be made up of a portfolio of weighted towards probing and appropriating strategies but a probing strategy cannot be made up of a weighted towards portfolio of explorer and innovator strategies.

This conceptualization leads to the proposal of a hierarchical relationship between the strategy typologies. Strategy can be defined as a pattern in a stream of decisions (Mintzberg, 1978). Both typologies meet this definition of strategy, but there may be different levels of strategy at which they operate. Business literature differentiates between corporate, business unit and functional strategies (Ansoff, 1965; Chandler, 1962; Porter, 1980). These two typologies address knowledge management at the business unit level. However within the business unit level, there can be discerned two categories of strategy – ‘grand strategy’ and ‘operational strategy’ – where grand strategy refers to the overarching goals that guide all business unit actions and operational strategy refers to the patterns of application of resources to achieve these

goals (Gleuck, 1976; Pearce, 1982; Hitt, Ireland and Palia, 1982). Just as grand strategy is predominant and of long duration, the Bierly and Chakrabarti typology is of enduring strategy types that change only infrequently. The von Krogh, Nonaka and Aben typology meets the criteria for operational strategy, in that a portfolio of strategies can be used either simultaneously or sequentially to develop different areas of knowledge within the organization to achieve the grand strategy. Therefore, while the Bierly and Chakrabarti typology is as an example of higher order grand strategy, the von Krogh, Nonaka and Aben typology is an example of a lower order operational strategy. They are therefore complementary rather than competing views. The ideal knowledge strategy portfolios presented in Figure 2-4 illustrate this, where the larger circles represent a greater reliance on the individual von Krogh, Nonaka and Aben operational strategy within a particular Bierly and Chakrabarti grand strategy.

**Figure 2-4 – Graphical Representation of Portfolios of Knowledge Strategies**



The differences between the typologies and suggested hierarchy can also be explained in terms of their assumptions regarding knowledge strategy. The von Krogh, Nonaka and Aben (2001) definition focuses on the “allocation of resources” (p. 435) whereas the Bierly and Chakrabarti (1996) definition focuses on “collective responses to... four strategic choices” (p.

124). This would suggest that the latter definition leads to an organizational position and set of beliefs that guide the selection of the former strategies, as is supported by the case study observations. Following the selection or evolution of the grand knowledge strategy, the operational knowledge strategies can be implemented sequentially or simultaneously.

The use of a sequential portfolio of knowledge strategies can best be illustrated by DevEd, the behavioral support and education firm that was classified as an explorer. The choice of a emphasizing a particular knowledge strategy over another can lead to different outcomes and a desired cumulative effect. Faced with immediate concerns regarding possible closure of the organization, the CEO chose an initial expanding strategy through the implementation of a professional development program to quickly reinforce the knowledge and capabilities of the organization. This was followed by an appropriating strategy to partner with external agencies to gain access to otherwise unavailable knowledge and create new opportunities. Once the organization's future was more secure, a probing strategy was used to develop unique capabilities and expand the range of services available. Throughout the changes in emphasis in operational strategies, the organization's grand strategy remained focused on knowledge exploration.

The use of a simultaneous portfolio of knowledge strategies can best be illustrated by ManuServ, the business outsourcing services firm that was classified as an innovator. This firm excels at maintaining parallel operational knowledge strategies throughout the organization, in spite of its small size. In the establishment of the semi-product manufacturing capability, all four strategies were applied simultaneously to stand-up the process. A core team was created to probe for knowledge regarding the process and how to automate it, new knowledge that was not available in the industry. Individuals were hired with experience in similar processes and the outsourcing partner's knowledge was tapped in order to appropriate knowledge for the firm. Knowledge of control system engineering was expanded into the real-time control domain. Experience in process control and work scheduling was leveraged from the manufacturing

cleaning domain into the new semi-product manufacturing domain. Consistently through out its history and the project, this firm has been focused on knowledge innovation.

## **2.5 Conclusions**

The core finding of this paper is that a hierarchy exists between two knowledge strategy typologies where consistent portfolios of operational knowledge strategies can support a grand knowledge strategy. Each typology was classified based on six underlying knowledge strategy dimensions and the two typologies were compared on those dimensions. The ideal relationships between typologies were compared to relationships found in eight case studies, with a high degree of congruence between the theoretic ideals and empirical findings. In examining the relationships between the two typologies, both conceptually and through the case studies, the hierarchy and portfolios became apparent.

### **2.5.1 Research and Management Implications**

First, the proposed hierarchical relationship between these two typologies illustrates how each can be used for different levels of analyses. While there is no apparent dominant knowledge strategy typology in the literature, as successive papers have defined their own typologies to establish contributions, the knowledge strategy field could benefit from adoption of common typologies (Choi and Lee, 2002). The acceptance of these two strategy typologies at two levels and the relationship between them would promote the development of a cumulative research tradition in the knowledge strategy domain.

Second, the establishment of a common set of dimensions upon which to compare knowledge strategies could also further the development of this research tradition. The six dimensions (operationalized to ten) provide a rich structure with which to study knowledge strategies in firms. Supporting this effort would be further study supporting the validity of these different dimensions.

For practitioners, the proposed concept of portfolios of operational knowledge strategies supporting a particular grand knowledge strategy may address a conceptual issue. One of the scarcest resources in firms is managerial attention and the focus of this attention determines what is done within the firm (Ocasio, 1997). The identification of knowledge strategy at the grand strategy level could allow for a common view of how a firm deals with its knowledge. In firms with fewer resources, choices may have to be made to develop a portfolio of operational knowledge strategies that can be tailored to support a desired or existing grand knowledge strategy. This understanding could be important to ensuring consistency in knowledge strategy within the organization.

### **2.5.2 Limitations**

There are inherent limitations of the analysis that suggest some caution in interpreting the results. First, as noted earlier, there are no perfect matches between the firms studied and the ideal knowledge strategy types, however to simplify analysis, each firm was classified into a single category in the Bierly and Chakrabarti typology. This means that while each firm was treated as a representative of a 'pure strategy', it exhibited characteristics of neighbouring strategies. While the mention was made of 'second-best fit' knowledge strategies to provide possible explanations for discrepancies in observations, no effort was made to discuss and test hybrid strategies in order to avoid complicating the analysis.

Second, the use of only two coders for the typology construction could be considered a limitation. This was a very complex classification and an additional rater would be of value to ensure validity of the construct and its dimensions.

The final limitation is the study reliance on small and medium enterprises in the sample. The von Krogh, Nonaka and Aben (2001) typology was developed in Unilever, a multinational firm employing nearly 200,000 people with world-wide turnover of €40 billion in 2007. The Bierly and Chakrabarti (1996) was developed through an analysis of the large firms in the

pharmaceutical industry. This study was undertaken in small and medium sized firms, ranging in size between 100 and 500 employees. While each of the types was represented in the sample, it is possible that the relationships are related to the organizations' sizes. However, all the strategy types examined were at the business unit level – each firm in the sample can be seen as having a single business unit, and hence the same concepts can be applied. While this argument can be made, it would require further research directly sampling small, medium and large firms to empirically support such a statement.

### **2.5.3 Future Research**

An issue that was neither examined nor resolved but requires future study is the relationship between knowledge strategy and its relationship to other strategies, including both those of the business and information systems. Specifically, neither the Bierly and Chakrabarti nor the von Krogh, Nonaka and Aben typologies have been used in studies of alignment within the firm. With the greater understanding of the knowledge strategies types developed in this paper, there is an opportunity to apply this knowledge in the wider context of aligned firm strategies.

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## Appendix A – Semi-Structured Interview Questions

Question	Construct	Indicator
Where do you get the majority of your knowledge?	Knowledge Source	Internal knowledge is unique, specific and tacit External knowledge is broader and related to industry Unbounded learning balances the two sources
Do you use your knowledge more to create new products or to exploit existing ones?	Knowledge Focus	Exploration focuses on creating or acquiring knowledge Exploitation focuses on using knowledge across niches Innovation balances between the two focuses
How much does learning challenge assumptions of the organization?	Radicalness of Learning	Radical learning challenges a firm's basic assumptions Incremental learning gradually expands knowledge base
How quickly can your organization learn from new knowledge?	Speed of Learning	Fast learning can lead to first mover advantage
Do you focus more on transferring existing knowledge or creating new knowledge?	Knowledge Process	Transfer relates to ensuring access to knowledge Creation relates to focusing on innovative knowledge
How specialized or general is the knowledge in the organization?	Breadth of Knowledge	Specific is narrowly focused on core competencies General is widely focused and allows flexible combination

## Appendix B – Coding Theory Basis

Source - Internal	Leveraging	HIGH	The leveraging strategy is focused on the internal movement of knowledge, whereas the expanding and probing strategies can benefit from both internal and external learning. Appropriating has no focus on the internal movement of knowledge.v Innovators have the highest level of internal learning, while explorers have a good balance between internal and external learning. Loners spend more than the average on internal R&D, but are ineffective learners, while exploiters spend the least on R&D, but are effective and efficient learners.ii Explorers focus more on internal than external learning. i
	Expanding	MED	
	Appropriating	LOW	
	Probing	MED	
	Loner	MED	
	Exploiter	MED	
	Explorer	HIGH	
	Innovator	HIGH	
Source - External	Leveraging	LOW	The leveraging strategy has no focus on the external movement of knowledge, whereas the expanding and probing strategies can benefit from both internal and external learning and the appropriating strategy is uniquely focused on movement of knowledge from the external environment into the firm. v Innovators and exploiters are strong in external learning, while explorers have a good balance between internal and external learning and loners have very low external linkages and are isolated. ii
	Expanding	MED	
	Appropriating	HIGH	
	Probing	MED	
	Loner	LOW	
	Exploiter	HIGH	
	Explorer	MED	
	Innovator	HIGH	
Process - Creation	Leveraging	LOW	Expanding and probing strategies are defined as those oriented to creation, so they are classified high, in contrast to the transfer orientation of leveraging and appropriating strategies which are classified low. v Exploiters focus on improvements to competitors' products rather than their own breakthroughs, while explorers spend their limited resources on creating new products. In contrast, innovators successfully develop, produce and replicate new products and services while loners are slow to create any new knowledge. ii
	Expanding	HIGH	
	Appropriating	LOW	
	Probing	HIGH	
	Loner	LOW	
	Exploiter	MED	
	Explorer	HIGH	
	Innovator	HIGH	
Process - Transfer	Leveraging	HIGH	Leveraging and appropriating strategies are defined as those oriented to transfer, so they are classified high, in contrast to the creation orientation of expanding and probing strategies. v Explorers have less internal and external linkages than innovators, preventing them from fully exploiting their breakthroughs, while exploiters have good linkages both internally and externally and loners have difficulty moving and integrating different streams of knowledge internally or externally. ii
	Expanding	LOW	
	Appropriating	HIGH	
	Probing	LOW	
	Loner	LOW	
	Exploiter	HIGH	
	Explorer	MED	
	Innovator	HIGH	
Focus - Exploitation	Leveraging	HIGH	The exploitation of existing knowledge domains is stressed in the leveraging and expanding strategies, but de-emphasized in the appropriating and probing strategies. v By definition, exploiters are high in exploitation and explorers are low, while loners are inward-looking but unfocused, and innovators blend exploitation and exploration. ii Exploration and exploitation are not mutually exclusive, as seen in the innovator.vi
	Expanding	HIGH	
	Appropriating	LOW	
	Probing	LOW	
	Loner	LOW	
	Exploiter	HIGH	
	Explorer	LOW	
	Innovator	HIGH	

Focus – Exploration	Leveraging	LOW	The exploration of new knowledge domains is stressed in the appropriating and probing strategies, but de-emphasized in the leveraging and expanding strategies. v By definition, explorers are high in exploration whereas exploiters are low, loners are unfocused, and innovators blend exploitation and exploration. ii
	Expanding	LOW	
	Appropriating	HIGH	
	Probing	HIGH	
	Loner	LOW	
	Exploiter	LOW	
	Explorer	HIGH	
	Innovator	HIGH	
Radicalness of Learning	Leveraging	LOW	The leveraging of internal knowledge is the least radical form of learning, followed by the incremental expansion of existing knowledge. ii More radical are the internalization of partner knowledge and development of new knowledge areas from scratch. v Explorers are the most radical learners, innovators balance highly effective radical and incremental learning, exploiters focus more on incremental than radical learning and loners are ineffective learners. ii
	Expanding	MED	
	Appropriating	MED	
	Probing	HIGH	
	Loner	LOW	
	Exploiter	LOW	
	Explorer	HIGH	
	Innovator	HIGH	
Speed of Learning	Leveraging	HIGH	Internal learning is generally faster than external and transfer is generally faster than creation, leading to leveraging being the fastest strategy, and each of the other strategies suffering from at least one obstacle to rapid dissemination. Innovators are the fastest learners, explorers and exploiters are less aggressive learners than innovators, and loners have a very slow technology cycle time. ii Explorers are typically technology leaders and focus on the rapid development of new knowledge to gain first-mover advantage.i
	Expanding	MED	
	Appropriating	MED	
	Probing	MED	
	Loner	LOW	
	Exploiter	MED	
	Explorer	HIGH	
	Innovator	HIGH	
Breadth of Knowledge	Leveraging	MED	Broad knowledge is a necessity for developing the absorptive capacity to identify and integrate knowledge,iii making it important for all strategies, but particularly for appropriating strategies. Knowledge dispersion is very low in loners, compared to explorers who have wide dispersion. Exploiters have broad but shallow knowledge bases, but innovators have both broad and deep knowledge. ii
	Expanding	MED	
	Appropriating	HIGH	
	Probing	MED	
	Loner	LOW	
	Exploiter	MED	
	Explorer	HIGH	
	Innovator	HIGH	
Depth of Knowledge	Leveraging	LOW	Depth of knowledge is a necessity for developing the combinative capacity to recombine and develop new knowledge,iv making it least important for leveraging and appropriating and most for expanding and probing strategies. Loners have limited knowledge bases, explorers have very broad knowledge and some depths in specific areas, innovators have both broad and deep knowledge, but exploiters have broad but shallow knowledge bases. ii
	Expanding	HIGH	
	Appropriating	LOW	
	Probing	HIGH	
	Loner	LOW	
	Exploiter	LOW	
	Explorer	MED	
	Innovator	HIGH	
i – Bierly (1999); ii – Bierly and Chakrabarti (1996); iii – Cohen and Levinthal (1990); iv – Kogut and Zander (1992); v – von Krogh, Nonaka and Aben (2001); vi – Zack (1999)			

## Appendix C – Analysis Tables

Distances between Knowledge Strategy Typologies				
	Leveraging	Expanding	Appropriating	Probing
Loner	3.87	4.00	4.47	4.36
Exploiter	2.83	3.32	3.61	4.69
Innovator	4.24	3.61	3.87	3.46
Explorer	4.36	3.74	3.46	2.24

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Distances between firms and knowledge strategy typologies								
	Leveraging	Expanding	Appropriating	Probing	Loner	Exploiter	Innovator	Explorer
CorrEd	1.73	3.16	3.74	4.58	4.24	2.65	3.87	4.47
ConEng	2.45	3.00	3.32	3.74	4.36	2.45	2.45	3.00
DistEd	3.61	3.46	3.16	4.12	2.45	2.65	5.00	4.47
DevEd	4.47	3.32	3.00	2.45	5.20	3.74	2.00	1.73
LegServ	2.45	3.61	4.80	4.90	3.61	3.46	4.90	5.20
PubLib	4.69	3.00	3.00	2.00	5.20	4.00	2.00	2.24
ManuServ	4.12	3.74	3.74	3.61	5.83	3.61	1.00	2.45
PubEd	2.45	3.00	4.12	4.47	3.61	2.00	4.00	4.36

## Appendix D – Case Study Coding

<b>CorrEd Coding</b>		
Source – Internal	MED	The firm has a well-developed handbook, but recognizes that there is a large tacit component of their work that is a factor of the correctional environment in which they work. Tacit knowledge is increased by the operational idiosyncrasies of various institutions, which is difficult to internalize.
Source – External	MED	There is a robust informal network between the firm and the correctional institutions they support, but the procedures for gaining new knowledge through IS not formalized. Contracting information is generally found on the Internet, along with much of the policy and procedures of supported institutions.
Process – Creation	LOW	Very little new knowledge is created in the firm.
Process – Transfer	HIGH	Due to the isolated and dispersed nature of the workforce, the firm concentrates on transferring knowledge between sites and from other partners.
Focus – Exploitation	HIGH	The focus of the organization is on improving the core processes involved in delivering correctional education.
Focus – Exploration	LOW	There is a limited amount of work being done on a new mediation task, but this work is most often hampered by the demands of the core business.
Radicalness of Learning	LOW	The development of the core business knowledge has been incremental, expanding slowly through primarily geographic extensions into new regions.
Speed of Learning	HIGH	Maintaining a very small head office and having a flat organization has helped the firm maintain a high speed of knowledge dissemination.
Breadth of Knowledge	MED	There is a relatively broad base of educational knowledge held in common across the educators.
Depth of Knowledge	HIGH	The core competence of the firm is in the management of education in a correctional setting, and they maintain deep knowledge of the correctional system and how to deliver their services in this environment.

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### ConEng Coding

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Source – Internal	HIGH	Firm uses a robust document management system. Well developed policy and procedures manual used by most personnel. High reliance on tacit knowledge held by individuals in the company ref bidding and estimation.
Source – External	MED	Relies on the Internet for finding job and process information. Have been involved in partnering through the use of joint ventures.
Process – Creation	MED	Some patents have been created within the company and new capabilities – such as a green-field concrete plant – have been developed.
Process – Transfer	HIGH	The firm focuses on moving knowledge within the organization and bringing it in using joint ventures.
Focus – Exploitation	HIGH	Tasks are repetitive, so the emphasis on the company is on increasing efficiency of currently held resources.
Focus – Exploration	MED	The firm has explored for new knowledge in such areas as establishing green-field concrete plants.
Radicalness of Learning	MED	The firm is balanced between those who feel that the changes implemented are radical and those who feel that they are incremental – there appears to be a balance within the firm.
Speed of Learning	MED	The firm generally has a good system for distributing knowledge quickly, but the industry itself is rather conservative and may slow some dissemination.
Breadth of Knowledge	HIGH	The firm has broad knowledge of the field and is capable of integrating external knowledge effectively.
Depth of Knowledge	MED	The firm is described as having strong core competencies, but not being at the leading edge of any one particular specialty. In a specific area, they may be outperformed by a specialist company, but they have a broader package of skills.

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**DistEd Coding**

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Source – Internal	LOW	Extremely high turnover has prevented the development of deep tacit knowledge. SOPs were described as not capturing the full complexity of the roles. Internal information systems fail to support operations effectively.
Source – External	MED	The organization is well connected with partner education institutions and an industry association.
Process – Creation	LOW	Very little evidence of creation of new knowledge within the organization.
Process – Transfer	MED	A rudimentary Intranet exists to capture and transfer codified knowledge, but it is incomplete. Transfer of external knowledge is used to bolster internal weaknesses.
Focus – Exploitation	MED	The primary focus is on improving the quality of the delivery vehicle for distance education.
Focus – Exploration	LOW	There is some high-level attention paid to provision of new services, but most new knowledge is focused on improving existing services.
Radicalness of Learning	MED	The operation of the distance education organization is very different from the rest of the university and challenges its conservative assumption. Overall, the ideas are not that radical, but in the environmental context, they may be seen to be.
Speed of Learning	LOW	The bureaucracy of the organization prevents the rapid adoption of innovation and slows its dissemination.
Breadth of Knowledge	MED	The organization has a relatively broad set of experience and knowledge, which enables them to absorb knowledge that they acquire.
Depth of Knowledge	LOW	Creating deep knowledge within the organization is difficult due to the high turnover experienced.

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**DevEd Coding**

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Source – Internal	MED	Very low turnover has resulted in high degree of tacit knowledge reliance in organization. Recent work has focused on the explication of tacit knowledge, particular in the area of administrative services.
Source – External	HIGH	External consultants were brought in to refine administrative procedures. Very linked into community, research institutions, and health and community services organizations and ministries. New CEO was brought in from outside to renew organization. The majority of new initiatives have resulted from leveraging external contacts.
Process – Creation	HIGH	The growth focus of the organization is used to create new knowledge both from existing stocks and in new areas.
Process – Transfer	MED	The establishment of academic partnerships and the sharing of knowledge within the organization highlight the importance of transfer, but to a lesser extent than creation.
Focus – Exploitation	MED	The internal focus of the staff is on increasing the effectiveness of current knowledge.
Focus – Exploration	HIGH	The organization is driven by the CEO's vision of new knowledge and service areas, as seen in the establishment of a regional expertise in a particular disorder.
Radicalness of Learning	HIGH	The CEO seeks to constantly challenge the assumptions of the organization by extending the vision of the firm and the areas where it provides services.
Speed of Learning	HIGH	In parallel to the focus on challenging assumptions, the CEO is focused on making rapid, cumulative changes to the organization. Those individuals not comfortable with fast change have left the organization.
Breadth of Knowledge	HIGH	The organization has a very broad knowledge of their field and the neighboring fields into which they have ventured. This base of knowledge has enabled them to recognize and absorb new knowledge into the organization.
Depth of Knowledge	MED	The organization develops deep knowledge where it needs it, but this appears to develop in silos to meet business needs as opposed to being completely focused in one knowledge area or consistent across the organization.

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**LegServ Coding**

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Source – Internal	HIGH	The legal system is based on codification and precedence and so there is a great deal of explicit knowledge supporting the operation of the organization. Given the idiosyncrasies of each client group, there is also a large volume of tacit knowledge internal to the organization. With very low turnover, the tacit knowledge has built substantially.
Source – External	LOW	The organization generally does not look outside for new knowledge, but in the case where a precedence has been successfully established, an innovation may be brought in.
Process – Creation	LOW	Due to the traditions of the organization, there is very little new knowledge creation undertaken.
Process – Transfer	HIGH	Standardization and the explicit following of rules and regulations are key to the operation of the organization. While the majority of the knowledge is transferred in a codified form, there is a significant volume of tacit knowledge regarding the operation of the organization that is passed through anecdotes and stories.
Focus – Exploitation	HIGH	The focus of the organization is on improving the efficiency and effectiveness of the current services delivered to the client groups.
Focus – Exploration	LOW	Due to the environment, there is little scope for experimentation or extensive knowledge search for new processes and services.
Radicalness of Learning	LOW	The organization operates in a very conservative environment and is only able to innovate through incremental means.
Speed of Learning	LOW	The organization operates in a very conservative environment and is only able to innovate gradually.
Breadth of Knowledge	LOW	The knowledge required within this field is very specialized and is narrow.
Depth of Knowledge	HIGH	The knowledge required within this field is very specialized and is very deep.

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**PubLib Coding**

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Source – Internal	MED	The librarians have good tacit knowledge of the library system and have an open internal network that encourages innovation and ideas. Business processes are partially documented and available on an Intranet.
Source – External	HIGH	The library is very generous in funding conference and seminar participation to bring in new knowledge. Each individual comment on the extent of their informal and formal networks external to their own library system.
Process – Creation	HIGH	The organization is very strong at creating new services, particularly their e-services division, where software and services were provided to the wider library community.
Process – Transfer	MED	While there is strong transfer with the library community and the city they support, the organization has some issues with transferring knowledge internally.
Focus – Exploitation	MED	There is a balance between exploitation and exploration in this organization, where the paper-based component is very interested in increasing efficiency, primarily in regards to how to increase hours open.
Focus – Exploration	HIGH	There is a balance between exploitation and exploration in this organization, where the cultural space and e-services components of the organization are interested in increasing the breadth of services available. The balance is slightly in favor of exploration as new services are a focus.
Radicalness of Learning	HIGH	Librarians are quite open to change and this is particularly apparent in e-services, where the focus is on staying at the forefront of provision of services to the community. While changes are embraced within the organization, the external reactions from the city council and community show the how assumptions are being challenged.
Speed of Learning	MED	Because of their reporting relationship with the city and the requirement for budget approval, large changes in direction and learning can take time, though individuals are very enthusiastic and can learn very quickly.
Breadth of Knowledge	HIGH	The skills and knowledge of the individuals in the organization are very broad and can be applied in a wide range of environments and contexts. This breadth allows for the recognition and exploitation of new knowledge.
Depth of Knowledge	HIGH	There is very deep and specific knowledge related to the provision of library services and both through traditional face-to-face and emerging electronic means.

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**ManuServ Coding**

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Source – Internal	MED	The core expertise of the organization is customer relationship management and problem solving. These two types of expertise are held internally, but are externally focused on current and potential clients.
Source – External	HIGH	The firm’s expertise is in two ways related to external sources of knowledge. First, they generate their business by being able to identify problems with their clients’ operations which become their opportunities. Second, they do not hesitate to identify external sources of knowledge to address those opportunities and secure those sources.
Process – Creation	HIGH	The firm is very adept at creating new processes to meet the business needs of their clients.
Process – Transfer	HIGH	The firm is able to source and secure information and move it throughout the organization to other client sites very quickly. Many procedures and software components are reused from one application to another.
Focus – Exploitation	HIGH	The firm is very adept at improving processes once they are brought in-house from the client. Their talent in process re-engineering, refinement and management are keys to their success.
Focus – Exploration	HIGH	The firm is very effective at finding new knowledge through research and experimentation in order to improve processes. They appear to successfully combine exploration and exploitation into double-loop learning.
Radicalness of Learning	HIGH	The firm is very opportunity seeking and aggressive, with little concern for challenging assumptions.
Speed of Learning	HIGH	The firm maintains a very entrepreneurial spirit and is very quick to acquire and disseminate knowledge throughout the organization.
Breadth of Knowledge	HIGH	The firm has very broad knowledge that allows them to recognize and seize opportunities, finding the correct mix of existing and new knowledge to meet the task.
Depth of Knowledge	MED	There is deep knowledge within the organization, but it exists in silos where needed to support a particular business process. There is not uniformly deep knowledge throughout the organization.

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**PubEd Coding**

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Source – Internal	HIGH	Much of the knowledge of the division stems from teachers and administrators in the field – those within the system itself.
Source – External	MED	Some knowledge stems from professional development opportunities and other from members of the community, but this is to a lesser degree than the internal sources.
Process – Creation	MED	The school system is fairly conservative but new people bring new ideas and knowledge into the system. The use of technology within the organization is seen as creative.
Process – Transfer	HIGH	Standardization is an important part of curriculum delivery so transfer is a critical process to the organization.
Focus – Exploitation	HIGH	The organization is focused on improvement and renewal of existing processes and knowledge content.
Focus – Exploration	LOW	Given the attention required on the provision of existing core services, there is little scope for the organization to focus on the development of new service lines.
Radicalness of Learning	LOW	The school board is described by its own head as being in a conservative field that evolves incrementally.
Speed of Learning	LOW	The bureaucratic nature of the education system tends to slow the diffusion of innovation and learning.
Breadth of Knowledge	MED	The organization balances between relatively broad knowledge regarding the education field as a whole and specialization through divisionalization to create depth.
Depth of Knowledge	MED	The organization balances between relatively broad knowledge regarding the education field as a whole and specialization through divisionalization to create depth.

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## **Chapter 3**

### **Knowledge Strategy and Strategic Alignment**

#### **Abstract**

The paper extends the discussion of strategic alignment into the knowledge domain by pairing Bierly and Chakrabarti's (1996) knowledge strategies with Miles and Snow's (1978) business strategy types and Sabherwal and Chan's (2001) IS strategy types. Survey data was analyzed using profile deviation and covariation conceptualizations of fit for conservative, proactive, balanced and non-viable strategy portfolios of business, information systems and knowledge strategies. Findings support the general alignment hypothesis that the alignment of strategies in a firm is associated with higher firm performance. Additionally, significant differences among business strategies alone and the aligned portfolios indicate that the choice of information systems and knowledge strategies in the firm can have significant impacts on business performance. Finally, the results indicate that knowledge strategy may dominate performance considerations in business-IS-knowledge strategic alignment.

#### **3.1 Introduction**

While over two decades of managerial attention and action has resulted in significant progress in the alignment between information systems (IS) and business strategies, strategic alignment remains a management concern (Luftman, Kempaiah and Nash, 2006). Interest in the alignment of business and IS originally arose due to the move of IS from a back-office automation to strategic role (Henderson and Venkatraman, 1993). Considerable effort has been

expended on research into the organizational fit of information systems since both Boynton and Zmud's (1987) call for focused research in this area and Iivari's (1992) critique on the state of its cumulative tradition. In spite of the level of interest shown by management and academe (Chan and Reich, 2007), not much practical advice has been provided to industry (Luftman, Papp and Brier, 1999) as neither researchers nor practitioners appear to have mastered alignment (Chan, 2002). Additionally, as research and practice have struggled with the alignment of information systems and business strategies, the management of knowledge in organizations has become of greater importance.

The rise in importance of information and knowledge can be seen in the consideration given to the capacity of knowledge to generate value (Nonaka and Takeuchi, 1995; Spender and Grant, 1996). It can also be seen in knowledge strategies, such as those described in Chapter 2, that are independent of business strategies (Bierly and Chakrabarti, 1996; von Krogh, Nonaka and Aben, 2001; Zack, 1999). Alignment of these knowledge strategies within the firm and their contribution to firm value and performance can then be seen as an important issue for practice. The aim of this paper is to extend the concept of strategic alignment to include the knowledge management domain by explicitly integrating knowledge strategy with IS and business strategies.

Following this introduction, the next section examines theory development, focusing on concepts of strategic alignment, strategies (including business, information systems and knowledge) and profiles of strategic alignment (including two different conceptualizations of fit). The following section outlines the methodology of the study, focusing on operationalization of strategy, alignment and performance, on data collection and on data analysis for both profile deviation and covariation conceptualizations of fit. The subsequent section presents the results, covering both the identification of strategy types and the impacts of their alignment. The final section discusses the implications of the findings, acknowledges limitations of the study and suggests avenues for future research.

## 3.2 Theory Development

In developing a model to address the integration of knowledge strategy into strategic alignment, two theory areas need to be considered: strategic alignment (including its conceptualization) and strategies (including business, information systems and knowledge).

### 3.2.1 Strategic Alignment

The concept of alignment is derived from contingency theory, in which models share the premise that “context and structure must somehow fit together if the organization is to perform well” (Drazin and Van de Ven, 1985, p 514). Fit has been conceptualized in multiple fashions. Venkatraman and Camillus (1984) identified and classified six such conceptual perspectives, based upon two dimensions: domain of fit (internal, integrated or external) and conceptualization of fit (as content of fit or patterns of interactions). Drazin and Van de Ven (1985) interpret fit in accordance with the selection, interaction and systems approaches to structural contingency theory. Accurate conceptualization of fit is important, as “the key concept in a contingent proposition is fit, and the definition of fit that is adopted is central to the development of the theory” (Drazin and Van de Ven, 1985, p. 515). Bergeron, Raymond and Rivard (2001) demonstrated how each of Venkatraman’s (1989b) categories of fit when applied to a common set of data can yield different results. This implies that “each approach to fit is theoretically and empirically different, thus the need for a clear theoretical justification of the specific approach adopted by the researcher” (Bergeron *et al.*, 2001, p. 138).

Much early alignment research has dealt with the alignment between the organization’s strategy or structure and its environment (Prescott, 1986; Venkatraman and Prescott, 1990). Information technology is a specialized form of fit research that originally looked at technology in general (Alexander and Randolph, 1985; Barley, 1990). IS strategic alignment has been defined as “the fit between the priorities of the IS function and those of the business unit” (Chan,

2002, p. 98), “the alignment between business unit strategic orientation and IS strategic orientation” (Chan, Huff, Barclay and Copeland, 1997, p. 132) and “the degree to which the IT mission, objectives, and plans support and are supported by the business mission, objectives, and plans” (Reich and Benbasat, 1996, p. 56). Higher strategic alignment between business and IS strategy has been found to lead to superior performance compared to lower levels of strategic alignment (Oh and Pinsonneault, 2007). Additionally, alignment has been found to be a better predictor of perceived performance than realized business strategy itself both in large firms (Chan *et al.*, 1997) and small businesses (Cragg, King and Hussin, 2002). Business and IS strategy alignment has been empirically shown to result in higher performance in several studies (Bergeron, Raymond and Rivard, 2001, 2004; Burn, 1996; Chan, Huff and Copeland, 1998; Chan, Sabherwal and Thatcher, 2006; Sabherwal and Chan, 2001; Sabherwal and Kirs, 1994).

Alignment studies are often framed in terms of typologies. One of the most common business strategy typologies used in alignment studies is that of Miles and Snow (1978). Prospectors have been found to be aggressive in their pursuit of technology as a group, narrowing the differences among individual firms and making technology more of a cost for this group than a contributor to success; defenders are generally more conservative in their investments in technology, focusing on those areas directly related to their core business, and thus contributing to their competitive advantage (Dvir, Segev and Shenar, 1993). Similarly, prospectors and defenders have been shown to differ in the extent to which they consider IS strategy in the development of business strategy, where prospectors’ IS strategy is more responsive than that of defenders (Tan, 1995). Hirschheim and Sabherwal (2001) identified three alignment profiles – infusion (alignment through business leadership), alliance (alignment through partnering) and utility (alignment through low cost delivery) – which corresponded with prospectors, analyzers and defenders.

Not all studies found consistent results across types. Sabherwal and Chan (2001) used a profile deviation approach to find that alignment between business and IS strategies is associated with firm performance. Prospector and analyzers were both found to have significant impacts, however the results for defenders were not significant. Croteau and Bergeron (2001) used a covariation approach to find that technology deployment was positively linked to prospectors and analyzers, negatively linked to defenders and not linked to reactors. Denford and Chan (2007) found a high degree of consistency among IS strategic alignment study results along typology lines and support for a moderating effect of business strategy on the relationship between IS strategic alignment and business performance, where analyzers show the greatest performance impact from alignment, with lesser impact seen in prospectors and defenders. While the support for the importance of IS strategic alignment may not be universal, there is a preponderance of evidence supporting strategic alignment as a viable hypothesis.

In comparison to business or IS strategy, the consideration of the effects of knowledge strategy in alignment has not been well represented in the literature. The importance of harmonized knowledge and business strategies has recently been suggested – but not empirically tested – in the knowledge strategy literature (Nicolas, 2004). Similarly, a relatively new view of strategic alignment focuses on the importance of aligning business and knowledge strategies, reflecting the importance of knowledge as a critical organizational resource (Snyman and Kruger, 2004). This follows earlier knowledge strategy theorizing, as Zack (1999a) noted that business strategy provided the most important context for the development of knowledge management and knowledge strategy. Extending further into the IS domain, Chan, Denford and Jin (2009) conducted a study of knowledge and information systems strategic alignment, finding significant relationships between strategy alignment and performance. While these two-aligned-strategy combinations are the basis for higher performance, there is the possibility of additional synergy created when the three strategies are aligned. Therefore, the first hypothesis is as follows:

Hypothesis 1. The strategic alignment of business strategy, IS strategy and knowledge strategies is positively associated with perceived business performance.

### **3.2.2 Strategy**

Strategy is a very broadly applied term that needs specific definition to be useful. Strategies can be intended or realized (Mintzberg, 1978). Intended strategies are those that are official and may be written down, whereas realized strategies are those reflected in decision making, resource allocation, and activities conducted by the organization (Chan, Huff and Copeland, 1998). Intended strategies that get realized are termed deliberate strategy while those that fail to be realized are unrealized strategy; unintended strategies that get realized are termed emergent strategies (Mintzberg, 1978). Strategies can be at the corporate or business unit level (Beard and Dess, 1981) where corporate strategies concern the selection of businesses to operate in and how business units should be managed, while business strategies concern the creation of competitive advantage (Porter, 1980). Finally, there is a distinction between a strategy's content and the process by which it was created (Sabherwal and Chan, 2001). Following the view of strategy as pattern (Mintzberg, 1987) and as being realized (Mintzberg, 1978), "strategy exists in the cognition of managers but is also reified in what companies do" (Gavetti and Rivkin, 2007, p. 435). In order to focus attention on the impacts of strategy on competitive advantage and its influence in alignment, strategy is viewed as realized patterns of action that influence resource allocation and activities conducted at the business unit level.

#### **3.2.2.1 Business Strategy**

There are several different approaches by which competitive strategy can be operationalized, including typologies and comparative measures (Chan and Huff, 1992). At the business strategy typology level, Miles and Snow (1978) developed four business strategy profiles: defenders, prospectors, analyzers, and reactors. Defenders are stable organizations with

predictable and narrow product domains offered at low prices. They devote attention to improving efficiency in their current operations as opposed to seeking out new ventures. Prospectors continually seek out new market opportunities and create change and uncertainty in their industries. The price of their flexibility and rapidity is a low operational efficiency. Analyzers operate in a stable domain, where firm operations are run efficiently, and an opportunistic domain, where the firm seeks out new products and market opportunities. Reactors are unable to respond to change effectively or to induce change in the industry, making strategic adjustments only when they are forced to do so and lack a consistent strategy-structure relationship. All but the reactor is seen as a consistent and viable strategy (Sabherwal and Chan, 2001). Miles and Snow's (1978) typology was a strong foundation for this study as it is in wide use and its validity has been generally supported (Shortell and Zajac, 1990). Additionally, adherence to one of Miles and Snow's (1978) prospector, analyzer or defender profiles has been shown significantly linked to higher performance (Doty, Glick and Huber, 1993).

Using a business strategy comparative measure approach, Venkatraman (1989a) developed six dimensions of the strategy construct, of which three are the most representative of the three viable types: analyzers with analysis, defenders with defensiveness and prospectors with proactiveness (Chan *et al.*, 1998; Sabherwal and Chan, 2001). Drawing on Miller and Friesen (1978), analysis is conceptualized as "the extent of tendency to search deeper for the roots of problems, and to generate the best possible solution alternatives" (Venkatraman, 1989a, p. 948). Defensiveness is drawn from Miles and Snow's (1978) work, reflecting the tendency to emphasize cost reduction and increased efficiency. Proactiveness is also drawn from Miles and Snow (1978), reflecting "participation in emerging industries, continuous search for market opportunities, and experimentation with potential responses to changing environmental trends (Venkatraman, 1989a, p. 949).

### 3.2.2.2 Information Systems Strategy

IS strategy is long-term guidance concerned with “aligning IS development with business needs and with seeking strategic advantage from IT” (Earl, 1989, p. 63). This is differentiated from IM strategy, which deals with effectively managing IS resources, and IT strategy, which deals with developing technical policies and architectures (Earl, 1993). A number of different typologies and dimensions of IS strategy have been proposed. Sabherwal, Hirschheim and Goles (2001) used a typology consisting of low cost, differentiation, growth, alliance and innovation IS strategy components. Croteau and Bergeron (2001) identified cost reduction, growth, advantage, and differentiation dimensions of strategic impact, which can be mapped similarly to the Sabherwal *et al.* (2001) taxonomy. Sabherwal and King (1991) noted that it is difficult to separate differentiation, growth, alliance, and innovation IS strategies, so it is possible to identify three viable IS strategy groups. One group focuses on a low-cost IS strategy, one on a combination of differentiation, growth, innovation or alliance, and one that balances both foci (Hirschheim and Sabherwal, 2001; Sabherwal and Chan, 2001). An efficiency IS strategy focuses on internal and interorganizational efficiency and long-term decisions; an opportunistic or flexible IS strategy focuses on market flexibility and quick decisions; and a comprehensiveness IS strategy balances the two, enabling thoroughly considered decisions while maintaining responsiveness (Hirschheim and Sabherwal, 2001; Sabherwal and Chan, 2001).

In addition to typological approaches, a number of studies have examined dimensional approaches. Bergeron, Raymond and Rivard (2004) defined IT strategy in terms of two dimensions: IT environment scanning and strategic use of IT. IT environment scanning denotes the firm's capacity to detect and react to technological change in its competitors; strategic use of IT denotes the firm's capacity to use IT to improve performance, quality and competitiveness of its products or services. Sabherwal and Chan (2001) conceptualized IS strategy based on the types of systems predominant in different strategic types. Specifically, they looked at the varying

levels of dependence on operational support systems, market information systems, strategic decision support systems and interorganizational information systems. IS strategies can also be defined as the actual provision of technological support for information acquisition, storage, transfer and retrieval (Adams and Lamont, 2003; Chan *et al.*, 1997). Acquisition involves capturing information during the course of the firm's engagement in day-to-day actions with the environment, playing an important role in market oriented systems. Storage is electronically recording information, which is important to operational systems such as transaction processing systems and the strategic decision systems which draw on them. Transfer incorporates connecting dispersed information repositories to enable knowledge collection and sharing, important features for inter-organizational systems and market-oriented systems. Retrieval involves facilitating searches for useful information, playing an important role in operational, market-oriented and strategic decision systems. Denford and Chan (2007) noted convergence of typologies and dimensions (Croteau and Bergeron, 2001; Das, Zahra and Warkentin, 1991; Hirschheim and Sabherwal, 2001; Sabherwal *et al.*, 2001) towards a single typology including IS for Efficiency, IS for Flexibility and IS for Comprehensiveness types (Sabherwal and Chan, 2001).

#### 3.2.2.3 Knowledge Strategy

Knowledge management refers to the portfolio of procedures and techniques used to get the most from a firm's knowledge assets (Teece, 2000). Knowledge strategy can be defined as "the overall approach an organization intends to take to align its knowledge resources and capabilities to the intellectual requirements of its strategy" (Zack, 1999, p. 135). While knowledge strategy deals with business outcomes and support for competitive advantage, knowledge management strategy deals with structural and technical issues. As an example, Zack's (1999) knowledge strategies of exploration and exploitation focus on the application of knowledge within the firm, while Hansen, Nohria and Tierney's (1999) knowledge management

strategies of codification and personalization focus on the structuring of knowledge within the firm.

One classification scheme identified four knowledge strategies: leveraging, expanding, appropriating, and probing (von Krogh *et al.*, 2001). Leveraging can be oriented towards achieving efficiency in operations and ensuring that the firm internally transfers existing knowledge from various knowledge domains to improve innovation. The emphasis of expanding is on increasing the scope and depth of knowledge by refining what is known and by bringing in additional expertise relevant for knowledge creation – better understanding of key processes can allow for substantial cost-reduction, helps create new process and product innovations, and reduces risks by building up local competence. Appropriating is predominantly externally oriented on knowledge domains that do not already exist in the firm, capturing knowledge from external partners and managing risk by spreading effort. The probing strategy gives teams the responsibility to build new knowledge domains from scratch.

In a second classification scheme, Bierly and Chakrabarti (1996) identified four distinct generic knowledge strategies among firms: loners, explorers, exploiters, and innovators. Loners were ineffective, with higher R&D expenditure ratios, slow technology cycles and low knowledge dispersion (Bierly and Chakrabarti, 1996). An explorer is a creator or acquirer of the knowledge required to be competitive in its strategic position (Zack, 1999). Explorers were found to have high levels of radicalness but were similar to other groups in other areas (Bierly and Chakrabarti, 1996). An exploiter has capabilities that exceed the requirements of its competitive position, allowing it to use its knowledge to deepen or broaden its position (Zack, 1999). Exploiters were seen to have low R&D expenditure and broad but shallow knowledge bases (Bierly and Chakrabarti, 1996). Members of the innovator profile closely integrate the best characteristics of explorers and exploiters (Zack, 1999). Innovators were the most aggressive and fastest learners, combining internal, external, radical and incremental learning (Bierly and

Chakrabarti, 1996). As discussed in Chapter 2, Bierly and Chakrabarti (1996) present a higher order typology than von Krogh *et al.* (2001). The former also corresponds more closely to Miles and Snow' (1978) formulation and, as such, is used as the basis for this study.

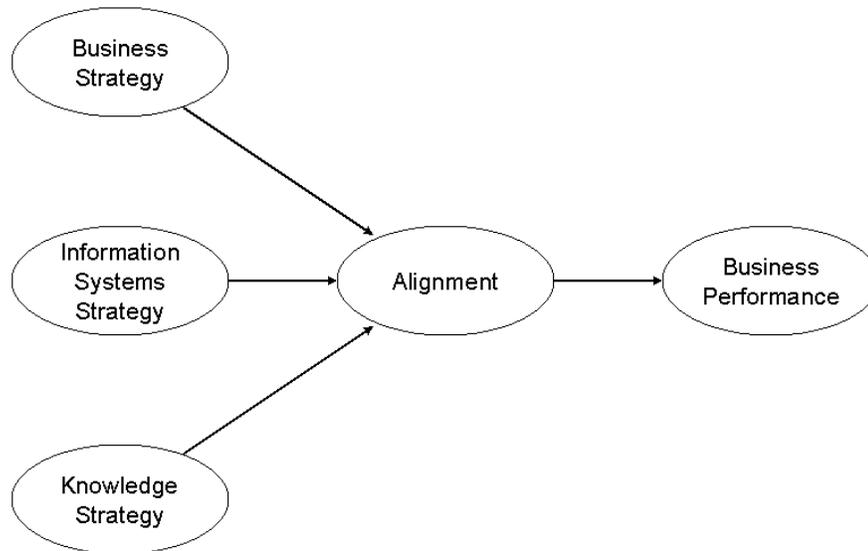
### **3.2.3 Profiles of Strategic Alignment**

The relationship between business and knowledge strategy has been described as one of interdependency (Snyman and Kruger, 2004). Knowledge is claimed to drive strategy and strategy to drive knowledge management (Tiwana, 2000, p. 103). Knowledge is seen as having an enabling role in the formulation of strategy (Snyman and Kruger, 2004) where the most important context for developing knowledge strategy is the firm's business strategy (Zack, 1999). It has been proposed that aligning knowledge strategies with business strategy creates the information resources needed for competitive advantage (Snyman and Kruger, 2004). Additionally, it has been proposed that knowledge management emphasis is a contextual antecedent to business strategic alignment that is mediated by planning participation (Kearns and Sabherwal, 2007).

The benefits from the alignment of knowledge strategy and information systems strategy have been little studied (Chan *et al.*, 2009), but have been hypothesized. "Just as strategic information systems planning is a prerequisite for developing successful information systems (Earl, 1993; Lederer and Sethi, 1988; Segars and Grover, 1998), knowledge strategy planning is indispensable for designing and implementing effective knowledge management" (Kim, Yu and Lee, 2003, p. 297). Kim *et al.* (2003) identified four differentiators of knowledge strategy planning from information systems strategy planning. First, they note the distinction between knowledge and information should be stressed in order to reflect the different management requirements of each. Second, typologies of knowledge differ from those of information with different techniques and processes required for each individual type. Third, planning techniques for IS strategy, which encompasses the entire enterprise, differ from those required for knowledge

strategy, which often focuses on specific knowledge needs of the organization. Fourth, knowledge is more human-focused than information, requiring recognition of its differences in terms of cognitive and social activities. Combining these streams of alignment research results in the research model in Figure 3-1.

**Figure 3-1 – Research Model**

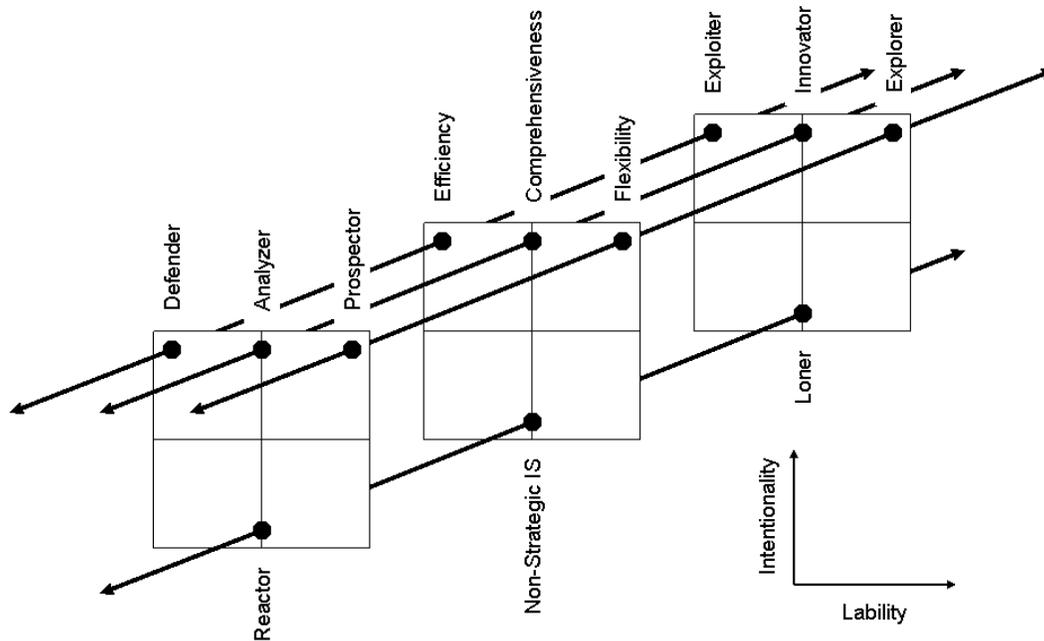


Congruent patterns of different strategy types can be seen in the literature. Denford and Chan (2007) found a high degree of consistency among study results along typology lines in the strategic alignment literature. This agreement focused on defenders using an IS for efficiency strategy, prospectors using an IS for flexibility strategy and analyzers using an IS for comprehensiveness strategy (Sabherwal and Chan, 2001). Following Burn (1996), the reactor type is seen as having a delayed (Earl, 1989) or non-strategic use of IS (Sabherwal *et al.*, 2001) – essentially the absence of IS strategy. These are considered non-viable strategies and even when aligned are not expected to have a positive influence on performance (Sabherwal and Chan, 2001). Exploiters have broad but shallow knowledge bases and focus on using existing knowledge (Bierly and Chakrabarti, 1996) giving them a defensive orientation. Explorers focus on increasing competitiveness through the creation or acquisition of new and radical knowledge

(Zack, 1999) matches the prospector strategy of continually expanding product lines or developing new markets. Members of the innovator profile closely integrate the best characteristics of explorers and exploiters (Zack, 1999) making their knowledge strategy a close parallel to the analyzer business profile. The ineffective loner knowledge strategy, with its high expenditures but slow technology cycle time (Bierly and Chakrabarti, 1996) is seen to mirror the unfocused reactor business profile.

The combination of these factors can lead to conceptualization of strategies as existing in two dimensions, as illustrated in Figure 3-2: lability and intentionality. Lability refers to being subject to frequent change and is contrasted with stability. In each of the strategy typologies, one type has been considered the most dynamic (Miles and Snow, 1978), opportunistic (Hirschheim and Sabherwal, 2001) or radical (Bierly and Chakrabarti, 1996) and compared to both a conservative extreme and a balanced midpoint. Each of these strategies is considered equally

**Figure 3-2 – Conceptualization of Strategic Alignment**



viable and consciously selected (Miles and Snow, 1978) particularly when compared to non-viable reactive types (Sabherwal and Chan, 2001). As each viable strategy is thought to be equally effective (Doty *et al.*, 1993), the viable and appropriate combinations of strategy are argued to be contributors to firm performance (Henderson and Venkatraman, 1993).

Hypothesis 2. The strategic alignment of a conservative strategy portfolio consisting of defender, IS for efficiency and knowledge exploiter strategies is positively associated with perceived business performance.

Hypothesis 3. The strategic alignment of a proactive strategy portfolio consisting of prospector, IS for flexibility and knowledge explorer strategies is positively associated with perceived business performance.

Hypothesis 4. The strategic alignment of a balanced strategy portfolio consisting of analyzer, IS for comprehensiveness and knowledge innovator strategies is positively associated with perceived business performance.

Hypothesis 5. The strategic alignment of a non-viable strategy portfolio consisting of reactor, non-strategic IS and knowledge loner strategies is negatively associated with perceived business performance.

With the hypotheses to be studied established, the next section describes the methods used to test them.

### **3.3 Methodology**

The discussion of methodology includes the operationalization of variables, collection of data and analysis of data, the latter including both profile deviation and covariation approaches.

### 3.3.1 Operationalization

Hambrick (1984) noted the importance of classification schemes to bring order to strategy research as there are a wide variety of individual strategy dimensions with almost limitless possible combinations. The basic rule of classification is that the classes formed must be both exhaustive and mutually exclusive (Bailey, 1994). Hambrick (1984) views the difference between typologies and taxonomies as the former being conceptually derived and the latter empirically derived. As they are conceptually derived, typologies are often either based on multiple dimensions (such as types in a conceptual two-by-two model) or based on polar types (such as opposites with intermediate types being a blend) (Bailey, 1994). Taxonomies identify empirical entities and are often hierarchical (as in biology) and evolutionary (growing as new entities are identified) (Bailey, 1994). A taxonomy whose entities fall either into multidimensional categories or along a polar-anchored range may be virtually indistinguishable from a similarly constructed typology, with the exception of the method of development. While taxonomies may be empirical and descriptive, they may be atheoretic, while typologies can be conceptually grounded in literature and theory (Doty and Glick, 1994).

**Table 3-1 – Mapping of Dimensions to Types**

	Defender	Prospector	Analyzer	Reactor
Defensiveness	High	Low	Medium	Low
Analysis	Medium	Medium	High	Negligible
Proactiveness	Low	High	Medium	Negligible
	Efficiency	Flexibility	Comprehensiveness	Non-Strategic IS
Acquisition	Low	High	High	Negligible
Storage	High	Low	High	Low
Transfer	Medium	High	High	Negligible
Retrieval	Medium	Low	High	Negligible
	Exploiter	Explorer	Innovator	Loner
Leveraging	High	Low	High	Low
Expanding	Low	Medium	High	Low
Appropriating	Medium	Low	High	Negligible
Probing	Low	High	High	Negligible

The three typologies are mapped in Table 3-1 from dimension and classification data, with linkages to extant literature provided in Appendix A. Business strategy types are based on the proactiveness, analysis and defensiveness STROBE dimensions (Venkatraman, 1989a), which have been mapped onto Miles and Snow's (1978) typology (Sabherwal and Chan, 2001). IS strategy types are based on combinations of acquisition, storage, transfer and retrieval dimensions (Adams and Lamont, 2003) which is mapped onto Sabherwal and Chan's (2001) typology. Knowledge strategy types are based on leveraging, expanding, appropriating and probing classes (von Krogh *et al.*, 2001) mapped onto Bierly and Chakrabarti's (1996) typology using a cross-mapping developed in Chapter 2.

The model of performance pays particular attention to non-balance sheet forms of capital and takes the form of a composite index that is comprised of Physical, Financial, Human, Structural, Relational and Innovation capital (Chan *et al.*, 2009). The first two of these are traditional and appear on the balance sheet of an organization. Human capital, including management (Castanias and Helfat, 1991), is often believed to be the most difficult to imitate and the most likely to lead to sustained competitive advantage (Coff, 1997; Pfeffer, 1994). It can be defined as the individual capabilities, knowledge, skills, experience, and problem-solving abilities that reside in people in an organization (Allee, 2000; Piazza-Georgi, 2002). Structural capital is comprised of the systems and work processes that leverage competitiveness, including IS/IT, communication technologies, images, concepts, and models of how the business operates, documents, patents, copyrights, and other "codified" knowledge (Allee, 2000). Relational capital, which includes customer capital, is comprised of external alliances and relationships with customers, strategic partners, investors, and the community (Allee, 2000). The degree to which these relationships are trusting, and reciprocal, add value to this form of capital (Edvinsson and Malone, 1997). Innovation capital, another subset of intellectual capital, can be described as a firm's collective ability to innovate, learn, and adapt to its competitive environment (McElroy,

2002). It should be noted that the measures themselves are perceptual, but these should accurately reflect the actual state of the firm, following Venkatraman and Ramanujam's (1986) finding that managerial assessment and objective performance indicators are highly correlated.

The relationship among the three strategies and firm performance are determined through an investigation of their degree of fit. Venkatraman (1989b) categorized the concept of fit in a classificatory framework with axes of specificity and anchoring, resulting in six interpretations of the concept. Specificity refers to the level of precision in the functional form of fit, whereas anchoring is whether the concept is anchored to a particular criterion or is concept is criterion-free. Selection of an appropriate conceptualization is important, as it can have a significant impact on results (Bergeron *et al.*, 2001). Different perspectives of fit have different characteristics and methods of analysis (Venkatraman, 1989b). In the criterion-specific domain, fit as moderation is conceptualized in terms of the interaction between two variables, fit as mediation in terms of an intervening variable between antecedents and consequences and fit as profile deviation in terms of the internal consistency of multiple contingencies (Bergeron *et al.*, 2001; Drazin and Van de Ven, 1986; Venkatraman, 1989b). In the criterion-free domain, fit as matching is defined in terms of a theoretically defined match between two variables, fit as covariation in terms of internal consistency among a set of theoretically related variables and fit as gestalts as internal congruency among sets of relationships (Bergeron *et al.*, 2001; Miller, 1981; Venkatraman, 1989b). As results can vary significantly based on selection of the conceptualization of fit (Bergeron *et al.*, 2001), the intent of the study was to use the most appropriate ones in order to compare and contrast results. There are two different conceptualizations of fit that are appropriate for this study: profile deviation and covariation. Both are centered on the internally consistent sets, however differ on their degrees of specificity and anchoring.

In profile deviation, "fit is the degree of adherence to an externally specified profile" (Venkatraman, 1989b, p. 433). It represents a conceptually ideal profile to which adherence leads

to high performance and deviation leads to negative effects on performance. It has been used successfully to test for the performance impacts of strategic alignment both in strategic management (i.e. Venkatraman and Prescott, 1990) and information systems (i.e. Sabherwal and Chan, 2001). There are two methods of developing the ideal profile: theoretical or empirical (Venkatraman, 1989b). Given that this paper extends the previously established and validated theoretical profiles of Sabherwal and Chan (2001) into the knowledge domain, the use of theoretical grounded for ideal profiles was selected. The choice of an unweighted multidimensional profile was based on the desire to establish the relative importance of the different strategy types in the alignment process. Should a weighting scheme be imposed *a priori*, this valuable information would be lost. As one possible conceptualization of fit involves the divergence from a theoretically-specified ideal set of strategies, but that the exact form of alignment is not known, fit as profile deviation is an appropriate approach using calculations of Euclidean distance of a firm's strategies from the ideal profiles as a measures of fit.

In covariation, "fit is a pattern of... internal consistency among a set of underlying theoretically related variables" (Venkatraman, 1989b, p. 435). It has been used successfully to test for the performance impacts of strategic alignment both in strategic management (i.e. Zajac, Kraatz and Bresser, 2000) and information systems (i.e. Chan *et al.*, 1998). In this view, alignment is seen as a concurrent allocation of resources to Operations, Information Systems and Knowledge Management areas of the organization in support of a consistent strategy set. Fit is then understood as occurring among these three dimensions of strategy, where strategies are defined in terms of their support for conservative, balanced, proactive or non-viable approaches. The anchoring assumption of criterion-specificity found in profile deviation is relaxed by assuming that each firm has a degree of adherence to each of the four strategic approaches rather than classification into a single approach. The assumption of specificity of the relationship is tightened by defining a particular relationship for the fit, that being a set of reflective paths both

from consistent strategic portfolios to performance and from strategy types to performance. This leads to a conceptualization of fit involving the performance impact of a coherent set of theoretically related strategies within a defined nomological network, so fit as covariation is an appropriate approach using structural equation modeling (SEM) to calculate the degree of fit.

### **3.3.2 Data Collection**

Construct measures were developed and refined following the guidance of Straub, Gefen and Boudreau (2004). Fifteen academics reviewed the draft instruments and then ten faculty and graduate students conducted three rounds of card sorting to enhance the face validity and discriminant validity of the measures (Moore and Benbasat, 1991). Where post-card sorting debriefings indicated misfits with categories, items that were not grouped as expected were modified or removed. In order to ensure that practitioners understood the questionnaire items, the instrument was then pilot tested with 40 MBA students who had managerial experiences in knowledge-based organizations. The last step in developing the survey was identifying the target audience. The 2005 Dun and Bradstreet Directory was used to identify small and medium-sized Canadian organizations with 100-249 employees in the following knowledge-intensive industries (Standard Industrial Classification in brackets): Business Services (83), Educational Services (82) and Legal Services (79). Anticipating a response rate of 10% or less given previous studies involving senior management respondents, this group was large enough to allow contact of at least 1000 firms.

The survey was administered following procedures recommended by Dillman (2000) using a combined mail and web return format. The first wave of the CEO survey included an invitation letter and a hardcopy questionnaire, including a web address for an identical web-based survey. Two waves of follow-up letters that contained the web survey link were mailed to non-respondents two weeks and four weeks after the first mailing. Of the 1450 CEOs who were

mailed the survey, 168 CEOs completed the questions, with 71 CEOs using the web, and 97 CEOs completing the hardcopy questionnaires, corresponding to an overall response rate of 11.6%. Six questionnaires had to be discarded due to insufficient performance data, with the remaining 162 surveys including ten from Legal Services, 65 from Educational Services and 76 from Business Services. The number of responses was sufficient for analysis based upon the power calculation. Non-response bias was tested using a two-tailed t-test of the difference in the means of the respondent demographic information and that of all firms contacted. Differences in early and late respondents were also tested using a chi-square test of the difference in industry classifications. Neither non-response bias nor early versus late response bias was significant at the .10 level.

### **3.3.3 Data Analysis – Profile Deviation**

Adapting the data analysis methods of Sabherwal and Chan (2001), a configurational approach to profile deviation was taken to assess the hypothesized alignment within the sampled firms (Drazin and Van de Ven, 1985; Gresov, 1989; Sabherwal and Kirs, 1994; Venkatraman and Prescott, 1990). Four steps were followed in the analysis: (1) normalization of survey data; (2) classification of each firm into their appropriate business, IS and knowledge strategy type; (3) calculation of alignment among the three strategy types; and (4) examination of the five research hypotheses.

#### **3.3.3.1 Normalization**

As specific industries may have a significant impact on findings (Chaisson and Davidson, 2005; McGahan and Porter, 1997), but that impact is not central to the research question, a normalization approach to industry effects was taken. Additionally, normalization as a control method was implemented to maximize the comparability of results between profile deviation and covariation conceptualizations of fit, as profile deviation cannot accommodate the dummy

variable method used in covariation analysis. Normalization followed procedures recommended by Dess, Ireland and Hitt (1990) and used in Sabherwal and Chan (2001) to correct for inter-industry differences in means and standard deviations for the research variables. Normalization of the data involves standardizing all item scores (Way, 2002) based on each individual industry (Hambrick, 1983) and then recombining the standardized sample. For this paper, this involved the creation of four sub-samples based on industry (the three industries and an unspecified group), centering industry means on the overall sample mean and calculating scores based on deviations from the original industry mean. The normalized research variables are summarized in Table 3-2.

**Table 3-2 – Research Variables**

	Reliability	Number of Items	Mean	SD
<b>Business Strategy Variables</b>				
Defensiveness	.782	4	4.23	0.61
Analysis	.752	4	3.93	0.71
Proactiveness	.902	4	3.80	0.92
<b>Information Systems Strategy Variables</b>				
Acquisition	.879	4	3.99	0.82
Storage	.911	4	4.09	0.85
Transfer	.877	3	4.05	0.91
Retrieval	.945	4	3.63	1.00
<b>Knowledge Strategy Variables</b>				
Leveraging	.874	4	4.18	0.69
Expanding	.796	3	3.96	0.72
Appropriating	.566	2	3.70	0.86
Probing	.874	4	3.65	0.88

### 3.3.3.2 Classification

Each firm in the survey was classified into each business strategy (Sabherwal and Chan, 2001), IS strategy (Denford and Chan, 2007) and knowledge strategy in Chapter 2. Use of ideal types or profiles has been recommended in previous literature using typologies (Doty *et al.*, 1993), so that each firm had its three strategies calculated based upon the closest calculated Euclidean distance of its attributes from an ideal profile. The ideal profile for each type was

determined from the literature and assigned a value of high, medium, low or negligible. On a five point scale, these were operationalized as 5, 4.25, 3.5 and 2, respectively, based on establishing quartiles across the sample. Next, an alignment score was calculated based on the Euclidean distance between each firm's business, information systems and knowledge strategy and the 12 respective ideal strategies. This score was one minus the distance divided by the maximum theoretical distance, yielding a value between zero and one, where one indicates perfect alignment. Firms were assigned an ideal strategy for each strategy typology based upon which type had the highest alignment score base upon its attribute measures.

#### 3.3.3.3 Calculation

Two separate sets of calculations were conducted to compute alignment, both involving individual strategies and aligned profiles of strategies. First, the means and standard deviations for each of the strategy types were computed. In this case, the type was made up of only those firms whose strategy closest approximated the ideal strategy and was a binary product of firm performance and profile membership, following Sabherwal and Chan (2001). Second, the correlation between individual strategy and firm performance was calculated. Following Doty and Glick (1994) who recommended that firms be rated according to their proximity to but not be assigned an ideal profile, each firm's alignment score was correlated with firm performance. The same two sets of calculations were made for the four ideal portfolios of aligned profiles: conservative, including defender, IS for efficiency and exploiter; proactive, involving prospector, IS for flexibility and explorer; balanced, including analyzer, IS for comprehensiveness and innovator; and non-viable, including reactor, non-strategic IS and loner.

#### 3.3.3.4 Examination

Research hypotheses were be assessed by focusing on two variables: perceived business performance and alignment. Two sets of hypothesis tests were conducted, corresponding to the

two sets of alignment measures. The first set of tests were unequal sample-size, heterogeneous variance T-tests of the difference between means comparing the set of four ideal portfolios of aligned profiles and their related individual strategy profiles. For example, the conservative portfolio was tested against each of the defender, IS for efficiency and exploiter types. This test was also conducted for Hypothesis 1 in order to confirm if the aligned portfolios had significantly different means from all other combinations, both including and excluding non-viable strategies. The second set of tests were paired T-tests of the difference between correlations comparing the aligned portfolios against their related strategies.

### **3.3.4 Data Analysis – Covariation**

Partial Least Squares (PLS) analysis (Chin 1998, Hulland 1999) was the structural equation modeling (SEM) technique used to test the hypotheses for the covariation conceptualization of fit. PLS utilizes an iterative series of principal components analysis, path analysis, and regressions with the aim of rejecting the null hypothesis of no effect (Gefen, Straub and Boudreau 2000). Despite its limitations (Marcoulides and Saunders 2006; Goodhue, Lewis and Thompson 2007), PLS was selected for the data analysis because of its ability to handle the relatively small data sizes found during the early stages of theory building and testing (Gregor 2006) and because it is helpful when making predictions as it specifies the variance explained in endogenous constructs (Chin 1998).

#### **3.3.4.1 Modeling**

All constructs were modeled as reflective; however, there may be some debate regarding whether firm performance is better modeled as reflective or formative (Petter, Straub and Rai 2007). In this paper, it has been modeled as reflective, following four decision rules to identify constructs as formative or reflective (Jarvis, MacKenzie and Podsakoff 2003). First, the direction of causality is from performance to the six types of firm capital, as these are manifestations of

firm performance because as performance increases, more firm capital accrues. Second, measures of a reflective construct should be distinct but have a degree of interchangeability – the six firm capital constructs (human, structural, relational, innovation, financial and physical) differ from each other, but reflect well the concept of firm performance by illustrating how firms can excel. Third, as seen in Table 3-3, covariation exists amongst the different types of capital indicating that the underlying firm performance construct is reflective. Finally, the nomological network is theoretically established to support the reflective measure of firm performance with the alignment of strategies leading to the development of firm capital.

**Table 3-3 – Correlations between Performance Measures**

	Human	Structural	Relationship	Innovation	Financial
Structural	.504				
Relationship	.567	.517			
Innovation	.410	.371	.436		
Financial	.497	.507	.536	.330	
Physical	.238	.419	.359	.466	.328

#### 3.3.4.2 Normalization and Classification

To maximize the comparability of results between the two conceptualizations of fit, the same normalized and classified data that was used for the profile deviation was also used for the covariation analysis. One difference in the normalization and classification process was that specific classes were not assigned for each firm. For example, a firm had Business Strategy alignment scores of 0.48, 0.98, 0.79 and 0.65 for Reactor, Defender, Analyzer and Prospector respectively. For profile deviation, a classification of Defender was assigned, while for covariation, the complete set of scores was obtained as a set of related variables reflecting the orientation of its business strategy. Reliability and validity checks were conducted on the data at this step. Reliability was demonstrated by examining the composite reliability index, which reflects the internal consistency or the reliability of a construct and should be generally higher than .70 (Hulland 1999, Carmines and Zeller 1979, Gefen *et al.* 2000). Convergent validity is

demonstrated when each of measurement items loads significantly on its construct, as shown when the t-values are above 1.96 (Gefen and Straub, 2005) and when the average variance shared between a construct and its measures is adequate, as shown when the Average Variance Extracted is greater than .50 (Chin 1998). Convergent validity was established as all t-values were above the minimum threshold and all AVEs were all above .50 for all dimensions. Reliability and convergent validity statistics are shown in Table 3-4.

<b>Table 3-4 – Reliability and Convergent Validity Tests</b>					
Construct	Measure	T-Value	Construct	Measure	T-Value
Conservative CRI 0.781 AVE 0.547	Defender	6.118	B-Strat CRI 0.906 AVE 0.710	Reactor	52.088
	Effectiveness	15.740		Defender	9.331
	Exploiter	14.495		Analyzer	175.879
Balanced CRI 0.861 AVE 0.675	Analyzer	15.517	IS-Strat CRI 0.945 AVE 0.812	Prospector	30.476
	Comprehensive	36.360		Non-Strategic	51.344
	Innovator	61.832		Effectiveness	44.602
Proactive CRI 0.815 AVE 0.595	Prospector	15.623	K-Strat CRI 0.900 AVE 0.694	Comprehensive	186.510
	Flexibility	10.217		Flexibility	30.287
	Explorer	25.133		Loner	21.501
Non-Viable CRI 0.849 AVE 0.653	Reactor	18.036	Performance CRI 0.863 AVE 0.514	Exploiter	10.149
	Non-Strategic	31.081		Innovator	122.808
	Loner	44.150		Explorer	21.573
Performance CRI 0.864 AVE 0.515	Human	16.020	Alignment CRI 0.926 AVE 0.513	Human	14.957
	Structural	18.873		Structural	20.066
	Relational	20.676		Relational	18.430
	Innovation	15.361		Innovation	16.621
	Financial	10.756		Financial	10.434
	Physical	10.885		Physical	11.351
			Reactor	22.112	
			Defender	6.087	
			Analyzer	19.597	
			Prospector	12.309	
			Non-Strategic	24.032	
			Effectiveness	17.331	
			Comprehensive	32.439	
			Flexibility	15.529	
			Loner	15.702	
			Exploiter	8.169	
			Innovator	40.177	
			Explorer	13.451	

Discriminant validity is established when a construct shares more variance with its measures than it shares with other constructs in a model, which is examined in two ways: by examining the item loadings to construct correlations (Gefen and Straub 2005) and by comparing a construct's AVE with the square of its correlations with other constructs (Chin 1998).

Establishing discriminant validity was more problematic, most likely due to the way the constructs were conceptualized, particularly for the portfolios of aligned strategies. In Table 3-5, the item loading for the Balanced and Non-Viable portfolios can be seen to be of similar magnitude but in opposite directions. Conceptually, these portfolios may appear at the surface level to be similar, operating in the middle of spectrum of lability, but the Balanced portfolio is an intentioned strategy whereas the Non-Viable portfolio is ad-hoc. It is possible that the measure captures the mid-ground strategies of both in the size of loading and the intentionality in the direction. In Table 3-6, all the items load on the correct construct, contributing to discriminant validity of the different strategy types. The comparison between the roots of AVEs and correlations exposed additional issues, as seen in Table 3-7. Specifically, while the AVEs were

**Table 3-5 – Construct Loadings for Portfolios**

	Conservative	Balanced	Proactive	Non-Viable	Performance
Defender	<b>0.555</b>	0.363	0.106	-0.250	0.154
IS for Effic	<b>0.693</b>	0.494	0.439	-0.405	0.327
Exploiter	<b>0.727</b>	0.360	0.374	-0.311	0.270
Analyzer	0.540	<b>0.720</b>	0.539	-0.632	0.448
IS for Comp	0.510	<b>0.832</b>	0.440	-0.789	0.639
Innovator	0.444	<b>0.874</b>	0.609	-0.868	0.666
Prospector	0.197	0.464	<b>0.719</b>	-0.460	0.397
IS for Flex	0.429	0.456	<b>0.580</b>	-0.412	0.291
Explorer	0.484	0.492	<b>0.794</b>	-0.475	0.395
Reactor	-0.388	-0.686	-0.551	<b>0.750</b>	-0.582
Non-Strat IS	-0.439	-0.838	-0.428	<b>0.835</b>	-0.654
Loner	-0.266	-0.782	-0.517	<b>0.861</b>	-0.609
Human	0.257	0.463	0.242	-0.505	<b>0.736</b>
Structural	0.408	0.628	0.305	-0.616	<b>0.788</b>
Relationship	0.235	0.494	0.330	-0.532	<b>0.786</b>
Innovation	0.164	0.494	0.501	-0.565	<b>0.675</b>
Financial	0.172	0.425	0.218	-0.443	<b>0.686</b>
Physical	0.303	0.507	0.438	-0.481	<b>0.653</b>

**Table 3-6 – Construct Loadings for Strategy Types**

	Business Strategy	IS Strategy	Knowledge Strategy	Alignment	Performance
Reactor	<b>-0.885</b>	-0.402	-0.566	-0.745	-0.580
Defender	<b>0.472</b>	0.254	0.135	0.329	0.153
Analyzer	<b>0.974</b>	0.400	0.457	0.730	0.446
Prospector	<b>0.636</b>	0.207	0.424	0.502	0.396
Non-Strat IS	-0.431	<b>-0.951</b>	-0.637	-0.803	-0.656
IS for Effic	0.347	<b>0.606</b>	0.328	0.507	0.330
IS for Comp	0.449	<b>0.984</b>	0.592	0.798	0.641
IS for Flex	0.276	<b>0.540</b>	0.422	0.488	0.292
Loner	-0.466	-0.560	<b>-0.886</b>	-0.776	-0.607
Exploiter	0.337	0.222	<b>0.478</b>	0.390	0.270
Innovator	0.519	0.648	<b>0.975</b>	0.858	0.665
Explorer	0.342	0.385	<b>0.623</b>	0.545	0.397
Human	0.348	0.422	0.446	0.465	<b>0.730</b>
Structural	0.501	0.560	0.507	0.614	<b>0.792</b>
Relationship	0.362	0.430	0.467	0.493	<b>0.783</b>
Innovation	0.407	0.411	0.541	0.533	<b>0.674</b>
Financial	0.276	0.353	0.439	0.406	<b>0.681</b>
Physical	0.346	0.519	0.408	0.512	<b>0.662</b>

high enough to meet the requirements for convergent validity, their root was in several cases not large enough to exceed the correlations between certain constructs. While extreme strategies could be easily differentiated from each other, there was some difficulty in differentiating the Balanced portfolio from the others, most likely due to its conceptual straddling between the other

**Table 3-7 – Discriminant Validity Tests**

	Cons	Bal	Pro	Non-V	Perf		AVE	SQRT
Conserv	1.000					Conserve	0.547	0.740
Balanced	0.788	1.000				Balance	0.675	0.822
Proactive	0.766	0.806	1.000			Proactive	0.595	0.771
Non-Viab	-0.595	-0.927	-0.689	1.000		Non-Viab	0.653	0.808
Perform	0.498	0.716	0.581	-0.731	1.000	Perform	0.515	0.718
	B-Strat	IS-Strat	K-Strat	Perf	Align		AVE	SQRT
B-Strat	1.000					B-Strat	0.710	0.843
IS-Strat	0.512	1.000				IS-Strat	0.812	0.901
K-Strat	0.593	0.656	1.000			K-Strat	0.694	0.833
Perf	0.544	0.583	0.677	1.000		Perf	0.514	0.717
Align	0.805	0.852	0.884	0.707	1.000	Align	0.513	0.716

three portfolios in the lability and intentionality dimensions. These deficiencies in discriminant validity led to some caveats of the results, which will be noted in the Discussion section.

#### 3.3.4.3 Calculation and Examination

PLSGraph v3.0 was used for the calculations to fit two separate models: one focused on the relationships between coherent profiles of strategies and performance and one focused on the alignment of strategy types. The same research hypotheses as for the profile deviation were examined using these two models.

These methods for data collection and analysis using profile deviation and covariation techniques were applied to produce the results discussed in the following section.

### 3.4 Results

Results can be divided into two areas: the impact of specific strategy types and the impact of alignment.

#### 3.4.1 Strategy Types

The frequencies of each type within each industry are summarized in Table 3-8. Also indicated are the means and standard deviations of firm performance for the types and the correlation between alignment and firm performance. The analysis of the types is applicable only to the profile deviation analysis, as the covariation analysis did not classify the firms into types – only the overall category applies to both analyses. Contrary to the Miles and Snow's (1978) initial view of equifinality among the three viable business types, the analyzer strategy is significantly better than both the defender ( $p \leq 0.001$ ) and prospector ( $p \leq 0.05$ ) strategies. This would correspond with Zajac and Shortell's (1989) findings that the more aggressive Analyzer and Prospector strategies result in higher firm performance and March's (1991) view that a balanced approach to strategies is preferable. The issue of hybrid strategies performing worse than pure

strategies (Thornhill and White, 2007) is moot in this case, as the Analyzer is viewed as a pure balance strategy rather than a hybrid strategy, as can be seen from its positive correlation with

**Table 3-8 – Strategy Configurations**

Strategy Measures	Conservative Mean(SD) Correl / Num	Proactive Mean(SD) Correl / Num	Balanced Mean(SD) Correl / Num	Non-Viable Mean(SD) Correl / Num	Overall Mean(SD) Num
<b>Business Strategy</b>					
	Defender	Prospector	Analyzer	Reactor	Overall
Business	3.89(0.59)	3.95(0.53)	4.20(0.33)	3.67(0.67)	3.97(0.54)
Services	0.326 / 28	0.396 / 15	0.443 / 20	-0.437 / 9	72
Education	3.94(0.59)	4.15(0.40)	4.40(0.41)	3.27(0.35)	4.03(0.56)
Services	0.189 / 25	0.544 / 12	0.594 / 20	-0.716 / 8	65
Legal	4.25(0.20)	4.12(0.45)	3.68(1.01)	3.66(N/A)	3.98(0.57)
Services	0.044 / 3	0.150 / 3	-0.031 / 3	-0.228 / 1	10
Unspecified	3.93(0.49)	4.07(0.47)	4.33(0.71)	3.58(N/A)	4.00(0.49)
	0.099 / 5	0.577 / 3	0.446 / 2	-0.516 / 1	11
Overall	3.92(0.54)	4.05(0.45)	4.26(0.47)	3.50(0.54)	4.10(0.54)
	0.223 / 61	0.456 / 33	0.469 / 45	-0.553 / 19	158
<b>Information Systems Strategy</b>					
	Efficiency	Flexibility	Comprehensive	Non-Strategic	Overall
Business	4.05(0.50)	3.99(0.43)	4.36(0.25)	3.43(0.55)	3.98(0.54)
Services	0.471 / 27	0.459 / 15	0.643 / 17	-0.664 / 15	74
Education	3.99(0.54)	4.02(0.50)	4.46(0.28)	3.43(0.45)	4.03(0.56)
Services	0.483 / 22	0.428 / 14	0.652 / 17	-0.658 / 11	64
Legal	3.83(0.80)	3.91(0.24)	4.55(0.16)	3.66(N/A)	3.98(0.57)
Services	0.064 / 4	0.110 / 3	0.452 / 2	-0.530 / 1	10
Unspecified	3.77(0.46)	3.77(0.22)	4.70(0.19)	4.23(0.54)	4.00(0.49)
	-0.263 / 3	-0.384 / 4	0.093 / 2	-0.217 / 2	11
Overall	3.99(0.53)	3.97(0.42)	4.43(0.26)	3.49(0.53)	3.99(0.54)
	0.411 / 56	0.371 / 36	0.606 / 38	-0.629 / 29	159
<b>Knowledge Strategy</b>					
	Exploiter	Explorer	Innovator	Loner	Overall
Business	4.08(0.35)	3.97(0.53)	4.52(0.20)	3.35(0.51)	3.97(0.55)
Services	0.390 / 28	0.414 / 20	0.691 / 10	-0.589 / 14	72
Education	4.08(0.48)	4.20(0.34)	4.49(0.29)	3.44(0.54)	4.5(0.58)
Services	0.444 / 22	0.621 / 6	0.709 / 16	-0.636 / 14	58
Legal	4.35(0.22)	3.82(N/A)	3.73(N/A)	3.50(0.78)	3.98(0.57)
Services	0.422 / 5	0.774 / 1	0.516 / 1	-0.453 / 3	10
Unspecified	4.09(0.45)	3.95(0.37)	4.70(0.19)	3.47(0.16)	4.04(0.49)
	0.103 / 3	0.158 / 3	0.691 / 2	-0.799 / 2	10
Overall	4.10(0.40)	3.99(0.47)	4.49(0.29)	3.41(0.52)	4.00(0.55)
	0.399 / 58	0.498 / 30	0.683 / 29	-0.612 / 33	150

performance (0.469). The IS for comprehensiveness strategy was significantly higher in performance than either of the IS for efficiency ( $p \leq 0.001$ ) or IS for flexibility ( $p \leq 0.001$ ) strategies, supporting Sabherwal and Chan's (2001) finding that the balanced IS strategy was most highly correlated with firm performance. The innovator knowledge strategy is significantly higher in performance than either of the explorer ( $p \leq 0.001$ ) or exploiter ( $p \leq 0.001$ ) strategies, supporting Zack's (1999) and March's (1991) contentions that a balance between exploration and exploitation is required for firm success. Additionally, there was no significant association found between industry and business strategy ( $\chi^2=1.80$ ,  $df=9$ ,  $p \leq 0.10$ ), information systems strategy ( $\chi^2=2.67$ ,  $df=9$ ,  $p \leq 0.10$ ) or knowledge strategy ( $\chi^2=10.66$ ,  $df=9$ ,  $p \leq 0.10$ ). This supports Zahra and Pearce's (1990) conclusion of a lack of association between the characteristics of an industry and the proportion of business strategy in that industry. This study further extends these findings into the information systems and knowledge strategy domains.

Similar data and analysis was developed for the four ideal portfolios of aligned profiles, which is presented in Table 3-9, showing the mean and standard deviation of the type, its correlation with the associated profile and the number of cases belonging to the type. There proved to be performance differences between the non-viable portfolio and each of the

**Table 3-9 – Aligned Strategy Configurations**

	Conservative Defender	Proactive Prospector	Balanced Analyzer	Non-Viable Reactor
Mean(SD)	Efficiency	Flexibility	Comprehensive	Non-Strategic
Corr w Perf/No.	Exploiter	Explorer	Innovator	Loner
Business	4.24(0.19)	3.64(0.47)	4.47(0.09)	3.28(0.58)
Services	2	2	2	5
Education	3.97(0.31)	4.21(N/A)	4.55(0.20)	3.22(0.39)
Services	2	1	8	5
Legal	4.16(0.16)	3.82(N/A)	N/A(N/A)	3.66(N/A)
Services	2	1	0	1
Unspecified	N/A(N/A)	N/A(N/A)	4.83(N/A)	N/A(N/A)
	0	0	0	0
Overall	4.12(0.22)	3.83(0.38)	4.56(0.20)	3.29(0.46)
	0.463 / 6	0.571 / 4	0.708 / 10	-0.731 / 11

conservative ( $p \leq 0.001$ ), proactive ( $p \leq 0.10$ ) and balanced ( $p \leq 0.001$ ) portfolios; between the conservative portfolio and the balance portfolio ( $p \leq 0.01$ ); and between the proactive portfolio and the balanced portfolio ( $p \leq 0.05$ ). Additionally, there was no significant difference between the relative proportion of aligned portfolios and industry ( $\chi^2 = 5.56$ ,  $df = 6$ ,  $p \leq 0.10$ ). Finally, the mean values and number of occurrences of each portfolio occurring three or more times was calculated and summarized in Table 3-10 to illustrate the differences in performance effects between aligned and non-aligned portfolios. The expect aligned profile result is seen in bold.

	Exploiter Mean(SD)Num	Explorer Mean(SD)Num	Innovator Mean(SD)Num	Loner Mean(SD)Num
<b>Defender</b>				
IS for Efficiency	<b>4.12(0.22)6</b>	3.83(0.66)6		3.32(0.24)6
IS for Flexibility	3.94(0.40)8	3.85(0.34)4		
IS for Comprehensiveness	4.30(0.18)5		4.62(0.16)6	
Non-Strategic IS	3.75(0.46)4			2.97(0.41)3
<b>Prospector</b>				
IS for Efficiency	4.44(0.09)3	3.76(0.43)4		
IS for Flexibility	4.10(0.40)4	<b>3.83(0.38)4</b>	4.32(0.07)3	
IS for Comprehensiveness				
Non-Strategic IS	4.01(0.37)5			
<b>Analyzer</b>				
IS for Efficiency	4.22(0.36)11	4.18(0.46)6		3.33(0.59)3
IS for Flexibility			4.15(0.43)3	
IS for Comprehensiveness	4.36(0.39)5		<b>4.56(0.20)11</b>	
Non-Strategic IS				
<b>Reactor</b>				
IS for Efficiency				
IS for Flexibility				
IS for Comprehensiveness				
IS for Non-Strategic IS				<b>3.29(0.46)11</b>

### 3.4.2 Impact of Alignment

The impact of alignment is demonstrated through both conceptualizations of fit: profile deviation and covariation.

### 3.4.2.1 Profile Deviation Approach

The results of T-tests for the profile deviation are presented in Table 3-11. Hypothesis 1 is the general alignment hypothesis, that the viable aligned strategy portfolios will demonstrate higher levels of performance than non-aligned combinations of strategies. This test specifically excludes the non-viable portfolio, as it was hypothesized to correlate negatively with performance. The difference between means of combinations with and without non-viable strategies was found to be significant ( $p \leq 0.001$ ), supporting the assertion that viable hypotheses are associated with higher performance. Hypothesis 1 received partial support, as while there is a significant difference between means of the aligned portfolios and all non-aligned portfolios ( $p \leq 0.01$ ), when tested against combinations that only contained viable strategies (no reactor, non-strategic IS or loner types) there was no difference at 0.10 significance. The latter test is recognized as a much higher hurdle than the former, but reflects the premise that alignment of 'good' strategies would be a more valuable finding for practice. The significant difference between viable and non-viable strategies ( $p \leq 0.001$ ) also would indicate that it is difficult to escape 'bad' strategy.

For the individual strategies, both differences between means and correlations were tested. Hypothesis 2 tested for alignment of the conservative portfolio, finding partial support as the aligned conservative portfolio outperformed the defender business strategy for both means ( $p \leq 0.10$ ) and correlations ( $p \leq 0.001$ ) and the exploiter knowledge strategy for correlations ( $p \leq 0.10$ ). Hypothesis 3 tested for the aligned proactive portfolio, finding no support as the proactive portfolio was not significantly different than the three individual proactive strategies in means, but was significantly different than each of the prospector ( $p \leq 0.001$ ), IS for flexibility ( $p \leq 0.001$ ) and explorer ( $p \leq 0.05$ ) strategies in the direction opposite to that hypothesized. This means that the aligned proactive portfolio of prospector-flexibility-explorer was less correlated with firm performance than any of its component strategies. Hypothesis 4 tested for the aligned

balanced portfolio, finding partial support as the balanced portfolio was associated with higher performance than the analyzer ( $p \leq 0.001$ ) and IS for comprehensiveness ( $p \leq 0.05$ ) strategies and was more correlated with performance than the analyzer ( $p \leq 0.001$ ) and IS for comprehensiveness ( $p \leq 0.001$ ) types. Hypothesis 5 tested for the aligned non-viable portfolio, finding partial support as the non-viable portfolio performed significantly worse than the reactor ( $p \leq 0.05$ ) and non-strategic IS ( $p \leq 0.10$ ) strategies and was more correlated with negative performance than all three individual strategies ( $p \leq 0.001$ ).

**Table 3-11 – Profile Deviation Hypothesis Testing**

	Viable Aligned vs All Misaligned	Viable Aligned vs Viable Misaligned	Viable vs Non-Viable	
H1 Alignment Difference in Means	0.001**	0.239	0.000***	Partially Supported
H2 Conservative Difference in Means	Defender 0.080†	Efficiency 0.227	Exploiter 0.869	Partially Supported
Difference in Correlations	0.000***	0.134	0.091†	Partially Supported
H3 Proactive Difference in Means	Prospector 0.295	Flexibility 0.491	Explorer 0.424	Not Supported
Difference in Correlations	0.001***	0.000***	0.012*	Not Supported
H4 Balanced Difference in Means	Analyzer 0.000***	Comprehensiveness 0.034*	Innovator 0.259	Partially Supported
Difference in Correlations	0.000***	0.000***	0.191	Partially Supported
H5 Non Viable Difference in Means	Reactor 0.039*	Non-Strategic 0.090†	Loner 0.298	Partially Supported
Difference in Correlations	0.000***	0.000***	0.000***	Fully Supported

†  $p \leq 0.10$ , \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$



for comprehensiveness, IS for flexibility and non-strategic IS strategies all loaded on the overall IS strategy construct between 0.850 and 0.969). The significance of the paths from functional strategies to alignment and thence to performance provides support for the Hypothesis 1, the general alignment hypothesis.

The structural model for the strategy portfolios was tested in two stages. First, the fit of the strategy portfolios was calculated to identify the path coefficients and loading on the performance construct. The left half of Table 3-12 provides the path coefficients, t-statistics and R<sup>2</sup> for performance for each portfolio. In this stage, all paths were significant at the .001 confidence level. Second, the full model was tested to determine the relative impact of the strategy portfolios, where Figure 3-4 shows the coefficients for each path and the right half of

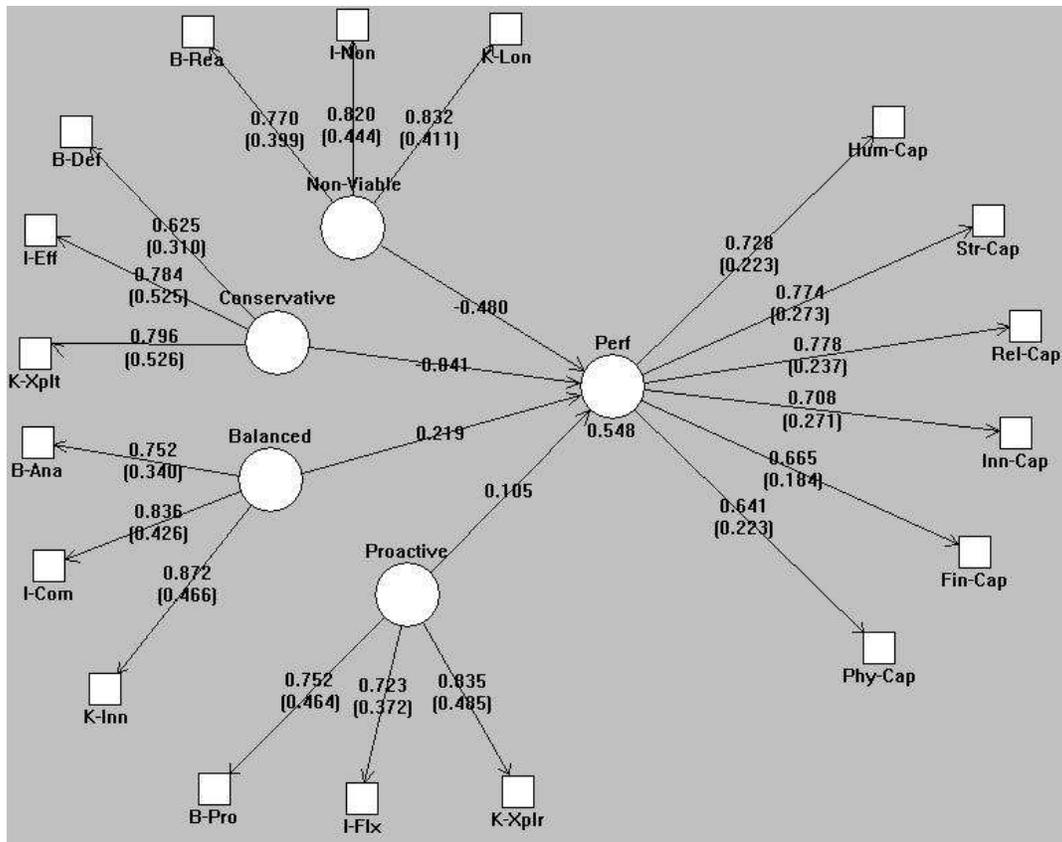
**Table 3-12 – Covariation Analysis Hypothesis Testing**

	Individual Models			Full Model		
	Path Weight	Path T-Stat	Construct R <sup>2</sup>	Path Weight	Path T-Stat	
H1 – Alignment						
Business Strategy				0.358	14.218 ***	Supported
IS Strategy				0.401	15.663 ***	Supported
K Strategy				0.408	16.646 ***	Supported
Alignment				0.707	18.534 ***	Supported
H2 – Conservative	0.508 ***	9.395	0.258	-0.041	0.312	Partially supported
H3 – Proactive	0.601 ***	11.708	0.361	0.105	0.901	Partially supported
H4 – Balanced	0.718 ***	18.773	0.516	0.219	0.861	Partially supported
H5 - Non-Viable	-0.730 ***	22.764	0.533	-0.480 *	2.549	Supported

† p≤0.10, \* p≤0.05, \*\*p≤0.01, \*\*\*p≤0.001

Table 3-12 provides the path coefficients, t-statistics and levels of hypothesis support. Each of the component strategies appeared to load well on the strategy portfolios (i.e. the analyzer, IS for comprehensiveness and knowledge innovator strategies loaded on the overall balanced portfolio construct at 0.752, 0.836 and 0.872 respectively). The discriminant validity issues were evident, as the only the Non-Viable portfolio was significant to the .05 confidence level. This leads to full support for only Hypothesis 5 (the non-viable portfolio), while Hypotheses 2, 3 and 4 (conservative, proactive and balanced overall portfolios respectively) receive partial support from the individual models only.

**Figure 3-4 – Strategy Portfolio Hypothesis Model**



Legend: Perf – performance, Hum-Cap – human capital, Str-Cap – structural capital, Rel-Cap – relational capital, Inn-Cap – innovation capital, Fin-Cap – financial capital, Phy-Cap – physical capital, Align – strategic alignment, B-Rea – reactor, I-Non – Non-Strategic IS, K-Lon –loner, B-Def – defender, I-Eff – IS for effectiveness, K-Xplt –exploiter, B-Ana – analyzer, I-Com – IS for comprehensiveness, K-Inn –innovator, B-Pro – prospector, I-Flx – IS for flexibility, K-Xplr –explorer

The implications of these findings, limitations of the study and suggestions for future research are discussed in the next section.

### **3.5 Discussion and Conclusion**

The discussion and conclusion of this paper focuses on the implications of the study, limitations of the paper and opportunities for future research.

#### **3.5.1 Implications**

Several implications of these findings and contributions of this paper can be identified. First, the range of support for the first four hypotheses provides additional support to the general alignment hypothesis that the alignment of strategies in a firm is associated with higher firm performance. Specifically, the combination of aligned information and knowledge strategies with their associated business strategy results in higher performance for defenders, analyzers and prospectors. This finding is further bolstered by the support for Hypothesis 5, which demonstrates that the alignment of non-viable strategies leads to worse performance than individual non-viable strategies alone.

Second, the extension of strategic alignment into knowledge domain and empirically pairing Bierly and Chakrabarti's (1996) knowledge strategies with Miles and Snow's (1978) business strategy types and Sabherwal and Chan's (2001) IS strategy types provides new insights into alignment. Specifically, from the profile deviation analysis, the low level or lack of differences between means and correlations for knowledge strategies and aligned portfolios may indicate that knowledge strategy dominates performance considerations in strategic alignment. Additionally, from the covariation analysis, while the differences were not significant, knowledge strategy also loaded higher on alignment than the other two strategy types. Theoretically, the recognition and testing of knowledge strategy as a component of strategic alignment and as an

important contributor to firm performance is new to the discipline and reflects calls to extend alignment into multiple dimensions (Sabherwal and Chan, 2001).

Third, the significant differences among business strategies alone and the aligned portfolios would indicate that the choice of information systems and knowledge strategies in the firm can have significant impacts on business performance, both positive and negative. While there were no better combinations for analyzers than the balanced portfolio and no worse combination for reactors than the non-viable portfolio, the relationship between both defenders and prospectors and their associated information systems and knowledge strategies appeared more complex than the simple alignment proposed in Hypotheses 2 and 3 may suggest. In these two cases, there were several combinations that resulted in higher levels of performance, suggesting that homogenous portfolios of extremely conservative or aggressive strategies may need tempering with proactive and defensive elements respectively for optimum performance. This finding was supported by the relative magnitudes of the path coefficients among the aligned strategy portfolios and performance. In this case, the two largest and most significant relationships were seen in the Balanced and Non-Viable portfolios.

Finally, this paper makes a methodological contribution by using a conceptualization of fit as profile deviation (Venkatraman, 1989b), which has been described as being under-represented in the strategic alignment literature (Chan and Reich, 2007). Additionally, this technique has been extended from a two-typology approach to a multi-typology approach, with alignment calculations and hypothesis testing designed to reflect this change. The direct comparison of profile deviation and covariation approaches and the normalization methods employed to maximize comparability are also advancements.

### 3.5.2 Limitations

While the contributions of this paper may be compelling, there are some limitations to be considered in interpreting the findings. First, the performance measure was perceptual and made use of non-balance sheet forms of capital that may be difficult to quantify. This positions the paper more in the vein of Sabherwal and Chan (2001) than studies that use financial measures such as Oh and Pinsonneault (2007). Caution should be used in generalizing the results directly to financial performance alone, which was only one of six areas of performance assessed.

Second, the appropriation factor in the knowledge strategy construct did not behave as anticipated from the pretests, loading at an unsatisfactory level (0.566) with only two of four original items retained. In spite of the low loading, the factor was retained as it is an important theoretical construct in the original von Krogh *et al.* (2001) classification. Additionally, a sensitivity analysis was conducted completely dropping the factor and the only two results were turning two results with low degrees of significance into non-significance. Specifically, the difference in means between the conservative portfolio and the defender business strategy ( $p \leq 0.10$  to N/S) and the difference in correlations between the proactive portfolio and the explorer knowledge strategy ( $p \leq 0.05$  to N/S) changed. Neither impacted on the overall support for the hypotheses, other than to provide further support for the greater complexity of these two strategy type extremes. As dropping appropriating from the analysis had little statistical significance and retaining it had theoretical importance, it was retained.

Third, while the constructs showed acceptable reliability and construct validity, they were not fully satisfactory in discriminant validity as not all constructs cleared both hurdles for claiming it (Gefen and Straub, 2005). This weakness was most pronounced in the lack of significance for several path coefficients among the aligned strategy portfolios and performance. While the path coefficients provided indicative support for the profile deviation findings, they

could not be used to fully substantiate the relative contributions of Proactive, Balanced and Conservative portfolios.

Finally, alignment is not necessarily static but rather can be viewed as a continual and cyclical process, as the natural state of a firm is for its various elements to be out of alignment (Broadbent and Weill, 1993). Strategic orientation of firms may not remain constant, but can change in response to the deployment of IS systems in support of particular IS strategies that provide new strategic options to the firm (Segars, Grover and Kettinger, 1994). Additionally, there is often a lag between changes in desired strategy, which is intangible, and the capacity to change the embedded technology infrastructure, which is very tangible and enduring (Pralhad and Krishnan, 2002). This study did not endeavor to capture these changes or the factors of time and as such may have missed some of these dynamics, however the contributions remain valid, accepting that the data collection captured a single snapshot in time.

### **3.5.3 Future Research**

Three directions of future research emerge from this paper. First, the order of the degree of support for the two analysis approaches was consistent. The most support was received for the Non-Viable portfolio, followed by the Balanced portfolio, then the Proactive portfolio and finally the Conservative portfolio, whether taken as the difference in means and correlations from the profile deviation or the magnitude of the path coefficients in the covariation analysis. This is very much in keeping with the consensus in the literature noted by Denford and Chan (2007) and bears further investigation.

Second, the implicit complexity of the defender and prospector relationships – as seen in the relatively equivocal relationship of the conservative and proactive portfolio relationships with performance – lead to deductions regarding the form that alignment may take in these organizations. Given that there were more effective combinations of strategies than the pure

aligned portfolios, investigation into conditions under which misalignment may lead to higher performance and alignment may lead to lower performance is recommended.

Finally, the magnitude of the impact of knowledge strategy - as seen in the high correlation among the ideal portfolios of aligned strategies and their associated knowledge strategies - was a surprise and is fertile ground for further investigation. The conjecture that knowledge strategy could have a more significant effect on firm performance than business strategy is likely controversial and will require further research to confirm or refute. This will likely involve investigating the relative contribution of different functional strategies to alignment. Additionally, alternative conceptualizations and measures of the functional strategies may be developed to confirm that the findings are independent of the strategy conceptualizations and research methods.

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## Appendix A1 – Business Strategy Profile Justification

Dimension	Value	Justification
Defensiveness Defender Prospector Analyzer Reactor	High Low Medium Low	<ul style="list-style-type: none"> <li>Defenders, prospectors and analyzers are consistent with Segev (1989) and Sabherwal and Chan (2001) values</li> <li>Defensiveness is a defining characteristic of defenders (Venkatraman, 1989a)</li> <li>While in the middle-low area of Segev's (1989) proactiveness dimension, reactors have low consistency</li> </ul>
Analysis Defender Prospector Analyzer Reactor	Medium Medium High Negligible	<ul style="list-style-type: none"> <li>Defenders, prospectors and analyzers are consistent with Segev (1989) and Sabherwal and Chan (2001) values</li> <li>Analysis is a defining characteristic of analyzers (Venkatraman, 1989a)</li> <li>Reactors have low consistency of strategy (Segev, 1989)</li> </ul>
Proactiveness Defender Prospector Analyzer Reactor	Low High Medium Negligible	<ul style="list-style-type: none"> <li>Defenders, prospectors and analyzers are consistent with Segev (1989) and Sabherwal and Chan (2001) values</li> <li>Proactiveness is a defining characteristic of prospectors (Venkatraman, 1989a)</li> <li>Reactors being in the middle-low area of Segev's (1989) proactiveness dimension is compounded by having low consistency</li> </ul>

Note: Values for the three viable strategies were taken from Sabherwal and Chan (2001). Values for the reactor were determined from Miles and Snow's (1978) discussion of the type and Segev's (1989) positioning of the type relative to the other members of the typology.

## Appendix A2 – Information Systems Strategy Profile Justification

Dimension	Value	Justification
Acquisition IS for Efficiency IS for Flexibility IS for Comprehensiveness Non-Strategic IS	Low High High Negligible	<ul style="list-style-type: none"> <li>IS for efficiency strategy relies least on Market IS, which are the most focused on acquisition.</li> <li>IS for flexibility and comprehensiveness both rely highly on Market IS</li> <li>Non-strategic IS does not look for information external to the firm</li> </ul>
Storage IS for Efficiency IS for Flexibility IS for Comprehensiveness Non-Strategic IS	High Low High Low	<ul style="list-style-type: none"> <li>Neither IS for flexibility nor non-strategic IS rely highly on operational support systems, which are heavily reliant on storage</li> <li>Both IS for efficiency and comprehensiveness rely highly on operational support systems</li> </ul>
Transfer IS for Efficiency IS for Flexibility IS for Comprehensiveness Non-Strategic IS	Medium High High Negligible	<ul style="list-style-type: none"> <li>Both IS for efficiency and comprehensiveness rely highly on inter-organizational information systems, which are focused on transfer</li> <li>IS for flexibility makes moderate use of IOS</li> <li>Non-strategic IS does not make use of IOS</li> </ul>
Retrieval IS for Efficiency IS for Flexibility IS for Comprehensiveness Non-Strategic IS	Medium Low High Negligible	<ul style="list-style-type: none"> <li>All types of systems less IOS rely moderately on retrieval and IS for comprehensiveness is most associated with all systems</li> <li>IS for efficiency relies on retrieval in its use of operational support and strategic decision systems</li> <li>IS for flexibility relies less on retrieval, which plays less of a role in the market IS which dominate this type</li> <li>Non-strategic IS have difficulty locating and retrieving information</li> </ul>

Note: The development of these values was based on mapping Adams and Lamont's (2003) IS strategy classes onto Sabherwal and Chan's (2001) IS strategy types using Sabherwal and Chan's (2001) IS strategy dimensions as the linkage between two, as illustrated below.

	Eff	Flex	Comp	Non		Acq	Stor	Tfr	Retr		Eff	Flex	Comp	Non
OSS	High	Low	Med	Low	OSS	Low	High	Negl	Med	Acq	Low	High	High	Negl
Mkt	Low	High	High	Negl	Mkt	High	Low	Med	Med	Stor	High	Low	High	Low
IOS	High	Med	High	Negl	IOS	Negl	Low	High	Low	Tfr	Med	High	High	Negl
SDSS	High	High	High	Negl	SDSS	Med	Med	Low	Med	Retr	Med	Low	High	Negl

Legend: OSS – Operational Support System; Mkt – Market Information System; IOS – Inter-Organizational System; SDSS – Strategic Decision Support System; Eff – IS for Efficiency; Flex – IS for Flexibility; Comp – IS for Comprehensiveness; Non – Non-Strategic IS; Acq – Acquisition; Stor – Storage; Tfr – Transfer; Retr – Retrieval

### Appendix A3 – Knowledge Strategy Profile Justification

Dimension	Value	Justification
Leveraging Exploiter Explorer Innovator Loner	High Low High Low	<ul style="list-style-type: none"> <li>Leveraging is most closely associated with the exploiter type and innovators share the best characteristics of exploiters and explorers</li> <li>Leveraging is used occasionally in explorers and loners, but it is not the focus of these types</li> </ul>
Expanding Exploiter Explorer Innovator Loner	Low Medium High Low	<ul style="list-style-type: none"> <li>Innovators are the fastest learners, quickly expanding their knowledge</li> <li>Explorers are also focused on rapid learning, but have a more narrow focus than Innovators</li> <li>Exploiters and loners seek to expand their knowledge, but it is a secondary focus</li> </ul>
Appropriating Exploiter Explorer Innovator Loner	Medium Low High Negligible	<ul style="list-style-type: none"> <li>Innovators frequently enter into partnerships to gain access to new knowledge</li> <li>Exploiters will use partnerships to access new knowledge, but to a lesser degree than innovators</li> <li>Explorers may use partnerships, but generally focus on internal learning</li> <li>Loners are ineffective at forming partnerships</li> </ul>
Probing Exploiter Explorer Innovator Loner	Low High High Negligible	<ul style="list-style-type: none"> <li>Explorers and innovators both spend considerable effort developing new knowledge internally</li> <li>Exploiters generally use the knowledge they have an invest little in their own R&amp;D</li> <li>Loners may invest in internal R&amp;D, but they are ineffective learners</li> </ul>

Note: The development of these values was based on mapping von Krogh *et al.*'s (2001) knowledge strategy classes onto Bierly and Chakrabarti's (1996) knowledge strategy types using their combined underlying dimensions as the linkage between two, basing the value on the proximity of each strategy to the other. The proximities and rationales for each value were discussed in Chapter 2 and are outlined in the table below.

	Bierly and Chakrabarti (1996)				von Krogh <i>et al.</i> (2001)			
	Loner	Exploiter	Explorer	Innovator	Leverage	Expand	Appropriate	Probe
Source – Internal	LOW	HIGH	LOW	MED	HIGH	HIGH	LOW	MED
Source – External	LOW	LOW	HIGH	MED	LOW	LOW	HIGH	MED
Process – Creation	LOW	LOW	HIGH	MED	LOW	HIGH	LOW	HIGH
Process – Transfer	LOW	HIGH	LOW	MED	HIGH	LOW	HIGH	LOW
Focus – Exploitation	LOW	HIGH	LOW	MED	HIGH	LOW	HIGH	LOW
Focus – Exploration	LOW	LOW	HIGH	MED	LOW	HIGH	LOW	HIGH
Radicalness of Learning	LOW	LOW	HIGH	HIGH	LOW	LOW	MED	HIGH
Speed of Learning	LOW	MED	MED	HIGH	MED	MED	LOW	MED
Breadth of Knowledge	LOW	MED	HIGH	HIGH	LOW	HIGH	MED	HIGH
Depth of Knowledge	LOW	LOW	MED	HIGH	MED	HIGH	MED	HIGH

## Appendix B1 – Factor Analyses of Business Strategy Dimensions

Business Strategy Items	
DEF1	We emphasize cost effectiveness in our business operations.
DEF2	We optimize coordination across our product and/or service lines.
DEF3	There is a constant drive to improve operational efficiency.
DEF4	We minimize operational costs in our supply chain.
ANA1	We tend to be analytical and/or number oriented.
ANA2	We analyze each business opportunity or challenge comprehensively.
ANA3	We use detailed, factual information to support our day-to-day decision-making.
ANA4	We use several analytical tools to assist us in our decision-making.
PRO1	We generally respond to new market needs before our competitors do.
PRO2	We are usually the first ones to introduce new products and/or services.
PRO3	We usually adopt innovations early.
PRO4	We are devoted to providing innovative products and/or services.

Rotated Factor Matrix			
	Factor 1	Factor 2	Factor 3
Eigenvalues	3.28	2.53	2.24
% Variance	27.3	21.1	18.7
DEF1	-.080	.412	<b>.626</b>
DEF2	.273	.013	<b>.802</b>
DEF3	.304	.159	<b>.725</b>
DEF4	-.074	.464	<b>.675</b>
ANA1	.034	<b>.644</b>	.155
ANA2	.174	<b>.673</b>	.297
ANA3	.241	<b>.773</b>	.209
ANA4	.351	<b>.721</b>	.017
PRO1	<b>.875</b>	.261	.072
PRO2	<b>.868</b>	.209	.025
PRO3	<b>.857</b>	.150	.194
PRO4	<b>.797</b>	.040	.164

## Appendix B2 – Factor Analyses of Information Systems Strategy Dimensions

Information Systems Strategy Items	
ACQ1	Our information systems are important sources of new knowledge.
ACQ2	We often use computer-based systems to gather knowledge.
ACQ3	We use information systems to acquire a lot of new knowledge.
ACQ4	We frequently use our information systems to record new knowledge.
STR1	Our computer-based systems effectively retain knowledge for later use.
STR2	Our information systems support storage of large amounts of useful data.
STR3	Our computer-based systems are valuable repositories of knowledge.
STR4	We have the computer-based systems we need to store valuable information.
TFR1	Our information systems are important channels to distribute knowledge.
TFR2	We use information systems to circulate knowledge throughout the organization.
TFR3	Our information systems support knowledge sharing in collaborative work.
RET1	Accessing knowledge in our computer-based systems is easy.
RET2	Searching for knowledge in our information systems is fast.
RET3	We can retrieve knowledge from our information systems quickly.
RET4	Our computer-based systems enable us to readily find information.

Rotated Factor Matrix				
	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalues	3.52	3.33	2.91	2.54
% Variance	23.5	22.2	19.4	16.9
ACQ1	.265	.408	<b>.717</b>	.029
ACQ2	.086	.259	<b>.829</b>	.233
ACQ3	.202	.146	<b>.813</b>	.306
ACQ4	.151	.455	<b>.592</b>	.396
STR1	.385	<b>.768</b>	.249	.164
STR2	.248	<b>.764</b>	.335	.273
STR3	.235	<b>.778</b>	.331	.246
STR4	.361	<b>.686</b>	.183	.198
TFR1	.213	.448	.207	<b>.717</b>
TFR2	.237	.094	.432	<b>.788</b>
TFR3	.338	.268	.166	<b>.786</b>
RET1	<b>.743</b>	.313	.189	.402
RET2	<b>.873</b>	.249	.149	.226
RET3	<b>.912</b>	.199	.170	.121
RET4	<b>.790</b>	.370	.177	.225

### Appendix B3 – Factor Analyses of Knowledge Strategy Dimensions

Knowledge Strategy Items	
LEV1	We make our existing knowledge readily available to personnel who need it.
LEV2	We leverage our existing knowledge throughout the organization.
LEV3	We transfer our important knowledge to employees who can use it.
LEV4	Existing knowledge is frequently shared among our personnel.
EXP1	We often update our information repositories.
EXP2	We frequently identify our knowledge needs and actively fulfill them.
EXP3	We try hard to obtain additional data that our employees request.
APP1	We often acquire new knowledge from our business partners.
APP2	We obtain new knowledge from research institutions.
PRB1	We build new knowledge domains from scratch when needed.
PRB2	We specialize in creating new business knowledge.
PRB3	We establish new areas of knowledge in the organization.
PRB4	Developing new expertise is one of our organizational strengths.

Rotated Factor Matrix				
	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalues	3.810	2.853	2.416	1.601
% Variance	23.8	17.8	15.1	10.0
LEV1	<b>.833</b>	.153	.178	.032
LEV2	<b>.881</b>	.154	.119	.113
LEV3	<b>.848</b>	.134	.208	.136
LEV4	<b>.665</b>	.204	.351	-.039
EXP1	.244	.103	<b>.771</b>	.072
EXP2	.346	.314	<b>.736</b>	.231
EXP3	.159	.226	<b>.777</b>	.192
APP1	.117	.162	.388	<b>.712</b>
APP2	.051	.316	.053	<b>.807</b>
PRB1	.116	<b>.790</b>	.303	.061
PRB2	.136	<b>.871</b>	.074	.236
PRB3	.270	<b>.756</b>	.269	.315
PRB4	.488	<b>.611</b>	.144	.244

## **Chapter 4**

### **Strategic Alignment and Misalignment in Knowledge-Based Enterprises**

#### **Abstract**

The strategic alignment hypothesis would suggest that higher alignment between a firm's strategies should lead to superior performance compared with lower levels of strategic alignment. However, not all studies have found uniformly consistent results. Using eight case studies to explore in detail the alignment-performance model, the paper provides explanations for cases where the strategic alignment hypothesis does not hold. Findings support earlier alignment research suggesting that environmental factors and strategic choices are important factors to be considered when examining misalignment in firms.

#### **4.1 Introduction**

The strategic alignment hypothesis would suggest that higher strategic alignment between business and IS strategy should lead to superior performance compared with lower levels of strategic alignment (Cragg, King and Hussin, 2002; Oh and Pinsonneault, 2007). Additionally, alignment has been found to be a better predictor of perceived performance than realized business strategy itself (Chan, Huff, Barclay and Copeland, 1997). Not all studies have found uniformly consistent results, however. For example, several researchers have found that alignment between business and IS strategies was generally associated with firm performance, but that results were not significant for all specific strategy types (Croteau and Bergeron, 2001; Sabherwal and Chan, 2001). Additionally, the manner in which alignment is conceptualized can have a significant impact on whether it is detected at all (Bergeron, Raymond and Rivard, 2001). Also, firms may

move in and out of alignment over time, either intentionally or accidentally (Sabherwal, Hirschheim and Goles, 2001). Finally, pathological forms of alignment may exist, where the achievement of alignment can be detrimental to the firm (Sauer and Burn, 1997). Explanations for the observed variation in results would be of interest to both researchers and practitioners interested in strategic alignment.

Each of the studies noted above focused primarily on the alignment between business and information systems strategies. This paper adds a layer of complexity to the assessment of alignment by incorporating knowledge strategy into this concept of strategic alignment. Knowledge can be a strategic asset as firms with superior knowledge can combine it with other assets, resources and capabilities in ways that their competitors cannot to generate value (Zack, 1999). In fact, “the sustainable competitive advantage of business firms flows from the creation, ownership, protection and use of difficult-to-imitate commercial and industrial knowledge assets” (Teece, 2000, p. 35). An organization's competitive position creates a requirement for particular new knowledge; however, its existing knowledge resources simultaneously create opportunities and constraints, hence the requirement to generate strategies to coordinate these competing demands (Zack, 1999). Knowledge strategy can be therefore seen as an important component of firm strategy to be aligned with business and information systems strategies.

In Chapter 3, partial support was found for the performance implications of alignment when applied to business, information systems and knowledge strategies and for the specific impacts of four different strategic portfolios. The intent of this paper is employ case studies to investigate and suggest possible explanations for why findings may not always support the strategic alignment hypothesis, as represented by Figure 4-1.

The paper is laid out in the following manner. Following this introduction, the next section examines the strategic alignment hypothesis, focusing on concepts of strategy and strategic alignment. The following section outlines the case research methodology, focusing on

the data collection and analysis processes employed. The subsequent section presents the results, covering both the within and cross-case analyses, using Figure 4-1 as a lens. Discussion focuses on identifying common alignment themes across cases and exploring the importance of firm knowledge in alignment. The final section discusses the limitations of the study and the implications of the findings for practice and research.

**Figure 4-1 – Strategic Alignment Hypothesis**

	Aligned	Misaligned
High Performance	Theorized	Unexpected
Low Performance	Unexpected	Theorized

## 4.2 The Strategic Alignment Hypothesis

IS Strategic Alignment has been defined as “the alignment between business unit strategic orientation and IS strategic orientation” (Chan *et al.*, 1997, p. 132). To formulate this definition theoretically requires integration of three key elements. The first is the concept of strategy and the selection of a view of business, information systems and knowledge strategies. The second is an idea of what strategic alignment means for these strategy types and a conceptualization of how they fit together. The third is a perspective on performance, which is linked to the strategies through strategic alignment.

### 4.2.1 Strategy

Strategies can be intended or realized (Mintzberg, 1978). Intended strategies are those that are official and may be written down, whereas realized strategies are those reflected in

decision making, resource allocation, and activities conducted by the organization (Chan, Huff and Copeland, 1998). In this light, strategy can be defined as “a pattern in a stream of decisions” (Mintzberg, 1978, p. 934) and it has been noted that “strategy exists in the cognition of managers but is also reified in what companies do” (Gavetti and Rivkin, 2007, p. 435). This focuses attention to conceptualizations of strategy less about plans and planning and more about impacts. The investigation of strategy in this study focuses on three mutually supporting typologies of realized strategy each of the areas of business, information systems and knowledge.

#### 4.2.1.1 Business Strategy

Business strategies can be discussed based on coherent profiles or types that capture a range of strategic behaviors. Miles and Snow (1978) developed four business strategy profiles: defenders, prospectors, analyzers, and reactors. Defenders are stable organizations with predictable and narrow product domains, often competing on low prices and cultivating a strong client base. They devote attention to improving efficiency in their current operations as opposed to seeking out new ventures. Prospectors continually seek out new market opportunities and create change and uncertainty in their industries. The price of their flexibility and rapidity is a low operational efficiency. Analyzers operate in a stable domain, where firm operations are run efficiently and current clients are catered to, and an opportunistic domain, where the firm seeks out market opportunities and develops new business lines. Reactors are unable to respond to change effectively or to induce change in the industry, making strategic adjustments only when they are forced to do so. All but the reactor is seen as a consistent and viable strategy (Sabherwal and Chan, 2001). Miles and Snow’s (1978) typology has been widely used as its validity and applicability has been generally supported (Shortell and Zajac, 1990). Additionally, it is an appropriate choice for studies that link strategy selection with organizational outcomes as adherence to one of the prospector, analyzer or defender profiles has been shown significantly linked to higher performance (Doty, Glick and Huber, 1993). Finally, the typology is one of the

more commonly used business strategy frameworks in the Information Systems literature for strategic alignment (Denford and Chan, 2007) and hence is useful for extending the research tradition in the discipline.

#### 4.2.1.2 Information Systems Strategy

IS strategy is long-term guidance concerned with “aligning IS development with business needs and with seeking strategic advantage from IT” (Earl, 1989, p. 63). This is differentiated from IM strategy, which deals with effectively managing IS resources, and IT strategy, which deals with developing technical policies and architectures (Earl, 1993). The difference has also been described in terms of supply and demand, where IS strategy is focused on what the business demands of IS, while IT strategy is focused on supplying particular technologies to support the firm (Hackney, Burn and Dhillon, 2000). IS strategy is a multidimensional construct and can be interpreted or defined in many ways (Hirschheim and Sabherwal, 2001). Hirschheim and Sabherwal (2001) and Sabherwal and Chan (2001) defined similar typologies of IS roles in efficiency, flexibility or opportunism, and comprehensiveness. The IS for efficiency strategy focuses on internal and inter-organizational efficiency and long-term decisions; the IS for flexibility strategy focuses on market flexibility and quick decisions; and the IS for comprehensiveness strategy balances the two, enabling comprehensive decisions and responsiveness. In Chapter 3, a non-strategic IS strategy was defined as being administrative in nature, does not look for information external to the firm, and does not invest in operational or inter-organizational information systems.

#### 4.2.1.3 Knowledge Strategy

A knowledge strategy can be viewed as “the overall approach an organization intends to take to align its knowledge resources and capabilities to the intellectual requirements of its strategy” (Zack, 1999, p. 135) and “a number of key decisions related to knowledge that provide

a context or strategic intent for the firm” (Casselmann and Samson, 2007, p. 70). Bierly and Chakrabarti (1996) used cluster analysis to define four distinct generic knowledge strategies within the pharmaceutical industry: loners, explorers, exploiters, and innovators. Loners were ineffective learners, with higher R&D expenditure ratios, slow technology cycles and low knowledge dispersion (Bierly and Chakrabarti, 1996). Explorers were creators or acquirers of new knowledge required to be competitive in a chosen strategic position (Zack, 1999). Explorers were found to have high levels of radicalness but were similar to other groups in other areas (Bierly and Chakrabarti, 1996). Exploiters had capabilities that exceed the requirements of its competitive position, allowing it to use its existing knowledge to deepen or broaden its position (Zack, 1999). Exploiters were seen to have low R&D expenditure and broad but shallow knowledge bases (Bierly and Chakrabarti, 1996). Members of the innovator profile closely integrated the best characteristics of explorers and exploiters in a balanced approach (Zack, 1999). Innovators were the most aggressive and fastest learners, combining internal, external, radical and incremental learning (Bierly and Chakrabarti, 1996). Innovators and explorers were generally more aggressive in their approach to knowledge (Bierly and Chakrabarti, 1996; Zack, 1999).

#### **4.2.2 Strategic Alignment**

Strategic alignment research is heavily influenced by contingency theory, which holds that the structural design of an organization must fit with the environment to be effective (Thompson, 1967). Early contingency research into alignment examined the effects of environment and strategy fit with weak results (Jauch, Osborn and Glueck, 1980), however as analysis methods improved, the strength but not the form of the relationship between strategy and performance was later found to be moderated by some environmental factors (Prescott, 1986). Contingency theory has been criticized for lacking clarity in developing contingency hypotheses, lacking recognition that contingency relations are stated as interactions, not defining the

functional forms of interaction, selecting inappropriate analytical models and assuming linearity in contingency relations (Schoonhoven, 1982). Significant work was done in the 1980s to address these issues and with refinements to the conceptualization of alignment from a reductionist perspective to a holistic one came stronger results linking strategy to environment and performance (Miller, 1992; Venkatraman and Prescott, 1990).

Information systems (IS) strategic alignment comes from the belief that there is a need to align business strategy and technology policy as a precondition for superior firm performance (Zahra and Covin, 1993). Similarly, a relatively new view of strategic alignment focuses on the importance of aligning business and knowledge strategies, reflecting the importance of knowledge as a critical organizational resource (Snyman and Kruger, 2004). Extending the list of strategy types, Chan, Denford and Jin (2009) conducted a study of knowledge and information systems strategy alignment, finding significant relationships between strategy alignment and performance. Two aspects of strategic alignment are important to the development of this paper: the recognition of aligned portfolios and the conceptualization of fit that allows their operationalization.

While alignment has been demonstrated to be important to firm performance across a wide range of literature (Chan and Reich, 2007), there are many reasons why firms may be out of alignment. Alignment is not necessarily static but rather can be viewed as a continual and cyclical process, as the natural state of a firm may be for its various elements to be out of alignment (Broadbent and Weill, 1993). Similarly, firms that change business strategy may find their change in IS strategy not to be along an ideal trajectory (Hirschheim and Sabherwal, 2001) or their IS strategy to be stagnant (Sauer and Burn, 1997). Strategic orientation of firms may not remain constant, but can change in response to the deployment of IS systems in support of particular IS strategies that provide new strategic options to the firm (Segars, Grover and Kettinger, 1994).

Finally, this change into and out of alignment may be purposeful and intended to instigate change or achieve competitive advantage in the organization (Sabherwal *et al.*, 2001).

#### 4.2.2.1 Aligned Portfolios

Congruent patterns or gestalts of different strategy types can be seen in the literature. Alignment-based studies are often expressed in terms of typologies, particularly that of Miles and Snow (1978). IS typologies that are linked to Miles and Snow's (1978) business typology generally show convergence towards a set of IS strategy types (Hirschheim and Sabherwal, 2001; Sabherwal and Chan, 2001). Prospectors have been found to be aggressive in their pursuit of technology as a group, narrowing the differences between individual firms and making technology more of a cost for this group than a contributor to success; defenders are generally more conservative in their investments in technology, focusing on those areas directly related to their core business, and thus contributing to their competitive advantage (Dvir, Segev and Shenar, 1993). Similarly, prospectors and defenders have been shown to differ in the extent to which they consider IS strategy in the development of business strategy, where prospectors' IS strategy is more responsive than that of defenders (Tan, 1995). Denford and Chan (2007) found a high degree of consistency between study results along typology lines in the strategic alignment literature, where defenders used an IS for efficiency strategy, prospectors used an IS for flexibility strategy and analyzers used an IS for comprehensiveness strategy. Following Burn (1996), the reactor type is seen as having a delayed (Earl, 1989) or non-strategic use of IS (Sabherwal *et al.*, 2001). These are considered non-viable strategies and even when aligned are not expected to have a positive influence on performance (Sabherwal and Chan, 2001), but are included to test this part of the theory.

Extending the existing research into knowledge strategies, exploiters have broad but shallow knowledge bases and focus on using existing knowledge (Bierly and Chakrabarti, 1996) giving them a defensive orientation. Explorers focus on increasing competitiveness through the

creation or acquisition of new and radical knowledge (Zack, 1999), matching the prospector strategy of continually expanding product lines or developing new markets. Members of the innovator profile closely integrate the best characteristics of explorers and exploiters (Zack, 1999) making their knowledge strategy a close parallel to the analyzer business profile. The ineffective loner knowledge strategy, with its high expenditures but slow technology cycle time (Bierly and Chakrabarti, 1996) is seen to mirror the unfocused reactor business profile. These various linkages can be used to establish relationships between each of these strategy types, resulting in the strategic profiles defined in Table 4-1. These strategic types were empirically supported in Chapter 3 through the profile deviation and covariation analyses, however for this paper, a different conceptualization of fit needs to be developed and used.

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**Table 4-1 – Cohesive Strategic Portfolios**

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	Portfolio			
Strategy Type	Conservative	Proactive	Balanced	Non-Viable
Business	Defender	Prospector	Analyzer	Reactor
Information	IS for	IS for	IS for	Non-Strategic
Systems	Efficiency	Flexibility	Comprehensiveness	IS
Knowledge	Exploiter	Explorer	Innovator	Loner

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#### 4.2.2.2 Concepts of Fit

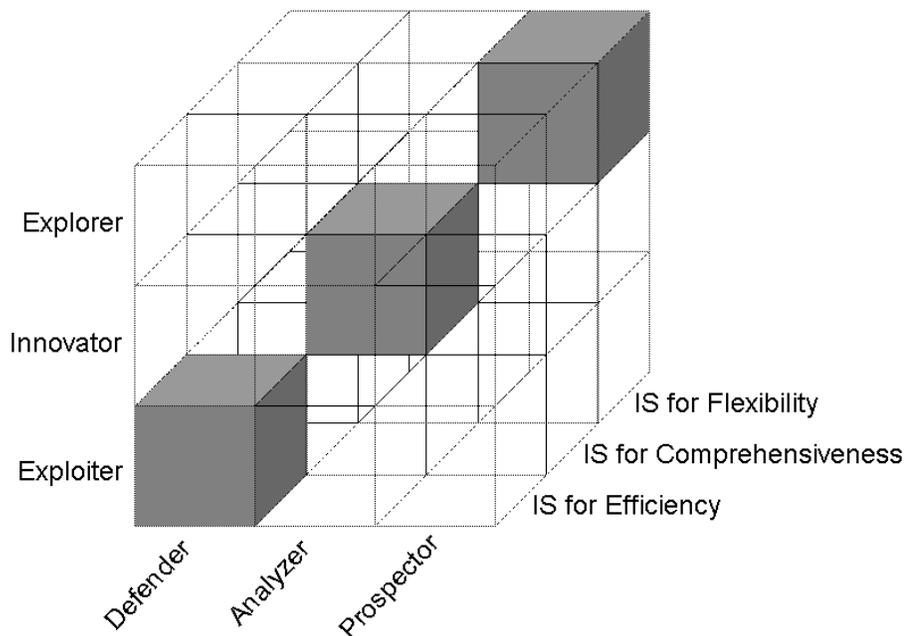
Fit has been conceptualized in multiple fashions. Venkatraman and Camillus (1984) identified and classified six such conceptual perspectives, based upon two dimensions: domain of fit (internal, integrated or external) and conceptualization of fit (as content of fit or patterns of interactions). The view of strategy taken in this paper reflects the requirement of strategy to deal externally with resources and performance and internally with coordinating various organizational elements. This falls into Venkatraman and Camillus' perspective of the integrated formulation-implementation school where the strategizing processes themselves – planning and plans – are ignored in favor of realized strategies. In a separate conceptualization, Drazin and Van

de Ven (1985) interpreted fit in accordance with the selection, interaction and systems approaches to structural contingency theory. Extending this work, Venkatraman (1989) categorized the concept of fit in a classificatory framework with axes of specificity and anchoring.

Specificity refers to the level of precision in the functional form of fit, whereas anchoring is whether the concept is anchored to a particular criterion or is criterion-free. These two axes result in six interpretations of the concept: fit as moderation, mediation, matching, covariation, profile deviation and gestalts. Accurate conceptualization of fit is important, as “the key concept in a contingent proposition is fit, and the definition of fit that is adopted is central to the development of the theory” (Drazin and Van de Ven, 1985, p. 515). Bergeron *et al.* (2001) demonstrated how each of Venkatraman’s (1989) categories of fit when applied to a common set of data can yield different results. This implies that “each approach to fit is theoretically and empirically different, thus the need for a clear theoretical justification of the specific approach adopted by the researcher” (Bergeron *et al.*, 2001, p. 138).

One form of fit is as matching, where the “fit is specified without reference to a criterion variable, although, subsequently, its effect on a set of criterion variables could be examined” (Venkatraman, 1989, p. 430). Fit is conceptualized as a theoretically defined match between two or more variables. This matching approach has been used to test alignment between business strategy and environment (Miller, 1992) and IT and organization structure (Raymond, Paré and Bergeron, 1995). For this study, a match between the three composing strategies of a strategy portfolio are hypothesized to lead to high performance, as illustrated by the solid cubes in Figure 4-2, whereas the lack of a match is hypothesized to lead to low performance.

**Figure 4-2 – Fit as Matching for Strategy Portfolios**



#### **4.2.3 Performance**

The ultimate question regarding alignment is whether it contributes to firm performance or not. The model of performance used in this study pays particular attention to non-balance sheet forms of capital and takes the form of a composite index that is comprised of Physical, Financial, Human, Structural, Relational and Innovation capital (Chan *et al.*, 2009). The first two of these are traditional and appear on the balance sheet of an organization, where Physical capital refers to plant and major equipment and Financial capital refers financial assets. Human capital can be defined as the individual capabilities, knowledge, skills, experience, and problem-solving abilities that reside in people in an organization (Allee, 2000; Piazza-Georgi, 2002). Structural capital is comprised of systems and work processes including communications and information systems technologies; conceptual models of how the business operates; and other “codified” knowledge including documents, patents and copyrights (Allee, 2000). Relational capital encompasses the value embedded in external alliances and relationships with customers, strategic partners,

investors, and the community (Allee, 2000). Innovation capital can be described as a firm's collective ability to innovate, learn, and adapt to its competitive environment (McElroy, 2002). It should be noted that the measures are perceptual, however they should be an accurate representation of firm performance, as managerial assessment and objective performance indicators are highly correlated (Venkatraman and Ramanujam, 1986).

In summary, the theory of this paper relies on the existence of three realized strategy typologies that are aligned through the matching of coherent types into a strategy portfolio which is hypothesized to lead to higher performance. The next section will detail the methods used to test the theory.

### **4.3 Research Methodology**

The methodology section is divided into data collection and data analysis. Semi-structured interviews were used to gather data, with indicators for the strategies and performance operationalized from theory as defined in Appendix A.

#### **4.3.1 Data Collection**

The case study has been suggested as being appropriate for answering research questions relating to the 'how' and the 'why' of a phenomenon (Yin, 1994). The case study method has been repeatedly cited as being effective in generating theory early in the research of a new topic (Benbasat, Goldstein and Mead, 1987; Eisenhardt, 1989; Dubé and Paré, 2003). Eisenhardt (1989) noted that the grounding in empirical evidence found in case study research leads to theory that is likely to be novel, testable, and empirically valid. This research is a multiple case study, following guidelines and standards established for case study research in IS (Benbasat *et al.*, 1987; Lee, 1989; Yin, 1994). The unit of analysis is the firm, drawn from the population of small and medium sized enterprises (SMEs) in the business services, legal services and

educational services sectors. These industries were selected due to the expected degree of knowledge-intensity of firms operating in them.

Participants were solicited in two rounds, with the intent to gain access to up to eight sites. The first round was solicited from a Canada-wide list of all 89 respondents who wished a copy of a report from a previous survey analyzed in Chapter 3. A letter inviting participation in the follow-on study was included in the mailing of the survey project report, with a promise of a subsequent report and a confidential, firm-specific alignment assessment for participants. A second round of invitations was sent to a sample of 70 firms within four hours of the university and in the business services and legal services sectors, which were underrepresented in the first mailing response. One additional site was added through contacts previously established by the candidate. A total of eight case study sites are discussed in this report. It was anticipated that with these eight case sites, there would be sufficient depth of data collected to achieve theoretical saturation, which is the point at which there is minimal incremental learning from each case (Glaser and Strauss 1967).

At each site, semi-structured interviews were conducted with individuals responsible for the functional areas of executive, operations, finance, IS, human resources and marketing. Depending on the size and structure of the organization, this ranged from between three and seven interviews per site. A single researcher (the candidate in six of the eight cases) conducted the interviews. Thirty-eight interviews lasting between 30 and 90 minutes were conducted, resulting in over 700 pages of typed transcripts. Participants were sent copies of their transcripts to provide them with opportunities to clarify or expand discussion points. Secondary data were collected from firm websites and pertinent documents were provided by some participating firms.

#### **4.3.2 Data Analysis**

Qualitative data analysis was grounded in positivist case study tradition (Paré, 2004) and followed Gopal and Prasad (2000) as a process exemplar, using a two stage analysis procedure.

The first stage involved listening to interviews, indexing contexts, initial coding, and structuring nodes; the second stage involved analysis of resulting nodes and clustering of nodes. The main steps in the analysis were coding, within-case analysis and cross-case analysis (Eisenhardt, 1989; Paré, 2004). One full transcript was independently coded by the candidate and supervisor based on a coding guide derived from the construct list. Issues regarding the understanding of codes and types were resolved prior to the candidate coding the remaining interviews in NVivo 7. For individual cases, a case summary was written providing key observations on each performance construct and applicable strategy type. Within-case analysis used a pattern matching strategy, comparing each element of the case against a range of factors related to the hypothesized constructs (Yin, 1994). The last step in the individual case analysis, and the first step in the cross-case analysis, was to convert the thick description into a single level of performance for the constructs and types (Miles and Huberman, 1984). This was done individually and then adjusted in comparison with the other firms. Cross-case analysis followed Eisenhardt (1989) and Miles and Huberman's (1984) tactic of comparing cases across the dimensions identified in the within-case analysis.

Lee (1989) identified four challenges in case study design: (1) how to make controlled observations; (2) how to make controlled deductions; (3) how to allow for replicability; and (4) how to allow for generalizability. Controlled observations were made through the use of natural controls by having firms ensconced in one of the three industries to minimize between group factors. Controlled deductions were made through the use of logical deductions through verbal propositions, focusing on evaluation criteria of falsifiability, logical consistency and confirmation of theory from the test results. Replicability and generalizability were achieved by testing the theory across the different cases with different initial conditions and outcomes.

Case studies can be assessed on three major types of validity – internal, construct, and external – and reliability (Yin, 1994). Internal validity was enhanced through the use of a pattern

matching strategy within and between cases and through the implementation of natural controls through multiple heterogeneous cases in a limited set of industries. Construct validity was addressed through the chain of evidence that a qualitative package such as NVivo provides, the review of transcripts by informants, and the use of multiple sources of evidence including interviews, documentary evidence and observation. External validity was enhanced through the use of cross-case analysis to and through the confirmation that observations fit across the eight organizations. Reliability was aided by the production of interview documentation and the organization of documentary evidence through the structures provided by NVivo.

#### **4.4 Results**

Results are presented in two parts, reflecting the findings from the within and cross-case analyses. The former are presented to introduce the case sites, identify their strategy portfolios and establish the linkages between alignment and performance. The latter are presented to compare and contrast the various cases.

##### **4.4.1 Within Case Analyses**

The within case analysis of the eight organizations in the sample is captured in three components. In this section, the firm and its strategies are described, along with significant factors leading to strategic decisions. Supplementary information detailing the levels of performance for each firm is included in Appendix B. Analysis and quotes supporting individual business, information systems and knowledge strategies are included in Appendix C.

###### **4.4.1.1 LegServ.**

LegServ was a moderate to high performing organization with an aligned Conservative strategy portfolio. The firm employed approximately 600 people supporting four major legal client groups. The Ontario-based headquarters of the organization was spread between four

buildings and it had 12 regional offices. It was an amalgamation of two different organizations combined in 2003 and was nearing the end of its consolidation efforts in 2006. The organization used the amalgamation as a means to spearhead a modernization process and implement standardized practices and IS across the firm. As the legal profession is very sensitive to tradition and precedence, circumscription and a slow rate of change were keys to the organization's strategy. Growth was focused on deepening and standardizing the quality of services for organizations clients rather than increasing the range of services available. Alignment between strategies was aided by combining portfolios that oversaw both IS and modernization.

#### 4.4.1.2 PubLib.

PubLib was a high performing organization with an aligned Balanced strategy portfolio. The firm was a southern Ontario public municipal library with five branches, filling over 100 full-time equivalent positions. It offered a wide variety of informational services, both traditional paper-based and electronic, and shared facilities with cultural and sporting users. The CEO pushed the concept of the library as an information hub and was very clear that "information is the core business." PubLib maintained a set of programs that catered to individuals from pre-school age to senior-citizens and were very conscious of maintaining these core services while expanding into a new e-services area. A key part of this strategy was to become a technology leader in the industry and use this position to create networks and set standards. In this way, the library positioned itself as an information provider and lynchpin of the community, rather than a mere lender of books.

#### 4.4.1.3 CorrEd.

CorrEd was a low to moderate performing firm with a misaligned strategy set consisting of Analyzer, Non-Strategic IS and Exploiter. The firm focused on the design and delivery of education programs to incarcerated adults, combining expertise in the teaching and security

domains. There were six people working in the head office in Ontario, with a regional coordinator position established in the Prairies. Having reached a perceived maximum growth through penetration of the Canadian market, the firm was focusing on expanding in two ways. The first was a geographic expansion from Canada to the United States with their core services; the second was based upon creating an unrelated service in mediation. They focused on exploiting the individual knowledge of the teachers, the firm's knowledge of security and the contracting agency's own knowledge. However, the firm had an acknowledged weakness in information acquisition and distribution in their field, which could be attributed to their lack of IS strategy.

#### 4.4.1.4 ConEng.

ConEng was a low to moderate performing firm with a misaligned profile of Analyzer, IS for Efficiency and Exploiter strategies. The firm was a northern Ontario-based construction and engineering company that worked in the commercial, industrial, mining, and aggregate sectors. There was a tension in the firm between following a defender or analyzer strategy, but a tendency towards the analyzer strategy due to the CEO's preferences for geographic expansion and diversification. Field and staging offices were established to extend the reach of the firm into southern Ontario, while the CEO was also very intent on expansion into less related construction areas. In favor of the defensive strategy was the CEO's own acknowledgement that "the worse the market gets the farther away you go from your core competency and the worse trouble you get in". The core administrative systems were efficiency-oriented and would support a Defender strategy very well, but only partially supported the Analyzer strategy. Both the exploitation and efficiency strategies revolved around the document management system which focused on codification but ignored the value-creating tacit knowledge of the organization.

#### 4.4.1.5 DistEd

DistEd was a poorly performing organization with an aligned Non-Viable strategy portfolio. It was a distance education organization that formed part of a small Ontario university, where on campus students numbered less than 2,000, but there were 6,000 to 8,000 distance education students with the majority of these in non-degree professional development programs. Distance learning was a less than ten-year-old initiative and had grown rapidly in this time to over 50 full-time staff. DistEd faced significant and systemic financial, human resource and IS limitations – specifically critical under-funding, over 50% annual turnover and inadequate course delivery and support tools. The business strategy was inconsistent as existing programs did not have all the courses needed to graduate but decision making was ad-hoc so new programs were being pushed in the absence of solid planning. No cohesive knowledge strategy existed due to the constant turnover. Finally, DistEd had tremendous difficulty in gaining an appropriate level of support from the university's IS organization, primarily due to its underfunding, administrative orientation and focus on residential programs. The overall effect was that independently poor strategies contributed to an alignment of non-viable strategies and poor performance.

#### 4.4.1.6 PubEd

PubEd was a low to moderately performing firm with an aligned Conservative strategy portfolio. The organization was a recently amalgamated public school district in Saskatchewan with over 40 primary and secondary schools within its jurisdiction. Integrating schools from the different former school boards required a focus on policy, standards and a shared understanding that defined the current strategy position. They described themselves as being open to innovation, both internal and external, but as operating in a conservative and traditional field. The amalgamation of the previous school districts in the current one was designed to create economies of scale and scope in the provision of services, so efficiency was the driving force in this change. The organization was more focused on improving existing services than creating new ones,

relying on the reuse of internal knowledge. The IS area was divided into support for curriculum instruction and business administration, with the latter having been the initial focus of amalgamation, particularly in linking wide-spread elements. While PubEd was likely to be constrained within conservative business and knowledge domains, they may have missed an opportunity to use IS strategy to a greater degree to generate changes within the organization by focusing on improving their core function of education delivery versus administration.

#### 4.4.1.7 DevEd

DevEd was a high performing organization whose various strategies were misaligned. The firm was a non-profit organization that provided living and support services for adults and children with developmental disabilities in southern Ontario. Adult services included residential services, activity and educational programs, community outreach and employment services. Children's services included a day-care that provided childcare for community children including those with developmental disabilities, a summer camp program, a preschool resource program and an academic enrichment program for preschoolers. They employed approximately 130 staff and had 70 volunteers. The organization was very conscious of its environment and the opportunities presented within it, being adept at identifying niches and creating new knowledge to establish positions in them. The current major environmental issue for the organization was the forecasted decrease in governmental funding, leading to strategic direction to find alternative means for generating funds to provide services. DevEd's change from a non-profit mentality towards a for-profit one showcased decoupling of alignment to force change, as the Analyzer's search for new opportunities while protecting the core was contrasted with an Explorer's pure search for new knowledge to support those opportunities. DevEd's IS strategy was also clearly dominated by both business and knowledge strategy, appearing almost incidental to the firm and not a factor in alignment.

#### 4.4.1.8 ManuServ

ManuServ was a high performing firm with a misaligned strategy portfolio. They provided outsourced support to primarily automotive manufacturers, offering a range of services, from fire and security, through cleaning, to semi-product manufacturing. The firm was very oriented towards expanding existing client relationships through the provision of new service lines and then marketing those new services to new clients. For example, their fire and security service was based upon the development of work-force management techniques in the cleaning business and a presence in automotive plants combined with expertise in mission-critical software development and process engineering learned from the semi-product manufacturing industry. ManuServ was particularly adept at identifying underperforming processes in client firms and making those processes more efficient and cost effective. IS strategy in the organization was almost entirely devoted to this efficiency, as they saw efficient information distribution as enabling effective control. The firm was not particularly concerned about achieving alignment, as they were willing to do almost anything to gain and retain customers. Their business and knowledge strategies were naturally aligned, as looking for new customers and increasing services to existing ones was closely matched by seeking new knowledge and reusing existing knowledge. In contrast, IS strategy was purposefully and consistently held out of alignment with the other two strategies, focusing entirely on generating efficiencies for the firm.

#### **4.4.2 Cross-Case Analysis**

The cross-case analysis approach was based on Eisenhardt's (1989) recommended procedure to select dimensions and then examine within-group similarities and between group differences. The strategic alignment hypothesis provides two theoretically-grounded dimensions for differentiation of cases: alignment and performance. Examining the data from the within-case analysis allows for the positioning of the eight cases in a two-by-two matrix consisting of two cases per cell, as illustrated in Figure 4-3.

**Figure 4-3 – Case Distribution**

	Aligned	Misaligned
High Performance	LegServ PubLib	DevEd ManuServ
Low Performance	DistEd PubEd	CorrEd ConEng

#### 4.4.2.1 High Alignment/High Performance

LegServ and PubLib both showed the theoretically expected relationship between good alignment and positive performance. Each organization employed a different cohesive portfolio of strategies – LegServ was Conservative while PubLib was Balanced – but both led to the same result of strong performance. Each of the organizations was operating in relatively stable environments, though LegServ was nearing the end of an amalgamation process. Both the legal and the library domains could be considered traditional, however while LegServ worked within this label, PubLib rejected it and sought to create a new image for itself.

LegServ appeared to find the Conservative strategy portfolio met their needs. Both CorrEd and LegServ operated in similarly stable and conservative environments, both organizations maintained a solid core business domain and both had knowledge bases that evolved very slowly. CorrEd’s CEO had great intellectual curiosity and admitted to being “bored” with his core domain, which led to his continual branching into marginally-related new business lines in contrast to LegServ’s focus on their core business. A second difference between their strategy portfolios appeared to be in their IS strategies, where LegServ had an aligned operational IS for Efficiency strategy and CorrEd had a misaligned administrative Non-Strategic IS focus.

LegServ appeared to have recognized the benefits of IS to the organization in supporting their processes (Chan, 2000; Tallon, Kraemer and Gurbaxani, 2000). On the other hand, CorrEd was only peripherally aware of how they could improve their performance through IS and, as a result, were dabbling in new business lines rather than bringing their IS strategy into alignment.

PubLib and ManuServ were the two highest performing firms and both tended towards Balanced strategy portfolios, though only PubLib was in alignment. The two organizations both maintained stable and growth areas and both were focused on updating existing knowledge while creating new knowledge. The difference between these two firms was in their IS strategies, where PubLib had an aligned IS for Comprehensiveness strategy and ManuServ had a IS for Efficiency strategy. As an outsourcing firm, ManuServ's focus on technology to improve efficiency was deliberate and appropriate – their clients hired them because they could perform task more efficiently than if they were left in-house. PubLib had two constituencies to address – those desiring traditional paper-based services and those seeking newer Internet-based services – so their balance between servicing their customers in multiple domains required an IS strategy that encompassed each. Each portfolio could be seen as being effective, supporting the business model and meeting the demands of the environment, but the approach – aligned or misaligned – differed.

#### 4.4.2.2 Low Alignment/Low Performance

CorrEd and ConEng both demonstrated the expected theoretical relationship between low alignment and poor performance. Both firms had a tendency towards a Conservative profile, but each had elements that were out of alignment. The Analyzer business strategy of ConEng was at odds with its otherwise efficiency focus in IS and knowledge. Several senior managers noted that the CEO's focus on expanding into new business lines was a detriment to their provision of services, particularly since the construction domain was so heavily tied to specialized physical assets and knowledge. Similarly, while the CEO was posturing the firm as an Analyzer, CorrEd

had limited success expanding into areas unrelated to its core business. The Non-Strategic IS strategy of CorrEd was at odds with its otherwise defensively focused knowledge strategy and the business core. While the firm was investing in new product lines, they may have been more successful providing IS infrastructure to allow for more effective delivery and support of their core services. In both cases, senior manager's vision of the firm appeared to be disconnected with the reality of what they could accomplish.

CorrEd and DevEd had many similarities in their environments. Both were private entities receiving primarily public funding for education of a special subset of students in a non-traditional classroom environment. The way they approached their domain was fundamentally different in many respects, however they had the same Non-Strategic IS strategy. This similarity bears examination as while DevEd consciously left IS out of alignment to focus on knowledge as their key business enabler, CorrEd appeared unconscious of the results of not developing their IS strategy to match their strategy portfolio. This may suggest that Non-Strategic IS can be a strategic choice if it is consciously made and weighed against other possible strategies, possibly leading to positive performance. If, on the other hand, the Non-Strategic IS strategy is drifted into through neglect, then it could be expected to have negative performance consequences, as seen in CorrEd.

ConEng and PubEd operated in different industries with very different outcomes, but with similar issues of sub-optimal performance. The two firms make an interesting pair as while ConEng was out of alignment in a stable environment (high growth in their core services and many opportunities to choose from), PubEd was in alignment in a changing environment (the amalgamation of several school districts into one). Contingency theory would suggest that the fit between business strategy and environment has a significant impact on performance (Venkatraman and Prescott, 1990). The contrast between these two firms may suggest a degree of

tension between internal alignment of a strategy portfolio and external alignment with environmental factors.

#### 4.4.2.3 High Alignment/Low Performance

PubEd and DistEd both had aligned portfolios – Conservative for the former and Non-Viable for the latter – and neither had particularly strong performance. Both organizations came from a similar traditional education area, but DistEd was operating in a fairly stable environment (after several years of growth) while PubEd was in the throws of significant organizational change. This organizational change may have contributed to the aligned internal strategy portfolio being unsuitable for the environment (Hirschheim and Sabherwal, 2001; Sauer and Burn, 1997). DistEd had so many organizational constraints that each of their individual strategies was non-viable, so while PubEd's aligned Conservative portfolio was inappropriate to its current circumstances, DistEd's aligned Non-Viable portfolio was inappropriate under any circumstances.

PubEd used the same Conservative portfolio as did LegServ, but to lesser effect. The overriding environmental factor for PubEd was the amalgamation forming the new school district, similar to the amalgamation that LegServ had previously passed through. As both operated in similarly conservative environments requiring a defensive strategy and both had knowledge that evolved only slowly over time, the difference appears to be in the application of their IS strategy. IS strategy in LegServ was focused on business processes in the core functions of the organization while IS strategy in PubEd was focused on business processes in administrative support functions. LegServ apparently seized the amalgamation opportunity to modernize with an IS-led change process in the midst of amalgamation, while PubEd deferred such an approach until the organizational change had been implemented, possibly leading to their lower levels of performance (Venkatraman, 1994).

DistEd may have aspired to the Conservative portfolio of LegServ, but was unsuccessful in execution. While LegServ had clear support for IS-led change in the firm, DistEd suffered from a lack of IS support. While LegServ sought and rewarded innovation and knowledge reuse, DistEd found innovation distrusted and knowledge reuse blocked due to excessive turnover. While LegServ had a clear understanding of their clients and the services they were required to deliver, DistEd did not always know what their customers required and had to react to needs in an ad-hoc manner. And while one non-viable strategy reduced the effectiveness of CorrEd, a complete set of non-viable strategies clearly led to very poor performance for DistEd. An aligned portfolio of bad or absent strategies may always be undesirable.

#### 4.4.2.4 Low Alignment/High Performance

DevEd and ManuServ were both high performers whose strategy portfolios were out of alignment. These two cases illustrate the concept of strategic misalignment, where strategies are purposefully disconnected for specific reasons. In both cases, the misalignment was intentional: in the case of DevEd to force change and in the case of ManuServ to gain competitive advantage. In ManuServ, while the firm prided itself on having never lost an existing client, the CEO was constantly looking for opportunities to expand their offerings to existing clients, find and develop new customers and leverage their core competences to open up new business lines. This Analyzer strategy was supported by conservative IS strategy that focused on efficiency and reuse of technology and an innovator strategy that focused on integration of new routines and knowledge. At DevEd, the CEO was trying to establish long-term change in the organization, focusing on developing new lucrative business lines to offset a loss of funding in core service areas and acquiring and developing new knowledge both to support and create those new opportunities. In contrast to ManuServ who generated business value from their IS, IS strategy was purposefully dominated by both business and knowledge strategies in DevEd.

DevEd and PubLib are an example of opposites achieving similar levels of high performance through very different means. PubLib was well aligned while DevEd had a strategy portfolio that had no elements aligned. DevEd had IS strategy primarily dominated by business and knowledge strategy while PubLib maintained a balance between its three strategies. The similarity between the two was that decisions on alignment were consciously and strategically made. Neither of these companies drifted into their strategic portfolios – these strategies were deliberately crafted, enacted and followed. Most of all, these portfolios – whether aligned or misaligned – were strategically suited to the industry and environment in which each company was situated.

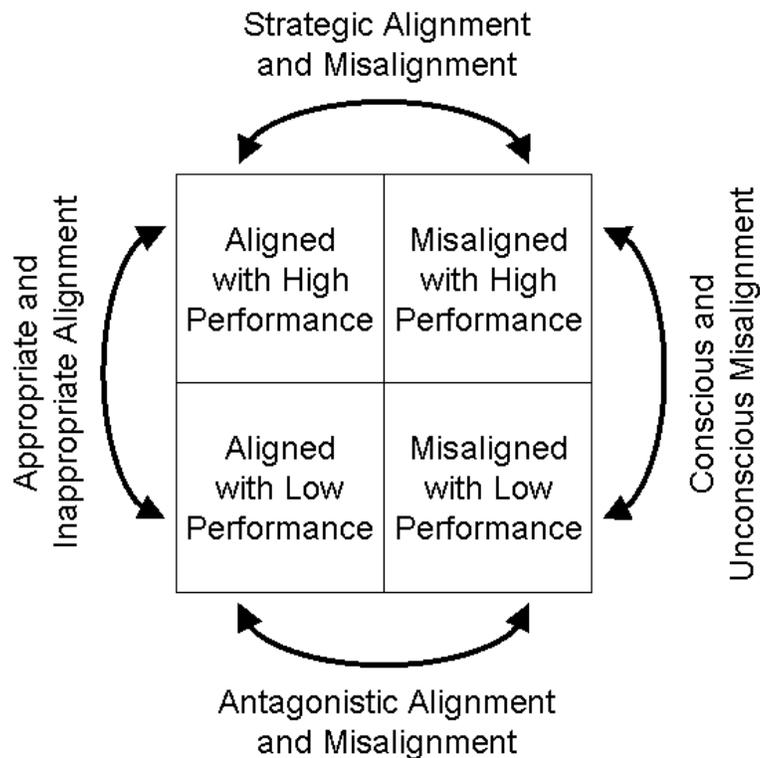
Two firms that were slightly out of alignment but showed great difference in results were ManuServ and ConEng. These firms shared very similar strategy portfolios – both followed Analyzer and IS for Efficiency strategies but were Innovators and Exploiters respectively. The difference was in whether misalignment was intentional or unintentional. ManuServ was quite conscious of its efficiency focus for its IS and based its sales-pitch around it. In fact, the CEO believed that the fit between efficiency-oriented IS and growing the business lines and knowledge of the firm was the core of its competitive advantage. For ManuServ, fit could mean something bigger than internal strategic alignment. On the other hand, the CEO of ConEng was apparently unaware of the impacts of expanding the business in his desired manner and how this decision was not supported by the very well-developed IS and knowledge-base supporting the efficient operation of the firm. While both firms were misaligned, only ManuServ was consciously so.

The eight firms tell eight very different stories about strategy, alignment and performance, but comparison between can start to develop commonalities and differentiators that could inform theory development. These emergent themes are discussed in the next section.

## 4.5 Discussion

The discussion focuses on the development and refinement of common themes across the eight cases. Four common themes emerge from the individual and cross case analyses as illustrated in Figure 4-4: appropriate and inappropriate alignment, conscious and unconscious misalignment, antagonistic alignment and misalignment, and strategic alignment and misalignment.

**Figure 4-4 – Alignment and Misalignment**



### 4.5.1 Appropriate and Inappropriate Alignment

When examining the high alignment side of Figure 4-4, the common difference between the high and low performing firms was whether alignment was appropriate or not to the firm's key external factors, supporting the basic premise of contingency theory, that the firm's strategy should be aligned to its environment (Prescott, 1986). Both PubLib, with its Balanced portfolio,

and LegServ, with its Conservative portfolio, understood their environments, considered them in their strategy development and devised an approach that was suitable for the environment that included strategic alignment. In contrast, PubEd's selection of a cohesive Conservative strategy was less suitable for the changing environment it faced. Similarly, DistEd's drifting into a Non-Viable portfolio highlighted the negative effects of multiple ineffective strategies. The common factor between the two was that they maintained internally aligned strategy portfolios which were inappropriate to their external situation (Sauer and Burn, 1997).

#### **4.5.2 Conscious and Unconscious Misalignment**

Strategies can become routines in organizations (Ireland, Covin and Kuratako, 2009) and these routines may produce a set of decisions and actions that are independent of explicit intentions (Allison and Zelikow, 1999). The pattern of decisions that create a realized strategy would be emergent (Mintzberg, 1978) and the product of the accumulation of individual and independent decision. Therefore the firm could be unconscious of its realized strategy and hence its alignment between those strategies. Additionally, when examining the low alignment side of Figure 4-4, it is apparent that those firms that were performing well were conscious of their misalignment – in fact, both DevEd and ManuServ revealed in it. In contrast, those firms that were poorly performing were oblivious to their level of misalignment – both ConEng and CorrEd felt that their strategy portfolios were internally consistent. As noted by Oh and Pinsonneault (2007), “organizational complexities often hinder managers from perceiving the true consequences of misalignment” (p. 259). CorrEd's unconscious neglect of IS strategy showing a marked contrast to DevEd's studied dominance of it. ManuServ's opportunity shaping through efficient delivery of IS and reuse of processes and knowledge was quite different from ConEng's opportunity seeking being hampered by a rigid document management system and organizational stovepipes of knowledge.

### **4.5.3 Antagonistic Alignment and Misalignment**

In certain cases, alignment and misalignment were negatively related – or antagonistic – to performance. In each case, the selected strategy portfolio – whether aligned or not – was a poor fit to the environment and circumstances of the organization. From DistEd’s dysfunctional but aligned Non-Viable portfolio to CorrEd’s neglect of their IS strategy, these firms made poor selections in their strategy portfolios. Seemingly small changes in the environment have been established to have potentially large impacts on the sustainability of alignment within firms and, ultimately, the performance of the firm (Oh and Pinsonneault, 2007). Of particular note is the lack of fit between the strategy portfolios and environments of PubEd and ConEng, where static alignment was held in a dynamic changing environment and the opposite. By extension, struggling to retain alignment in the face of environmental change may be counterproductive. While internally consistent, DistEd and PubEd’s aligned strategy portfolios were at odds with their environments. Miller (1992) examined circumstances under which external and internal fit were inconsistent, finding that external fit between the competitive environment and organizational structures were not always aligned with the internal fit between organizational structures and firm processes. He advocated aligning externally first and then internally, which would be supported by PubEd’s poor performance, which appears to have focused first on internal alignment. An IS-specific form of this explanation is the ‘Alignment Trap’, where alignment with business is addressed prior to solving existing internal IT infrastructure issues (Shpilgerg, Berez, Puryear and Shah, 2007).

### **4.5.4 Strategic Alignment and Misalignment**

One of the most interesting differences was between high performing firms and how they could achieve this level either with or without alignment. All of these firms seemed to understand their environment and how they could best position themselves within it. PubLib and LegServ were aware of the consistency of their various strategies – the CEO of PubLib was quite clear that

maintaining balance between strategies was a major challenge and the Director of Modernization for LegServ was very aware that the convergence of structural, process and technology changes in a single office would lead to a consistent and successful implementation. The CEOs of ManuServ and DevEd were equally clear about the benefits of misalignment for their organizations – to generate competitive advantage as a low-cost outsourcing provider for ManuServ and to set the conditions for adaptation and growth in DevEd’s changing environment. The effectiveness of IS strategic alignment has been described as being contingent upon there being consistency between the internal and external domains (Henderson and Venkatraman, 1993). These two firms decision to focus on the internal and external alignment over internal strategic alignment would also support Miller’s (1992) contention that in some cases, external alignment may be of greater importance than internal alignment, allowing for strategic misalignment to occur.

#### **4.6 Conclusion**

Strategic fit is a fundamental concept in management (Venkatraman and Camillus, 1984) to the point that strategy has been defined as “maintaining an effective alignment with the environment while efficiently managing internal interdependencies” (Miles and Snow, 1978, p. 3). Recognizing the balance between internal and external fit, IS researchers in the alignment field have been previously advised to collect environmental contingency factors in order to control for them (Chan and Huff, 1993). This paper has supported and reinforced this warning by demonstrating how environmental factors can influence strategic alignment, providing possible explanations for the mixed findings in this research area. In addition, this paper has extended Miller’s (1992) work by focusing on portfolios of strategies in place of structure and process as elements of internal fit that may be appropriate or inappropriate to external environmental fit. Additionally, it adds to Sauer and Burns’ (1997) work by identifying cases of misalignment that may be beneficial. Finally, the paper integrates these contributions to support the position that

misalignment is at times necessary to address the environment (Hirschheim and Sabherwal, 2001) and extends this work into the knowledge domain. These various contributions lead to a number of implications both for practice and research.

#### **4.6.1 Limitations**

The decision to follow a positivist approach to case study research is both an asset and a limitation. Through this approach, the application of the case studies was to discover the underlying reality of the relationship between alignment and performance and to model it (Paré, 2004). This implies a focused and objective approach to the data that would be at odds with a more immersive and subjective approach of interpretivism (Orlikowski and Baroudi, 1991). With over 700 pages of interview transcriptions and notes, multiple interpretations of the data are possible and so the model developed from the case observations may be only one such interpretation.

One of the major concerns of positivist research, including case studies, is replicability and generalizability (Paré, 2004; Yin, 1994). While these concerns were addressed by testing the theory across the different cases, it is acknowledged that all the firms were Canadian SMEs from three specific industries. This narrow sample frame may require some judicious consideration when generalizing the study's findings.

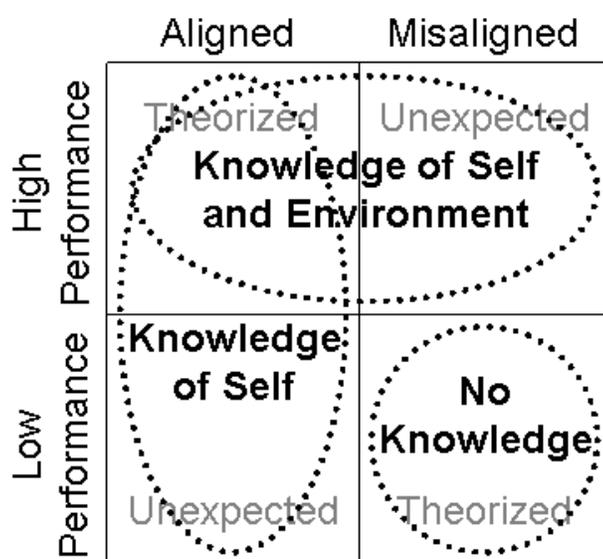
#### **4.6.2 Implications for Practice**

The four common themes spanning the matrix can be further reduced to two knowledge-oriented concepts for practitioners as illustrated in Figure 4-5: (1) knowledge of the firm and (2) knowledge of the environment.

Self knowledge here represents the understanding of one's firm and a consciousness of the strategies selected. For those firms without a clear understanding of the external environment but with a good view of their strategies, maintaining an internally consistent set of strategies –

which form a strategy portfolio – is a logical and potentially high performing approach. Research into strategic alignment would support the finding that strategic alignment leads to good performance more often than not (Chan and Reich, 2007). This would lead to the conclusion that in the absence of a strong understanding of the environment, strategic alignment is a strong approach to follow. However, should the environment be markedly inappropriate for the particular cohesive portfolio, then this approach could result in low performance in spite of the aligned strategies. Self-knowledge and alignment alone can lead to positive or negative outcomes.

**Figure 4-5 – Knowledge and Alignment**



In contrast, understanding of both the environment and one's firm leaves the organization free to select between strategic alignment and misalignment. As noted by several respected researchers (Bergeron, Raymond and Rivard, 2004; Chan *et al.*, 1997; Luftman, Papp and Brier, 1999), alignment is the more likely path, but there are other misaligned paths to high performance (Sabherwal *et al.*, 2001), as demonstrated by two of the firms. Self-knowledge and knowledge of the environment can then be seen to lead to higher performance as trade-offs between alignment with the environment and internal alignment can be consciously made, an important realization for managers to consider.

### 4.6.3 Implications for Research

First, the strategic alignment hypothesis can be seen to capture in the high performance/high alignment cell those firms that meet one of two types. The first are those firms who understand their firm and adopt an aligned portfolio because it is a basically sound orientation that is ultimately, but unintentionally, right for their environment at that time. The second are those firms who understand both their firm and the environment and adopt an aligned portfolio deliberately because it is the most appropriate orientation for the firm's environment at that time. The strategic alignment hypothesis also captures those firms who are not fully aware of their firm's strategic orientation or the requirements of the environment. The inconsistencies in findings of regarding the strategic alignment hypothesis can be attributed to those firms who incorrectly select a cohesive strategy portfolio due to miscomprehension of the environment and those firms who correctly chose a misaligned portfolio to match the requirements of their understanding of the environment. Those firms that fell into the unexpected areas of the strategic alignment hypothesis could be explained through an application of contingency theory, where a portfolio of strategies must be aligned to the environment. This conclusion leads to a recommendation for strategic alignment researchers to establish control variables both for the environment and for the firm's perceptions of the environment.

Second, this study was conducted using a sample of eight case studies that happened to fall equally into the four cells of Figure 5-1, but this does not imply an expectation of an equal probability for any other sample. Research into strategic alignment has generally supported the strategic alignment hypothesis (Chan and Reich, 2007) and this paper continues that support. Specific cases have been identified that demonstrate why mixed results may have been found, but the proportion that they may exist in the population was not suggested. Future study may wish to examine the degree to which results that do not conform to the strategic alignment hypothesis may be attributable to environmental factors.

Finally, defining how the environment interacts with strategy and performance has been a significant problem in discerning its effects, both in terms of what environmental factors are important and the form the interaction takes (Venkatraman and Prescott, 1990). Based on the results of this paper, particularly that no clear relationship emerged between environment and alignment, it is apparent that a simple mediating, moderating or matching approaches may not be appropriate to capture the complexities of the relationship. Evaluation of the combined effects of strategic alignment and environment on performance may require the holistic (Venkatraman and Prescott, 1990) conceptualizations of fit that include profile deviation, covariation and gestalts (Venkatraman, 1989). Linkages between environment and antecedents to alignment have already been established (Choe, 2003), but further investigation of environment's direct impact on strategic alignment remains a fruitful area of future research.

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**Appendix A – Semi-Structured Interview Indicators**

Topic	Concept	Indicator
Performance	Physical Capital	Fixed assets and facilities Up to date equipment
	Structural Capital	Business models and processes well established
	Human Capital	Know-how and skills of employees Development of employees
	Innovation Capital	Ability to generate new products and services Ability to generate inventions Ability to generate novel ideas
	Relational Capital	Reputation with customers Reputation with partners Reputation with investors
	Financial Capital	Profit and revenue growth reference competitors Increase in market share and volume of business
Business Strategy	Defender	Narrow product-market domain Tend not to search outside own domain for new opportunities Little product-market development
	Prospector	Continually searching for market opportunities Tend to be creators of change in the industry Frequently changing product lines Experiment with potential responses to emerging trends
	Analyzer	Maintain stable domain while searching dynamic domain Operate routinely and efficiency in stable domain Watch competitors for ideas to adopt in dynamic domain Fewer innovations than P but less committed to stability than D
	Reactor	Lacks a consistent strategy Responds to environmental pressures but does not foresee Unable to respond effectively to perceived changes

Information Systems Strategy	IS for Efficiency	Focus on achieving internal and inter-organizational efficiency Focus on long-term decision making
	IS for Flexibility	Focuses on maintaining market flexibility Respond quickly to opportunities
	IS for Comprehensiveness	Makes comprehensive decisions and quick responses High knowledge of competitors
Knowledge Strategy	Loner	Ineffective and isolated learners Technology cycle time is high (slow learners) Knowledge dispersion is very low, focusing on narrow areas
	Exploiter	Low R&D expenditure levels, but with high linkages Broad but shallow knowledge base Place priority on external and incremental learning
	Explorer	High level of radicalness
	Innovation	Effectively combine internal and external learning High internal and external learning; very fast learners Focus on both radical and incremental learning

## Appendix B – Performance Levels of Case Study Firms

	LegServ	PubLib	CorrEd	ConEng
Physical	Med – Owns no facilities or major assets but has access to very high quality leased assets that meet their needs.	High – Exceeded desired per capita space and distance standards and reconfigured libraries as community space.	Med – Own all and lease part of their headquarters building, but operate from their clients’ facilities.	Med – Equipment is the largest part of the balance sheet and they keep it fully utilized, but it limits their range of tasks.
Structural	High – Very well developed and codified processes and administrative systems. Rely heavily on procedures and traditions.	High – Processes are very progressive, with e-services being a national leader and exemplar of technology use in libraries.	Med – Adopted procedures of correctional services and continuous entry and exit. Have some difficulties in distribution of due to isolation.	Med – They stress process codification, including ISO accreditation, but much knowledge is tacit and there are still isolated pockets.
Human	Med – Very knowledgeable employees and high retention but has threat of near-term high retirement.	High – All librarians have advanced qualifications and there is a very low turnover of personnel.	Med – Employees are disaffected with typical school systems and while pay is lower than in schools, they still have low turnover.	Med – Effort is made to keep talented individuals but the industry has high turnover in general.
Innovation	High – Encouraged and aided by integration of modernization and IM/IT portfolios.	High – Technology and changing demographics have provided opportunities to innovate.	Low – Limited opportunity to innovate in primary business and limited success with new business lines.	Med – Successful in process and IS innovation and have learned much from failed attempts.
Relational	High – Very strong relationship with primary clients and customers.	High – Over 70% of population hold library cards and the library ranked first of all city services.	Med – Have a good reputation with the correctional community, but public scoring mechanisms limit impact.	Low – Has a reasonable reputation with clients but a poor one with employees.
Financial	Low – Public organization has sufficient funds to achieve mission but no ability to accrue savings.	Med – Public organization has sufficient funds to achieve mission and is allowed to keep donations and accrue savings.	Low – Private organization with relatively low profit growth of near 6% and slowing client growth.	Med – Reasonable growth and return on equity for the industry, but have limits on growth in the local area.

	DistEd	PubEd	DevEd	ManuServ
Physical	Low – Infrastructure belongs to the university not the division. Area allotted for future expansion is already insufficient.	Low – Schools are the main assets, but they are rapidly deteriorating. Management is difficult as political issues are tied to divesting assets.	High – Rent headquarters and packing facility but own 12 homes and education facility, with constant growth in assets.	Med – Own the semi-product manufacturing facility and the headquarters building, but operate from their clients’ facilities.
Structural	Low – Financial and operational management processes are ineffective. Course selection is an ‘adhocracy’ and IS support is haphazard and minimal.	Med – Amalgamation led to uneven processes across the district. Conscious effort to adopt best practices and learning vice teaching focus	Med – Up to date policies and processes and are becoming accredited. Have developed new processes to help specific disabilities.	High – Competence in real-time process control and labor management, including both procedures and supporting IS.
Human	Low – Academics are not part of the division. Annual staff turnover is over 50%, so much expertise routinely leaves the organization.	Med – Wide range of abilities in over 500 teachers. Evaluations are conducted to support and improve teachers.	High – Learning culture with education and training opportunities provided including professional certification. Low turnover.	High – Majority of revenues come from knowledgeable supervisors and the core staff which participate in each start up activity.
Innovation	Low – Partnerships account for much innovation due to the inability to get internal support. Most effort is focused on attaining minimum service standards.	Low – Consolidating what amalgamation has brought together is the focus, but they have started putting structures in place to support future innovation.	High – Constant search for new services for existing clients and for opportunities to expand clients. Specific rewards given for research, innovation and creativity.	High – Combine software and cost control expertise to create outsourcing solutions for their clients. CEO states “I create a different way of doing business.”
Relational	Med – There are good relationships with external agencies and adequate ones with academics and students	Med – There is some positive feedback from the community but many still resent amalgamation.	Med – Very good relations with ministries, families of clients and employees, but only fair with community.	High – Firm has never lost a contract and relationship with clients enables them to expand services offered.
Financial	Low – Revenues are not retained and the budgeting system is inflexible, causing loss of resources.	Low – The challenge is managing a dispersed area with steadily declining enrolment and thus funding.	Med – Revenues and allocations are adequate, but the switch to individual funding will be a challenge.	High – Entrepreneurial outlook focuses on high margin opportunities that reuse core capabilities.

### Appendix C – Business, Information Systems and Knowledge Strategies of Case Study Firms

	LegServ	PubLib
Business Strategy	<p style="text-align: center;">Defender</p> <ul style="list-style-type: none"> <li>• little desire to expand range of services</li> <li>• cost control is very important</li> <li>• researched the efficacy of their services with surveys</li> <li>• decision making takes extended period of time and requires cooperation of all stakeholders</li> <li>• very strong understanding of their core services</li> </ul>	<p style="text-align: center;">Analyzer</p> <ul style="list-style-type: none"> <li>• view library as community information and culture hub</li> <li>• defend paper-based services against bookstores and e-services against search engines</li> <li>• balance existing and expanding services and clients</li> <li>• statistical analyses of service standards and performance</li> <li>• efficiency is a concern but still seek new opportunities</li> <li>• forefront of provincial e-services vision since 1990</li> </ul>
Information Systems Strategy	<p style="text-align: center;">IS for Efficiency</p> <ul style="list-style-type: none"> <li>• amalgamation allowed reduction of duplication</li> <li>• implemented standardized networks and docking stations to facilitate travel between sites</li> <li>• uses other organizations' precedent to implement new technology</li> <li>• acquisition of a case management system is efficiency driven</li> <li>• firm is improving services to their existing clients for existing services</li> </ul>	<p style="text-align: center;">IS for Comprehensiveness</p> <ul style="list-style-type: none"> <li>• amalgamation of basic IT infrastructure operations and maintenance enabled focus on information services</li> <li>• community information hub view emerged in early 1990s</li> <li>• neglect administrative IS for operational IS services</li> <li>• implemented “a new integrated library system”, RFID and internal wikis for youth</li> <li>• positioned as active information agent for community</li> <li>• developed and marketed their own open-source software that supports their electronic services</li> </ul>
Knowledge Strategy	<p style="text-align: center;">Exploiter</p> <ul style="list-style-type: none"> <li>• amalgamation allowed identification of best practices</li> <li>• modernization focus on improving selected best practices</li> <li>• rely on front-line employees to examine process</li> <li>• implemented formal modernization committees</li> <li>• major cross-training and succession planning initiatives</li> <li>• legal domain processes are legislated so focus is on codification</li> </ul>	<p style="text-align: center;">Innovator</p> <ul style="list-style-type: none"> <li>• both exploit existing internal knowledge and explore for new external knowledge</li> <li>• well networked with libraries and other professional librarians are aware of diverse knowledge sources</li> <li>• innovative knowledge strategy ingrained into operations</li> <li>• information is encouraged to flow freely in firm</li> <li>• recombine existing knowledge to create new services</li> </ul>

	CorrEd	ConEng
Business Strategy	<p style="text-align: center;">Analyzer</p> <ul style="list-style-type: none"> <li>stable domain is correctional education where they compete effectively</li> <li>very good understanding of costs but do not undercut</li> <li>have attempted previously to branch out into curriculum development for health with low success</li> <li>currently attempting expansion in both geographically (to U.S.) in correctional education business and in adding a new mediation business line</li> </ul>	<p style="text-align: center;">Analyzer</p> <ul style="list-style-type: none"> <li>CEO noted that reducing costs and finding new opportunities “go together”</li> <li>“efficiency is #1 ... you don’t want to do anything twice”</li> <li>growth from \$55M mining, crushing and roads to \$80M in a wider range of sectors</li> <li>geographic growth from northern to southern Ontario</li> <li>CEO entrepreneurial attitude is key: “We’ll go on the edge and do things that we’ve never done before”</li> </ul>
Information Systems Strategy	<p style="text-align: center;">Non-Strategic IS</p> <ul style="list-style-type: none"> <li>very little investment in IS infrastructure or strategy</li> <li>rudimentary administrative IS systems and no operational ones supporting development or delivery</li> <li>very limited use of IS to scan the environment</li> </ul>	<p style="text-align: center;">IS for Efficiency</p> <ul style="list-style-type: none"> <li>main IS are a customized accounting information system (AIS) and a document management system (DMS)</li> <li>AIS provides integrated production support</li> <li>DMS is designed for information and knowledge capture</li> <li>DMS suffers from indexing problems and system functionality supporting innovation has been limited</li> </ul>
Knowledge Strategy	<p style="text-align: center;">Exploiter</p> <ul style="list-style-type: none"> <li>small headquarters with much tacit corporate knowledge</li> <li>training relies on both transfer of codified procedural knowledge and tacit exchange from mentoring</li> <li>isolation poses significant challenges in knowledge distribution</li> <li>success is based on combining educational and correctional knowledge</li> <li>attempting to expand knowledge area into unrelated mediation area</li> </ul>	<p style="text-align: center;">Exploiter</p> <ul style="list-style-type: none"> <li>focus on codification and transfer of explicit knowledge is seen in DMS, where all information is entered</li> <li>reuse has been seen in moving development knowledge from one bridge project to another</li> <li>DMS indexing issues have limited retrieval of knowledge</li> <li>limited recognition of the importance of tacit knowledge</li> </ul>

	DistEd	PubEd
Business Strategy	<p style="text-align: center;">Reactor</p> <ul style="list-style-type: none"> <li>• “curriculum decisions have been complete ad-hocracy”</li> <li>• trying to analyze their performance, but are not yet aware of the linkages</li> <li>• not drawing the best students, as “if they are really high-end, then they’re not our students”</li> <li>• recognition that the level of support they can provide their students may be less than that of competitors</li> </ul>	<p style="text-align: center;">Defender</p> <ul style="list-style-type: none"> <li>• “Education is a naturally conservative institution because everybody’s gone to school”</li> <li>• efficiency in provision of their core services is a key concern as they have finite resources available to them</li> <li>• evolution is oriented refining and providing different means for delivering core programs</li> <li>• performance review is a high priority where assessment is focused more on correction than expansion</li> </ul>
Information Systems Strategy	<p style="text-align: center;">Non-Strategic IS</p> <ul style="list-style-type: none"> <li>• strategy is based on efficiency, but it is poorly executed</li> <li>• “We are very information systems poor. We have a number of very well motivated people who are trying to put such things in place, but are dreadfully missing those tools that would make them work.”</li> <li>• financial management system and student information system are both geared to in-house student requirements rather than both residential and distance students</li> <li>• information is largely not captured, or “it tends to end up in spreadsheets across the institution, carefully guarded”</li> </ul>	<p style="text-align: center;">IS for Efficiency</p> <ul style="list-style-type: none"> <li>• IS area is divided into support for curriculum instruction and business administration, with the latter having been the initial focus of amalgamation.</li> <li>• “moved the IS function off the teacher’s shoulders and hired information systems professionals that specialize in various IS areas”</li> <li>• technology can mitigate the impact of distance linking “41 schools over about 12,000 square miles”</li> <li>• development of tools to support special interest groups and improving communications within the extensive area</li> </ul>
Knowledge Strategy	<p style="text-align: center;">Loner</p> <ul style="list-style-type: none"> <li>• very inward looking in its knowledge strategy due to poor information management practices</li> <li>• “we would have reluctance to share – not because we’d be afraid of giving away our trade secrets or competitive advantage, but because we might look like idiots”</li> <li>• residential program focus of the university overshadowed the requirements for distance education</li> <li>• firm has an internal knowledge focus, an opportunistic capture process and limited knowledge reuse</li> </ul>	<p style="text-align: center;">Exploiter</p> <ul style="list-style-type: none"> <li>• more focused on improving existing services than creating new ones</li> <li>• reuse of internal knowledge or acquisition of external knowledge are their main knowledge processes</li> <li>• source of much knowledge is internal and is based on education as a profession and teachers as professionals</li> <li>• attempts to codify knowledge for reuse</li> <li>• newly amalgamated organization has a wide range of knowledge in the organization</li> </ul>

	DevEd	ManuServ
Business Strategy	<p style="text-align: center;">Analyzer</p> <ul style="list-style-type: none"> <li>• core is residential and non-residential services to individuals with behavioral and developmental issues</li> <li>• CEO has an entrepreneurial and analytical outlook</li> <li>• maintains a wide range of operations, where certain parts of the organizations work on a business model to fund other parts of the organization</li> <li>• created an entirely new niche business area around a particular disability, starting with one client and expanding to become a regional resource</li> </ul>	<p style="text-align: center;">Analyzer</p> <ul style="list-style-type: none"> <li>• “we’re very focused on perfecting and improving what we’re currently doing but certainly we always have to be looking to the future and what else can we do”</li> <li>• relationship focus as opposed to a transactional one and positioned more on quality than cost</li> <li>• analyzes customers’ needs and expanding their service offerings to provide efficient outsourcing for those needs</li> <li>• “in the business of whatever my customers need if I can make money at it and if I can do it better than anyone”</li> </ul>
Information Systems Strategy	<p style="text-align: center;">Non-Strategic IS</p> <ul style="list-style-type: none"> <li>• IS used for supporting administration within the firm</li> <li>• e-mail is a recent introduction, as there was not the installed base to ensure that distribution was effective</li> <li>• IS and information is viewed as unrelated to client care</li> <li>• resistance to automation of client care is prevalent</li> </ul>	<p style="text-align: center;">IS for Efficiency</p> <ul style="list-style-type: none"> <li>• efficient knowledge sharing enabled by IS is at the core of their system - “the reason that [the firm] exists is because information systems are making visible areas of cost control that weren’t visible before”</li> <li>• efficient information distribution enables effective control - “We were developing business applications to support our workforce in terms of what they need to be more efficient”</li> </ul>
Knowledge Strategy	<p style="text-align: center;">Explorer</p> <ul style="list-style-type: none"> <li>• revitalized older programs and integrated new knowledge to make them more effective through external links</li> <li>• annual rewards recognizing innovation, teaching and research among other service areas</li> <li>• acquired the knowledge need to develop a handbook, run a conference, train the staff and open a residential treatment facility on a new disorder</li> <li>• focused on identifying and absorbing external knowledge to bring into the field</li> </ul>	<p style="text-align: center;">Innovator</p> <ul style="list-style-type: none"> <li>• routinely bring together teams of subject matter experts to develop new capabilities</li> <li>• defined by what it knows and this is constantly changing as it learns how to meet the expanding needs of its clients</li> <li>• “we choose new processes to the industry... we didn’t invent them but we took them into that industry”</li> <li>• both learn internally and partner with others to acquire knowledge</li> <li>• reuse core knowledge of scheduling and IS within multiple domains to generate new knowledge</li> </ul>

## **Chapter 5**

### **Strategic Orientation of Knowledge-Based Enterprises (STROKE):**

#### **An Instrument Development**

##### **Abstract**

Knowledge strategy and its alignment with business and information systems strategies can be conceptualized in many ways. This paper follows the development of the Strategic Orientation of Knowledge-Based Enterprises (STROKE) instrument, a knowledge strategy counterpart to the Strategic Orientation of Business Enterprises (STROBE) instrument of Venkatraman (1989) and the Strategic Orientation of Information Systems (STROIS) instrument of Chan, Huff, Barclay and Copeland (1997). As part of the process, issues regarding the rigor of existing scale development analysis techniques using card sorts are addressed through the development of Matrix Kappa, a validation statistic intended as an extension of and complement to Cohen's Kappa.

### **5.1 Introduction**

Business and information systems (IS) strategic alignment has been empirically shown to result in higher performance (Bergeron, Raymond and Rivard, 2004; Burn, 1996; Chan, Huff, Barclay and Copeland, 1997; Chan, Sabherwal and Thatcher, 2006; Cragg, King and Hussin, 2002; Sabherwal and Chan, 2001), however empirical study of alignment impacts between business strategy and each of knowledge and IS strategy has been limited. The relationship between business and knowledge strategy has been described as one of interdependency where

the alignment of knowledge strategy with business strategy creates the information resources needed for competitive advantage (Snyman and Kruger, 2004). A recent investigation of the IS and knowledge strategy types indicated a complementary relationship between the two strategies in the generation of firm performance (Chan, Denford and Jin, 2009). Additionally, while the impacts of pairs of business, IS and knowledge strategies has been studied, the three components together have not been considered in research.

The development of the research model was driven by two research questions: first, how does knowledge strategy align with business and information strategies in organizations and second, what is the performance impact of that strategic alignment. The specific aim of the paper was to develop an instrument to directly compare the strategic orientations of firms in terms of their business, IS and knowledge strategies. The instrument is designed for senior managers as respondents and has the organization as the unit of analysis; while it is designed to capture cross-sectional data, it can also be employed longitudinally (Pinsonneault and Kraemer, 1993).

The paper is organized as follows: first a theory-base for the paper is developed, identifying key definitions, tracing the development and linkages of theory components and explaining the conceptualization of alignment underlying instrument development. Next, the instrument development is outlined, using a sequential method of item creation, scale development and instrument testing. This is followed by a section describing concerns with a method used in scale development and proposing a complementary analytical method to address the concerns. The instrument is described, tracing the development of the individual scales and reporting on their reliability and validity. Discussion focuses on the resulting scales, instruments and suggested methodological improvements. The paper concludes by looking at the limitations, implications and contributions of the study.

## **5.2 Theory Development**

In this section, key definitions are provided, theory components are examined, and then the conceptualization of alignment is discussed.

### **5.2.1 Key Definitions**

In studying the strategic alignment of organizations, two key definitions are required to frame this paper: strategy and alignment.

#### **5.2.1.1 Strategy**

Strategy can be defined as “a pattern in a stream of decisions” (Mintzberg, 1978). Strategies can be intended or realized (Mintzberg, 1978). Intended strategies are those that are official and may be written down, whereas realized strategies are those reflected in decision making, resource allocation, and activities conducted by the organization (Chan, Huff and Copeland, 1998). Following the view of strategy as pattern (Mintzberg, 1987) and as being realized (Mintzberg, 1978), “strategy exists in the cognition of managers but is also reified in what companies do” (Gavetti and Rivkin, 2007, p. 435). Strategies can be at the corporate or business unit level (Beard and Dess, 1981) where corporate strategies concern the selection of businesses to operate in and how business units should be managed, while business strategies concern the creation of competitive advantage (Porter, 1980). Finally, there is a distinction between a strategy’s content and the process by which it was created (Sabherwal and Chan, 2001).

In order to focus attention on the impacts of strategy on competitive advantage and its influence in alignment, neither the promulgated plan nor the process for achieving it are of issue. Instead, this paper takes the view of strategy as ‘realized patterns of action that influence resource allocation and activities conducted at the business unit level.’ Reflecting their strategies, firms are

seen to have strategic orientations toward the marketplace that are stable and enduring, while being industry independent (Venkatraman, 1989a). These strategic orientations are “the general pattern of various means employed to achieve the business goals, with a particular emphasis on the business-unit level of the organizational hierarchy” (Venkatraman, 1985, p. 25).

#### 5.2.1.2 Alignment

A number of different terms are grouped under ‘alignment’: fit (Venkatraman, 1989b; Gresov, 1989; Porter, 1996), alignment (Chan *et al.*, 1997; Sabherwal and Chan, 2001), linkage (Henderson and Venkatraman, 1993; Reich and Benbasat, 1996), bridge (Ciborra, 1997) and coalignment (Bergeron *et al.*, 2004; Drazin and Van de Ven, 1985; Venkatraman and Prescott, 1990). Strategic alignment can be divided into intellectual or social dimensions, where the former deals with the interrelatedness of plans and strategies while the latter deals with common understanding amongst executives (Benbasat and Reich, 1996). This work focuses on the intellectual dimension of strategic alignment using realized strategy as its key indicator.

The concept of alignment is derived from contingency theory, in which models share the premise that “context and structure must somehow fit together if the organization is to perform well” (Drazin and Van de Ven, 1985, p. 514). Both Venkatraman (1989b) and Drazin and Van de Ven (1985) noted that different definitions of alignment spring from different perspectives and lead to different operationalizations. Alignment and coalignment are differentiated based on Venkatraman and Camillus’ (1984) distinction between ‘patterns of interaction’ and ‘content of fit’ perspectives. In the former, coalignment is considered internal consistency between decisions or dimensions supporting a type, whereas in the latter, alignment is between strategies (Venkatraman, 1990). Adopting the Venkatraman and Camillus (1984) view of alignment as ‘content of fit’ and adapting Drazin and Van de Ven’s (1985) view to the current paper context leads to viewing the strategic alignment hypothesis as ‘strategies must fit together if the

organization is to perform well.’ Within this view, the specific concept of strategic alignment is based upon the fit between business, IS and knowledge strategic orientations (Chan *et al.*, 1997).

### **5.2.2 Theory Components**

There are several different approaches by which realized competitive strategy can be operationalized, including typologies and comparative measures (Chan and Huff, 1992). Typologies are exhaustive and mutually exclusive classes that are conceptually derived (Hambrick, 1984) and are often either based on multiple dimensions (such as types in a conceptual two-by-two model) or based on polar types (such as opposites with intermediate types being a blend) (Bailey, 1994). In contrast to nominal single-item classifications such as specific types in typologies, comparative measures are ordinal, multi-item construct operationalizations that may include several different dimensions (Venkatraman, 1989a). The multidimensional nature of comparative measures and basis of typologies can be used to link the two methods, as seen in Sabherwal and Chan’s (2001) for business and IS strategies and in Chapter 2 for knowledge strategies. This paper focuses on the comparative measure approach, in contrast to typological approaches used in Chapters 3 and 4.

Realized business strategy research has a long history, resulting in several typologies and dimensions. Using a business strategy comparative measure approach, Venkatraman (1985, 1989a) developed multiple dimensions of the strategy construct, entitled the Strategic Orientation of Business Enterprise (STROBE). Aggressiveness involves a firm “improving market rates at a relatively faster rate than the competitors in its chosen market” (Venkatraman, 1989a, p. 948). Analysis is conceptualized as “the extent of tendency to search deeper for the roots of problems, and to generate the best possible solution alternatives” (Venkatraman, 1989a, p. 948). Defensiveness is drawn from Miles and Snow’s (1978) work, reflecting the tendency to emphasize cost reduction and increased efficiency. In the original Strategic Orientation of

Business Enterprises (STROBE) formulation (Venkatraman, 1985), internal defensiveness referred to cost cutting and efficiency whereas external defensiveness referred to the development of tight marketplace alliances (Chan *et al.*, 1998). Futurity focuses on “temporal considerations reflected in key strategic decisions, in terms of the relative emphasis on effectiveness (longer-term) considerations versus efficiency (shorter-term) considerations” (Venkatraman 1989a p. 948). Proactiveness is also drawn from Miles and Snow (1978), reflecting “participation in emerging industries, continuous search for market opportunities, and experimentation with potential responses to changing environmental trends (Venkatraman, 1989a, p. 949). Riskiness deals with “resource allocation decisions as well as choice of products and markets” (Venkatraman, 1989a, p. 949). Some studies (Chan *et al.*, 1997; Sabherwal and Chan, 2001) use the inverse of this construct, defining risk aversion in terms of “reluctance to embark on risky projects” (Chan *et al.*, 1998, p. 277). Other studies use one of Venkatraman’s (1985) original dimensions – innovativeness – to capture the firm’s strengths in creativity and experimentation (Chan *et al.*, 1997). This paper uses all of the original STROBE dimensions with the exception of innovativeness, which was dropped at the outset as it could have been confounded with an innovativeness measure included in the intended firm performance construct.

IS strategy is long-term guidance concerned with “aligning IS development with business needs and with seeking strategic advantage from IT” (Earl, 1989, p. 63). Realized IS strategy is defined as “strategy evident in IS investment decisions and IS deployments, as contrasted with vocalized or documented IS strategy” (Chan *et al.*, 1997, p. 126). IS strategy is a multidimensional construct and can be interpreted or defined in many ways (Hirschheim and Sabherwal, 2001). Chan *et al.* (1997) provided direct IS analogs to Venkatraman’s (1989a) STROBE formulation in the Strategic Orientation of Information Systems (STROIS) construct, identifying dimensions of IS support for each of aggressiveness, analysis, internal defensiveness, external defensiveness, futurity, proactiveness, risk aversion and innovation. All of the IS strategy

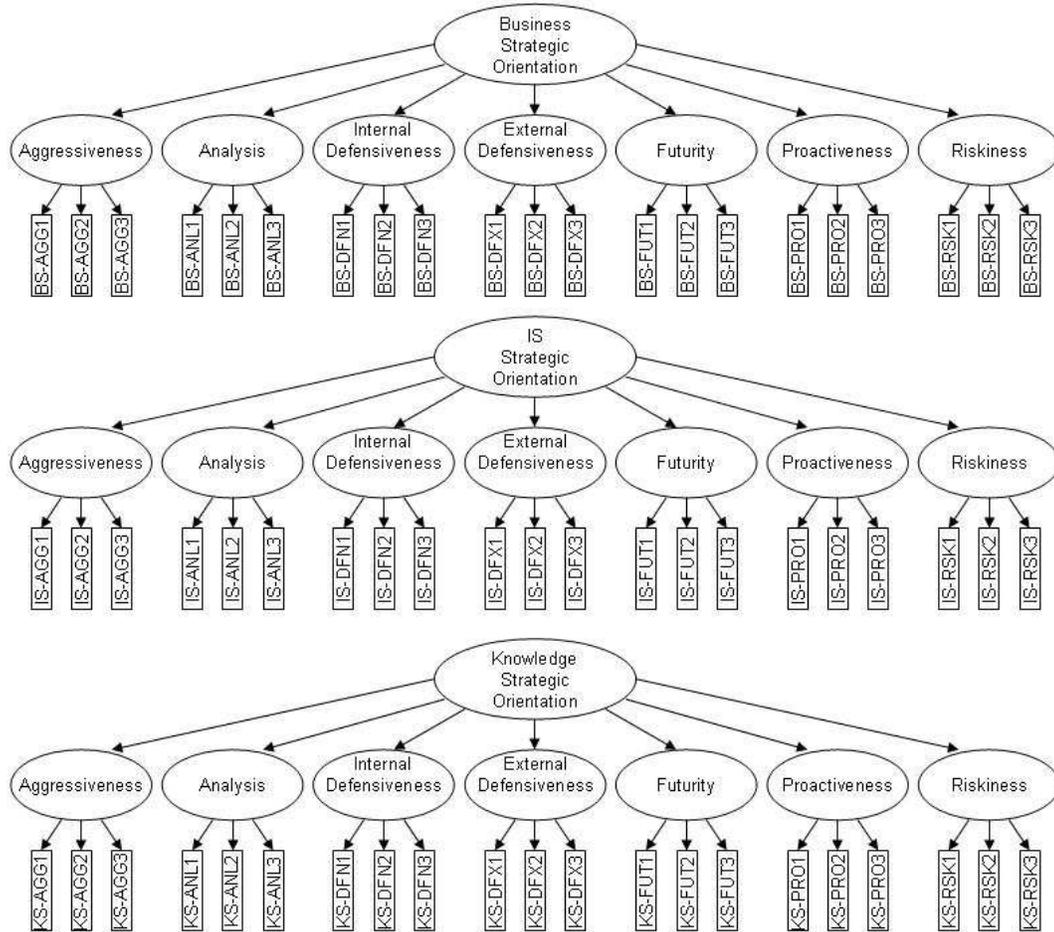
construct dimensions captured how a firm's IS provides support for the corresponding STROBE dimension, with significant empirical support (Chan *et al.*, 1997; Chan *et al.*, 1998). This paper uses all of the STROIS dimensions with the exception of IS support for innovativeness.

Knowledge can be a strategic asset as firms with superior knowledge can combine it with other assets, resources and capabilities in ways that their competitors cannot to generate value (Zack, 1999). In fact, "the sustainable competitive advantage of business firms flows from the creation, ownership, protection and use of difficult-to-imitate commercial and industrial knowledge assets" (Teece 2000 p. 35). Every strategic position or decision taken by a firm "is linked to some set of intellectual resources and capabilities" (Zack, 1999, p. 131). An organization's competitive position creates a requirement for particular new knowledge; however, its existing knowledge resources simultaneously create opportunities and constraints, hence the requirement to generate strategies to coordinate these competing demands (Zack, 1999). "Knowledge strategies build distinctiveness through resource allocation" (Nonaka, von Krogh and Voelpel, 2006, p. 1195). As they deal with decisions regarding resource allocation, knowledge strategy can be seen as a realized strategy. This paper adopts a parallel definition of realized knowledge strategy to that of realized IS strategy, that being strategy evident in knowledge investment decisions and knowledge deployments, as contrasted with vocalized or documented knowledge strategy (Chan *et al.*, 1997).

While Chan *et al.* (1997) extended Venkatraman's work into the IS strategy area, this paper seeks to extend both works into the knowledge strategy area. A knowledge strategy construct was developed to parallel that of STROBE and STROIS. Strategic Orientation of Knowledge-Based Enterprises (STROKE) is the primary theoretical contribution of this paper, incrementally extending the concept of strategic alignment into the knowledge domain using one of the conceptualizations of fit employed by Chan *et al.* (1997). The parallel nature of the three instruments is illustrated in Figure 5-1. Each of the seven dimensions is conceptualized as having

three items that are conceptually equivalent. For each individual STROBE item, a parallel STROIS was employed and a parallel STROKE item was developed, evolving as seen through the appendices.

**Figure 5-1 – STROBE, STROIS and STROKE Constructs**

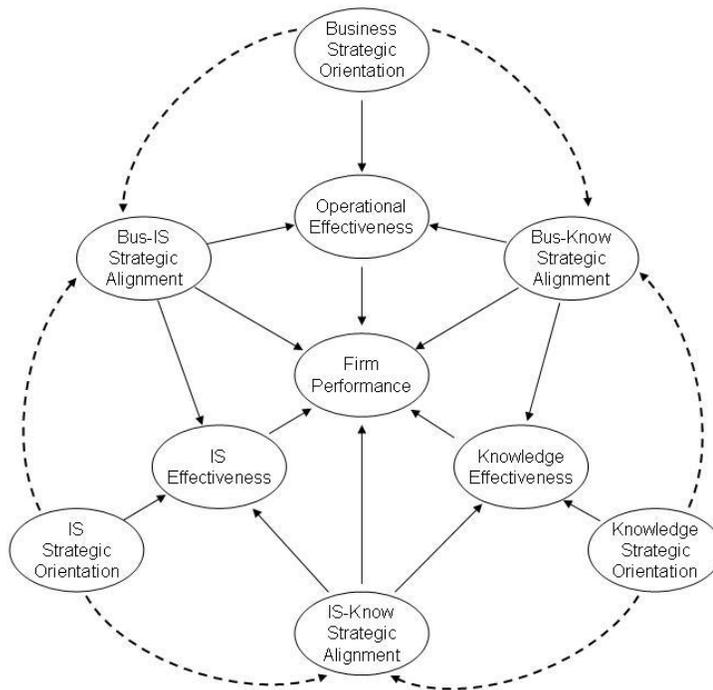


The rationale for IS strategy alignment with business strategy has been well developed (Chan and Reich, 2007), however the same relationship between business and knowledge strategies and between IS and knowledge strategies has been less investigated. Knowledge is seen as having an enabling role in the formulation of strategy (Snyman and Kruger, 2004) where the most important context for developing knowledge strategy is the firm's business strategy (Zack, 1999). Similarly, the benefits from the alignment of knowledge strategy and information systems

strategy have been hypothesized. “Just as strategic information systems planning is a prerequisite for developing successful information systems..., knowledge strategy planning is indispensable for designing and implementing effective knowledge management” (Kim, Yu and Lee, 2003, p. 297). The intent of the paper is to develop an instrument to test these hypotheses of the benefits of aligning the three strategies together.

An underlying assumption for this study is that firms would employ systems and procedures that support their strategic orientations. The conceptual model is an extension of the Chan *et al.* (1997) formulation, depicting that while business, IS and knowledge strategic orientation each directly affect their own domains’ effectiveness, the alignment between pairs of strategic orientation enhances effectiveness. The original model is extended to include knowledge strategic orientation, knowledge strategic alignment and knowledge effectiveness. In a departure from the original model, firm performance is differentiated from operational performance, an

**Figure 5-2 – Research Model**



intermediate measure on the same level as IS and knowledge performance. All three alignments and functional performances are proposed to contribute to firm performance, as shown in Figure 5-2. The individual hypotheses implied by the model are not stated as it is not within the scope of this paper to test them.

### **5.2.3 Conceptualization of Alignment**

A range of individual variables are assessed by firm members with the intent of testing for contingency effects. The contingency view is based on the expectation that different components of organizational strategy, structure or environment must fit together to maximize performance (Drazin and Van de Ven, 1985; Venkatraman and Camillus, 1984). “A contingency variable is significant to the extent to the degree that businesses that differ on that variable also exhibit major differences in how strategic attributes or actions are associated with performance” (Hambrick and Lei, 1985, p 765). Oh and Pinsonneault (2007) predicted that a contingency-based perspective would have stronger explanatory power than the resource-based perspective, but found mixed results. Specifically, the resource-based and contingency views of strategic alignment were found to be complementary, the former explaining revenue and profit impacts and the latter efficiency and cost reduction (Oh and Pinsonneault, 2007).

Adopting one of the alignment models used in Chan *et al.* (1997), strategic alignment was viewed as the alignment between pairs of strategic orientations, with a representation being a matching model at the systems level. Strategic alignment is modeled as the average difference of items belonging to two strategic orientations, as depicted in Table 5-1 for the aggression dimension. Firm 1 can be seen to be moderately aggressive in each of the business, IS and knowledge domains, and there is a high degree of alignment between the three constructs (an average score of 3.33 each). Firm 2, in comparison, is highly aggressive in business and knowledge areas, but is passive in IS, resulting in high alignment between business and

knowledge strategies (an average score of 3.67) but low alignment between IS and the other two strategies (average scores of 1.00 for business and 0.67 for knowledge).

**Table 5-1 – Strategic Alignment Calculations**

	(1) STROBE	(2) STROIS	(3) STROKE	(4) 4 -   (1) - (2)	(5) 4 -   (1) - (3)	(6) 4 -   (2) - (3)
Firm 1	3,2,3	2,2,4	2,3,3	3,4,3 (Avg 3.33)	3,3,4 (Avg 3.33)	4,3,3 (Avg 3.33)
Firm 2	4,4,5	1,2,1	4,5,5	1,2,0 (Avg 1.00)	4,3,4 (Avg 3.67)	1,1,0 (Avg 0.67)

### 5.3 Instrument Development Method

The purpose of explanatory survey research is to test theory and causal relationships (Pinsonneault and Kraemer, 1993). This paper focuses on the steps leading up to the application of the survey to test the research model, introducing and validating the survey instrument, including designing it to capture the newly developed knowledge strategy construct, but not applying it. The methodological focus is on critiquing one specific component of model development – the card sort – and suggesting a method to improve its rigor.

A survey's quality can be judged on three factors: research design, sampling procedure, and data collection (Pinsonneault and Kraemer, 1993). Within research design, there are three components of interest: longitudinal or cross-sectional design, unit of analysis, and the data analysis technique. The research model is configured and designed as a variance model, hence a cross-sectional design is appropriate. The unit of analysis is the firm, with the requisite elements of strategy, structure and firm performance. As one view of the model is of as a complex variance model, structural equation modeling is recommended as the data analysis technique when employing the STROKE instrument. Sampling procedures involved the systematic application of the sampling frame; representativeness was anticipated to be good and sample size adequate. Efficacy of data collection was maximized by extensive pre-testing and the response rate will be maximized using the Tailored Design Method (Dillman, 2000).

Development followed Moore and Benbasat's (1991) method of item creation, scale development and instrument testing using best practices from Churchill (1979), Davis (1989), Straub (1989) and Straub, Gefen and Boudreau (2004). Item creation was focused on content validity. Items were collected from existing formulations of STROBE including Byrd, Lewis and Bryan (2006), Chan *et al.* (1997), and Venkatraman (1989a). These items were then subjected to review by faculty members from the disciplines of business strategy, MIS and knowledge management.

Scale development was focused on construct and discriminant validity. As advocated by Moore and Benbasat (1991), two card sorts were conducted: open and closed. The general principal of a card sort is to confirm the coverage of a domain with a set of constructs (Davis, 1989). A participant is given a set of cards where on each card a single statement is written that represents a possible item. Multiple cards contain statements that reflect an underlying constructs. The task is to sort the index cards into separate piles or categories based on the similarities and differences among the statements on each card, where each pile should reflect one underlying concept. The difference between a closed and an open card sort is that in the former the categories are given to the sorter and in the latter the sorter must define the categories based on the items and his or her perceptions of the underlying unifying constructs. The open card sort stage was devised to confirm that the meaning of the construct was well understood, while the convergence and divergence of items within categories was used to demonstrate convergent and discriminant validity (Moore and Benbasat, 1991). As recommended, Cohen's Kappa (Cohen, 1960) was used for inter-rater agreement, but an additional measure was developed that will be discussed in the next section.

Instrument testing was conducted using two pilot tests and focused on reliability. The first pilot test was a convenience sample consisting of 21 volunteers from MBA classes of two universities. As the intended recipients of the questionnaires were senior executives, individuals

receiving professional education leading to those roles were seen as a representative proxy for actual executives in the pilot test. The second pilot test was intended as a full-scale test of the questionnaire using respondents from the target population. This stage was used to ensure that the scales showed appropriate reliability. This pilot test was of a convenience sample consisting of 70 senior executives from Canadian industry.

The results of the instrument development process will be discussed in Section 5.5. First, however, issues regarding the card sort stage will be discussed in the next section.

#### **5.4 Card Sort Methodology**

Moore and Benbasat's (1991) paper is a classic of survey instrument development and validation, in the company of other gold-standards including Davis (1989) and Straub (1989), and a great leap forward in rigor within the discipline (Benbasat and Zmud, 1999). One of the many innovations in the Moore and Benbasat (1991) paper was the use of open card sorts, which was an extension of the method used by Davis (1989). The intent of this commentary is to identify one weakness of this otherwise strong procedure and recommend a method for improving upon it. The weak step in the open card sort analysis is for the researcher to compare the categories created by judges with the *a priori* categories from the research model using what may be inappropriate measures of inter-rater reliability. The following discussion explains and illustrates this claim.

There are two issues related to terminology in card sorts. First, inter-rater reliability refers to the consistency in order of a rating while inter-rater agreement refers to the degree to which judges give exactly the same rating to a target (Burke, Finkelstein and Dusig, 1999). Reliability is correlational in nature and refers to the proportion of variance among raters (Lawlis and Lu, 1972). It is more concerned with equivalence of relative rankings between judges rather than equivalence of scores (LeBreton and Senter, 2008). Agreement is concerned with the

interchangeability of judges and the degree to which they assign the same ratings (James, Demaree and Wolf, 1984). It is typically expressed in terms of a within-group rating dispersion (LeBreton and Senter, 2008). There is not necessarily a relationship between the two measures and therefore they should be used precisely and not interchangeably (Tinsley and Weiss, 1975). Nominal scales are categorical and do not imply order, therefore the distinction between reliability and agreement blurs as the concept of proportion of variance used in reliability is no longer usable and agreement is absolute – it either exists or it does not (Tinsley and Weiss, 1975). As inter-rater reliability is nonsensical for nominal scales, the term inter-rater agreement is the appropriate one for card sort analyses.

A second issue of terminology is differentiation between card sorts and Q-sorts. Q-sorting is “a modified rank-ordering procedure in which stimuli are placed in an order that is significant from the standpoint of a person operating under specified conditions” (Brown, 1980, p. 195). Q-sorting is a component of a larger Q-methodology, which is described as “a distinctive set of psychometric and operational principles that, when conjoined with specialized statistical applications of correlational and factor-analytical techniques, provide researchers a systematic and rigorously quantitative means for examining human subjectivity” (McKeown and Thomas, 1988, p. 7). From a mechanical point of view, there are similarities as both involve the placement of cards imprinted with statements in a manner which most makes sense to the participant. The underlying task is significantly different, however. A card sort is a cognitive task involving the nominal grouping of items in accordance with an underlying idea perceived by the sorter (Moore and Benbasat, 1991). In contrast, a Q-sort is a reflective task involving grouping of items on an interval scale as best reflect the participant’s point of view (McKeown and Thomas, 1988). Card sorts are focused on the scale and on the agreement between sorters to validate the underlying scale structure; Q-sorts are focused on the participant and on the differentiation of sorters to develop the underlying sorter types. Previous research has called on MIS researchers to ensure

they employ the correct methodology for their task and the correct terminology for their method (Thomas and Watson, 2002).

The earliest agreement indices used proportion of agreement as an indicator, but these statistics were deficient in that they did not adjust for chance agreement (Kozlowski and Hattrup, 1992). As it does not adjust for chance, pure proportion of agreement will tend to overestimate the true absolute agreement between judges (Tinsley and Weiss, 1975). Cohen's Kappa is a coefficient of agreement for nominal scales between two judges that adjust for chance agreement, as noted by Moore and Benbasat (1991). Assumptions of Cohen's Kappa include that: (1) units are independent; (2) categories are independent, mutually exclusive and exhaustive; and (3) judges operate independently (Cohen, 1960). Cohen's Kappa is expressed as

$$(1) \quad \kappa = \frac{p_o - p_e}{1 - p_e}$$

where  $p_o$  represents the proportion of agreement between judges and  $p_e$  represents the proportion of expected chance agreement. An alternate description of Cohen's Kappa is a ratio of disagreement between two observers, where distance is measured by aggregating binary agreement (one) or disagreement (zero) (Light, 1971). A value of .70 is considered a minimum level of agreement required to justify newly developed measures (LeBreton and Senter, 2008).

The interrelationships between the items as theoretically specified by the researcher form the benchmark for comparison of each judge. Essentially, there are  $n$  sets of pairs of measures incorporating the researcher and  $n$  judges, where overall agreement is determined by the average of these assessments. It should be noted that the practice of comparing all judges using Cohen's Kappa as an aggregate measure should be discouraged as it is a paired inter-rater agreement index only. For multiple judge applications, Fliess' Kappa (1971), Conger's (1980) "Fliess exact"  $\kappa_m$ , Berry and Mielke's (1988)  $\mathcal{R}$  or a multiple-rater extension of Cohen's Kappa (Janson and Olsson, 2001) should be considered.

The fundamental difference between open and closed card sorts is the *a priori* assignment of categories in the latter, or rather the lack of it in the former. In either a hit-count measures or a Cohen’s Kappa analysis, the calculation of  $p_o$  requires a judgment call by the researcher whether the emergent construct label is close enough to the intended construct label to constitute a hit - there is a substantial degree of subjectivity in this process. As the categories are unspecified, they cannot be independent, mutually exclusive or exhaustive, hence Cohen’s Kappa cannot be used as one of its assumptions has been violated. Moore and Benbasat (1991) acknowledge that open card sort analysis is more qualitative than quantitative in nature, however they applied both hit-count and Cohen’s Kappa analysis after subjectively judging construct equivalencies. For example, in the first sorting round of their seminal paper illustrated in Table 5-2, Judge A’s construct label “Fit with Personal Style” was assigned to the theoretical construct “Compatibility” while Judge C’s construct label “Personal Fit” was assigned to the theoretical construct “Voluntariness” (Moore and Benbasat, 1991, p. 215). Subjective judgments of this type may be questioned and rigorous validation may require more explanation of this type of decision. However Cohen’s

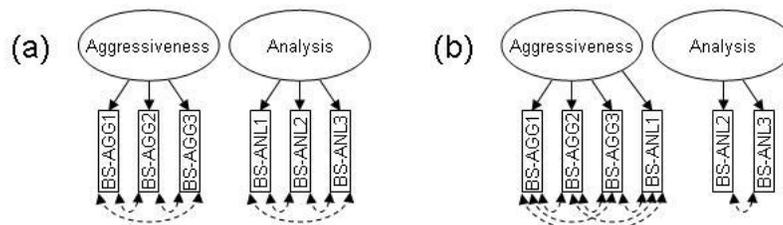
**Table 5-2 – First Sorting Round Individual Judge’s Construct Labels**

CONSTRUCTS	JUDGES			
	A	B	C	D
VOLUNTARINESS	Access/ Barriers	Voluntariness	Personal Fit	Voluntariness
IMAGE	Image/ Visibility	Image	Image	Status
RELATIVE ADVANTAGE	Advantages	Benefits	General Usefulness	Value
COMPATABILITY	Fit with personal style	Experience	Fit with job	Change in Work Patterns
EASE OF USE	Required Skills	Understanding	Ease of Use	Ease
TRIALABILITY		Trialability	Trialability	Availability
RESULT DEMONSTRABILITY	Explaining Results	Perceptions of Results	Measureability	

Kappa is inappropriate when applied to *a posteriori* allocation of judges' categorizations, leaving the researcher with a quandary of how to objectively substantiate these judgments.

A possible solution is to change the level of analysis from the construct, which is undefined, to the item, which is well-defined. When reflective items load well on their constructs, they should also be highly correlated with each other and not correlated with other items (Straub *et al.*, 2004). Using the Aggressiveness and Analysis constructs from STROBE (Venkatraman, 1989) as examples, Figure 5-3a shows three items loading correctly on each of the two constructs, while Figure 5-3b shows one of the Analysis items inappropriately loading on the Aggressiveness construct. The relations between items exist whether or not the construct has been explicitly defined, so in the absence of a defined construct, this relationship can be used to infer the existence of the unobserved construct through the linkages between items.

**Figure 5-3 – Graphical Depiction of Constructs and Items**



Light (1971) advocated representing agreement in binary form, but at the construct level. Using this conceptualization at the measure level, items can be considered nodes related to an overall construct and a comparison can be made between the paths between nodes. For example, the three items for Aggressiveness should be related to each other and not to Analysis, therefore each item should have two paths, as illustrated in Figure 5-4a. Lack of a path and additional paths both indicate items not mapping on the construct. In Figure 5-4b, the additional paths in Aggressiveness and the lack of expected paths in Analysis illustrate the misloading of an item.

**Figure 5-4 – Matrix Depiction of Item Relationships**

	BS-AGG1	BS-AGG2	BS-AGG3	BS-ANL1	BS-ANL2	BS-ANL3
(a) BS-AGG1	0	1	1	0	0	0
BS-AGG2	1	0	1	0	0	0
BS-AGG3	1	1	0	0	0	0
BS-ANL1	0	0	0	0	1	1
BS-ANL2	0	0	0	1	0	1
BS-ANL3	0	0	0	1	1	0

	BS-AGG1	BS-AGG2	BS-AGG3	BS-ANL1	BS-ANL2	BS-ANL3
(b) BS-AGG1	0	1	1	1	0	0
BS-AGG2	1	0	1	1	0	0
BS-AGG3	1	1	0	1	0	0
BS-ANL1	1	1	1	0	0	0
BS-ANL2	0	0	0	0	0	1
BS-ANL3	0	0	0	0	1	0

Misloading is a term that can be used only if there is an *a priori* expectation of how the items should load. This can be stated as the items were specifically selected by the researcher to load on particular constructs that he or she has developed (Moore and Benbasat, 1991). Using the same example, Figures 5-3a and 5-4a can be used to represent the intended item loadings by the researchers and Figures 5-3b and 5-4b can be used to represent the item loadings of a judge, where one item is misplaced. The difference between the matrices can be used to capture the degree of disagreement between the two item lists, where zeros represent agreement, minus ones represent expected links that are missing and plus ones represent unexpected links that are present, as illustrated in Figure 5-5a. The relevant level of agreement can be found in the upper corner above the diagonal, as illustrated in Figure 5-5b. Here, there are 15 possible agreements,

**Figure 5-5 – Matrix Depiction of Inter-Rater Agreement**

	BS-AGG1	BS-AGG2	BS-AGG3	BS-ANL1	BS-ANL2	BS-ANL3
(a) BS-AGG1	0	0	0	1	0	0
BS-AGG2	0	0	0	1	0	0
BS-AGG3	0	0	0	1	0	0
BS-ANL1	1	1	1	0	-1	-1
BS-ANL2	0	0	0	-1	0	0
BS-ANL3	0	0	0	-1	0	0

	BS-AGG1	BS-AGG2	BS-AGG3	BS-ANL1	BS-ANL2	BS-ANL3
(b) BS-AGG1		0	0	1	0	0
BS-AGG2			0	1	0	0
BS-AGG3				1	0	0
BS-ANL1					-1	-1
BS-ANL2						0
BS-ANL3						

where an agreement is defined in terms of either concurrence on whether there should be the existence or absence of a relationship. Of the 15 possible agreements there are three unexpected relationships and two absent ones, leaving ten actual agreements.

Hit-counts have already been seen to be ineffective as they do not adjust for chance agreement. In the matrix-item form, however, all three of Cohen's (1960) assumptions are met as the paths are independent, mutually exclusive and exhaustive, therefore Kappa can be calculated. First, the hit-count can be used to calculate a matrix-size adjusted  $p_{om}$ . There are ten of 15 possible agreements, for a raw probability of 0.667. To adjust for the size of the matrix, it is important to take into consideration the number of items per construct ( $I_j$ ) and the number of constructs ( $n$ ), adjusted for degrees of freedom, to determine an adjustment constant ( $c$ ):

$$(2) \quad c_o = \frac{n(n-1)}{\sum_{j=1}^n (I_j - 1)}$$

where

$$(3) \quad p_{om} = p_o^{c_o}$$

In the case of the example with two constructs, each with three items, the constant would be 0.5 and the  $p_{om}$  would be 0.816.

The calculation of  $p_{em}$  is also based on the marginal probabilities described by Cohen (1960), adjusted for matrices. The marginal probabilities can be represented as another matrix, with the diagonal set to zero, as represented in Figures 5-6a and 5-6b for the theoretical item distribution and the judges distribution.

**Figure 5-6 – Matrix Depiction of Marginal Probabilities**

(a)		BS-AGG1	BS-AGG2	BS-AGG3	BS-ANL1	BS-ANL2	BS-ANL3
BS-AGG1	0	0.28	0.28	0.28	0.28	0.28	0.28
BS-AGG2	0.28	0	0.28	0.28	0.28	0.28	0.28
BS-AGG3	0.28	0.28	0	0.28	0.28	0.28	0.28
BS-ANL1	0.28	0.28	0.28	0	0.28	0.28	0.28
BS-ANL2	0.28	0.28	0.28	0.28	0	0.28	0.28
BS-ANL3	0.28	0.28	0.28	0.28	0.28	0	0

(b)		BS-AGG1	BS-AGG2	BS-AGG3	BS-ANL1	BS-ANL2	BS-ANL3
BS-AGG1	0	0.46	0.46	0.46	0.15	0.15	0.15
BS-AGG2	0.46	0	0.46	0.46	0.15	0.15	0.15
BS-AGG3	0.46	0.46	0	0.46	0.15	0.15	0.15
BS-ANL1	0.46	0.46	0.46	0	0.15	0.15	0.15
BS-ANL2	0.15	0.15	0.15	0.15	0	0.15	0.15
BS-ANL3	0.15	0.15	0.15	0.15	0.15	0	0

The value for  $p_{em}$  is calculated as the sum of products between the two marginal probability matrices, adjusted for both the diagonal zeros and the relevant upper corner above the diagonals. This can be expressed mathematically as:

$$(4) \quad c_e = (2 \sum_{i=1}^{n} \sum_{j=1}^{m} A_{ij}) (2 \sum_{i=1}^{n} \sum_{j=1}^{m} B_{ij})$$

where

$$(5) \quad p_{em} = c_e \sum_{i=1}^{n} \sum_{j=1}^{m} A_{ij} B_{ij}$$

In the case of the example, the constant would be 2.69 and  $p_{em}$  would be 0.403.

As the original constructs are known, it is possible to compare the original Cohen's Kappa values with those of what is termed here 'Matrix Kappa'. Using the two-construct, six-item example,  $K$  is 0.667,  $P_o$  is 0.833 and  $P_e$  is 0.5, while  $K_m$  is 0.692,  $P_{om}$  is 0.816 and  $P_{em}$  is 0.403. The actual open and closed data will be tested in the subsequent section using both this method and that advocated by Moore and Benbasat (1991) to demonstrate a degree of agreement between Cohen's Kappa and Matrix Kappa.

## 5.5 Instrument Development

Instrument development was conducted in three steps: item creation, scale development and instrument testing.

### 5.5.1 Item Creation

Item creation was an abridged step as the three scales were based on Venkatraman's (1989a) STROBE from Sabherwal and Chan (2001) using STROIS operationalization process from Chan *et al.* (1997). As items were required to be in parallel, any item dropped from one scale would result in a drop from the other two scales, hence an approach was taken to rephrase items first and only drop them if they absolutely would not load. Eight faculty members were consulted to confirm the applicability of individual items on their supporting constructs. Each faculty member was given a description of the construct in question and the list of items and was asked whether the item reflected the construct and, if not, how it could be amended to better reflect it.

The STROBE construct has been found to be reliable and valid (Sabherwal and Chan, 2001). Two versions of the instrument exist: one from Venkatraman's original PhD dissertation (1985) which included eight dimensions and one from his Management Science paper (1989b) which included six dimensions. The operationalization of the construct relied on the questions employed from Sabherwal and Chan (2001) for the Analysis, Defensiveness, Proactiveness, Futurity and Risk Aversion attributes, the last being a reversal of the original Riskiness attribute. The Aggressiveness items were taken from the operationalization of Byrd *et al.* (2006), which showed higher reliability than the Sabherwal and Chan (2001) item list for this attribute. In all, 18 items for six constructs were proposed at the start of the faculty review process.

The concept of STROIS and STROKE are that both IS and knowledge can be used by the organization to support the various facets of its business orientation. For example, a firm that is highly analytic in nature, making decisions based on study and statistics, may have a robust systems of management information systems (MIS), decision support systems (DSS) and executive support systems (ESS) to provide that data to decision makers. Similarly, the same

organization may have knowledge management practices in place that encourage the retention and reuse of their studies or learning mechanisms to ensure that findings are integrated into the organization's best practices. Reflecting the focus of STROBE on realized business strategy (Mintzberg, 1978), STROIS and STROKE are focused on realized IS and knowledge strategy as seen in the systems and practices actually in use by the organization, rather than its plans or intentions (Chan *et al.*, 1997).

The STROIS and STROKE items were operationalized from the STROBE items using the method developed by Chan *et al.* (1997). Each STROIS and STROKE item was developed to explicitly mirror a corresponding STROBE item. This was done to allow for future alignment calculation based on the distance between individual items (Chan *et al.*, 1997). For example, a STROBE Analysis item that was phrased as

*We require detailed, factual information to support our day-to-day decision making.*

was be phrased for STROIS as

*Our systems provide us with detailed, factual information to support our day-to-day decision making.*

and for STROKE as

*We learn from the detailed, factual information provided to support our day-to-day decision making.*

A complete list of items for the STROBE, STROIS and STROKE constructs at the start and end of the item creation process is included in Appendix A. The most apparent change from the faculty review was in regards to an increase in the number of items, particularly for the Defensiveness construct. From the 1985 original to the 1989 published version, Venkatraman collapsed the Internal and External Defensiveness constructs together into a single Defensiveness construct. Discussion of the items pointed to the desirability of reversing this change and

including the two separate dimensions. Two new items were added to see if the card sorts would detect the same difference. Additionally, an item was added to the Futurity construct in order to bring it up to three items prior to the card sorts.

A second set of changes was more minor in nature, reflecting suggestions to change the wording of particular items, with the intent of the changes either to simplify the wording or better specify the concept. Wording changes generally started with the STROBE construct and then were passed through to the STROIS and STROKE constructs. For the STROIS items, the STROBE item was used as a root, prefixed with 'Our systems ...' either helping, enabling, allowing or other support-oriented terms. For the initial STROKE items, the support-oriented terms were almost exclusively focused on 'Our knowledge', but after discussion with reviewers, this was broadened to include concepts of learning and expertise to better reflect knowledge management practices and processes.

At the end of the item creation process, this list of 21 items per construct, composed of three items for each of seven attributes, was then introduced into the scale development process.

## **5.5.2 Scale Development**

As advocated by Moore and Benbasat (1991), two card sorts were conducted during scale development: open and closed. The card sort task also included the recommended ten-card trial sort used in their paper. Both open and closed card sorts were conducted with four judges per construct, with different judges in each of the two rounds, for a total of 24 judges in total.

### **5.5.2.1 Open Card Sort**

At the start of the open card sort, concerns over the use of both hit-counts and Cohen's Kappa as card-sort evaluation methods prevented their use. It was at this point that a network analysis method was developed where individual questions were nodes and a comparison was

made between the paths between nodes for those paths reported and those expected. This manual approach ultimately became the basis for the Matrix Cohen method by combining the matrix representation with the Cohen's Kappa analysis. In the absence of an inter-rater reliability static, analysis focused on qualitatively identifying emergent constructs through the paths between items and either changing wording to create desired and sunder unintended linkages between the items.

For example, the three questions for Aggressiveness should be related to each other and to no other construct, therefore each item should have two paths reported by each sorter. Lack of a path and additional paths both indicate items not mapping on the construct (or issues with the construct definition itself). This is similar to a fit as profile deviation method, as the *a priori* constructs have an expected set of paths that can be compared to the emergent set of paths. In essence, the emergent construct is defined by its associated items, which may more closely represent the sorter's mental model than their attempt to externalize it in words on the envelope.

Continuing the previous example, Aggressiveness involves a firm "improving market rates at a relatively faster rate than the competitors in its chosen market" (Venkatraman, 1989a, p. 948). BS-AGG1, BS-AGG2 and BS-AGG3 items were phrased as: 'We strive to be one of the top three companies in our market(s);' 'We constantly attempt to be ahead of the competition;' and 'We tend to act proactively in our market(s).' BS-AGG1 and BS-AGG2 were linked strongly with each other, as all four judges grouped them together. However, they were also somewhat linked to a Proactiveness item (BS-PRO1 – capacity increase), a Risk Aversion item (BS-RSK3 – less risks) and an External Defensiveness item (BS-DEF3 – market position), as several, though not all, judges grouped these items together. It was posited that these links were due to the weakness of the other questions, not the two Aggressiveness items, that allows them to be grouped in a market-focus type construct. Therefore, BS-AGG1 and BS-AGG2 were retained unchanged. The BS-AGG3 was more problematic and did not group at all with the other Aggressiveness items, but rather had its closest match with the Proactiveness construct. Mixing

'proactiveness' and 'markets' may have given mixed signals, so this item was reassigned to BS-PRO and a new BS-AGG3 item was created stating 'We try to be a market leader'. These changes to the Aggressiveness and Proactiveness constructs were then applied to their respective IS and knowledge items to maintain the parallelism.

Based on a similar review of each item in each construct, 38 changes were made to the instrument, as detailed in Appendix B. This included confirmation of the separateness of the Internal and External Defensiveness constructs, where the former focused on internal efficiencies while the latter focused on external relationships. While a non-statistical method was used to make the changes required prior to the closed card sort, it is of value to compare the results of the two Kappa calculations for this data set *post hoc*.

As can be seen in Table 5-3, none of the card sorts had a strong result, indicating that significant changes were required in the item wordings. It bears remarking that the use of Matrix Kappa came to the same finding as Cohen's Kappa, without the requirement for the researcher to make judgments whether the judges' categories matched the researcher's intended attributes. It should be also noted that this analysis only showed that there was a problem with the scale development – it did not indicate where that problem lay. However, the use of matrix representation can aid in the location of those problem areas as a roadmap for conducting the item-by-item evaluation described earlier.

One additional issue is that the judges very rarely developed the exact category intended by the researcher and hence there were many challenges for the researcher in determining the mapping between categories and attributes (if there even were one). For example, the Aggressiveness attribute could fairly easily be linked to a judge-derived category of competition/market orientation. However, a progress/performance measurement category developed by a judge could on first glance be applied to Internal Defensiveness or Analysis attribute. It is only by looking at the items that were grouped in this category to determine that the

judge's definition included a temporal component (progress over time and performance measurement to capture it) to find that the category mapped most appropriately on the Futurity attribute. This mapping was made much clearer by the matrix representation of the card sort.

**Table 5-3 – Open Card Sort Comparison Between Cohen's and Matrix Kappas**

		Cohen's Kappa				Matrix Kappa			
Business Strategy									
	Kappa	Po	Pe	Rank	Kappa	Pom	Pem	Rank	
B1	0.504	0.571	0.136	3	0.370	0.456	0.135	3	
B2	0.504	0.571	0.136	2	0.422	0.501	0.138	2	
B3	0.394	0.476	0.136	4	0.304	0.412	0.156	4	
B4	0.682	0.714	0.102	1	0.650	0.704	0.156	1	
Avg	0.521				0.436				
Information Systems Strategy									
	Kappa	Po	Pe	Rank	Kappa	Pom	Pem	Rank	
I1	0.389	0.476	0.143	4	0.347	0.447	0.153	2	
I2	0.398	0.476	0.129	2	0.306	0.412	0.153	3	
I3	0.394	0.476	0.136	3	0.298	0.412	0.163	4	
I4	0.623	0.667	0.116	1	0.573	0.635	0.147	1	
Avg	0.451				0.381				
Knowledge Strategy									
	Kappa	Po	Pe	Rank	Kappa	Pom	Pem	Rank	
K1	0.403	0.476	0.122	3	0.366	0.456	0.141	3	
K2	0.278	0.381	0.143	4	0.146	0.286	0.164	4	
K3	0.412	0.476	0.109	2	0.480	0.561	0.155	2	
K4	0.629	0.667	0.102	1	0.635	0.692	0.158	1	
Avg	0.430				0.407				

#### 5.5.2.2 Closed Card Sort

The closed card sort was conducted with the revised item list and 12 sorts, where the results are presented in Table 5-4. In contrast to the open sort, judges were provided the categories as part of the process. Both the Kappa approaches showed strong agreement with the judge in each of the business strategy and IS strategy sorts achieving a perfect score. Using either method, the average Kappa was well above the 0.70 threshold recommended for new scales (such as STROKE) or 0.80 recommended for previously validated scales (such as STROIS or

STROBE) (LeBreton and Senter, 2008). These scales were then judged to be ready for instrument testing, with items listed in Appendix C.

**Table 5-4 – Closed Card Sort Comparison Between Cohen’s and Matrix Kappas**

		Cohen’s Kappa			Matrix Kappa			
Business Strategy								
	Kappa	Po	Pe	Rank	Kappa	Pom	Pem	Rank
B1	1.000	1.000	0.143	1	1.000	1.000	0.165	1
B2	0.945	0.952	0.136	2	0.964	0.970	0.168	2
B3	0.890	0.905	0.136	4	0.878	0.898	0.167	4
B4	0.944	0.952	0.143	3	0.912	0.927	0.168	3
Avg	0.945				0.939			
Information Systems Strategy								
	Kappa	Po	Pe	Rank	Kappa	Pom	Pem	Rank
I1	0.778	0.810	0.143	4	0.676	0.728	0.161	4
I2	0.781	0.810	0.129	3	0.813	0.844	0.164	3
I3	1.000	1.000	0.143	1	1.000	1.000	0.169	1
I4	0.944	0.952	0.143	2	0.912	0.927	0.168	2
Avg	0.876				0.850			
Knowledge Strategy								
	Kappa	Po	Pe	Rank	Kappa	Pom	Pem	Rank
K1	0.945	0.952	0.136	1	0.964	0.970	0.163	1
K2	0.891	0.905	0.129	2	0.929	0.941	0.167	2
K3	0.733	0.762	0.109	4	0.862	0.884	0.162	4
K4	0.836	0.857	0.129	3	0.895	0.912	0.167	3
Avg	0.851				0.913			

### 5.5.3 Instrument Testing

Instrument testing was conducted using two pilot tests. Following Moore and Benbasat (1991), the primary statistics used to assess reliability at this stage were Cronbach’s alpha and Guttman’s Lower Bound (GLB) six-lambdas. The intent of each test was to provide a lower estimate of the reliability of the scales.

#### 5.5.3.1 First Pilot Test

The first pilot test was a convenience sample consisting of 21 volunteers from MBA classes of two Canadian universities. As the intended recipients of the questionnaires were senior

executives, individuals receiving education leading to those roles were seen as a representative proxy for actual executives in the pilot test. The aim of the first pilot test “was to ensure that the mechanics of compiling the questionnaire had been adequate” (Moore and Benbasat, 1991, p. 204) through completion of the questionnaire and commenting on the wording, length and layout. The comments received from the participants influenced some aspects of survey layout, but not the content of the instrument items.

A second aim of the pilot test was to conduct an initial reliability assessment of the instrument. There were four Business strategy, 11 Information Systems strategy and six Knowledge strategy respondents to the pilot test. Reflecting the parallel nature of the questions and as the low numbers of independent sets would preclude analysis, the items were aggregated into a single set, which was a procedure used the Chan *et al.* study (1997). As seen in Table 5-5, all but the Analysis attribute had a Cronbach’s alpha and GLB of greater than 0.70. For this attribute, it was noted that elimination of the third item would bring the scale above 0.70, however it was retained for confirmation in the subsequent round. Nunnally (1967) has noted that while 0.70 is a recommended benchmark for established measures, for initial development alphas down to 0.50 can be considered sufficient to continue. It should also be noted that as alpha can be artificially inflated by adding marginally correlated items (Cortina, 1993), a parsimonious three-item scale with a reasonable reliability may be acceptable for early scale development.

**Table 5-5 – Pilot Test Results**

	First Pilot		All (91)		Combined First and Second Pilot					
	All (21)				Business (34)		IS (28)		Knowledge (29)	
	$\alpha$	GLB	$\alpha$	GLB	$\alpha$	GLB	$\alpha$	GLB	$\alpha$	GLB
AGG	.931	.931	.830	.841	.959	.959	.872	.874	.645	.675
ANL	.650	.651	.734	.768	.800	.859	.734	.735	.669	.670
DFX	.773	.780	.798	.800	.818	.824	.780	.797	.817	.819
DFN	.812	.821	.772	.795	.841	.847	.730	.791	.690	.711
FUT	.881	.893	.694	.702	.690	.740	.685	.724	.727	.824
PRO	.897	.914	.813	.825	.828	.842	.920	.905	.727	.766
RSK	.825	.839	.632	.715	.610	.633	.775	.790	.549	.783

### 5.5.3.2 Second Pilot Test

The second pilot test was intended as a full-scale test of the questionnaire using respondents from the target population. This stage was used to ensure that the scales showed appropriate reliability. This pilot test was of a convenience sample consisting of 70 senior executives from Canadian industry. Given that the questions were identical and the MBA students were a close proxy for the intended audience, the first and second pilot tests were combined. Using the Kolmogorov-Smirnov Z test for two-independent samples, none of the 21 items was significant at the 0.05 level, permitting combination of the samples into a single 91 case set.

The principal components analysis showed seven components which roughly, but not perfectly, mapped on to the seven theorized dimensions. In Table 5-6, expected satisfactory loadings (above 0.600) are identified in bold and both unsatisfactory item loading (under 0.600) on the intended scale and unintended loading (above 0.500) of items from another scale are identified in italics. Factor 2 was clearly the Aggressiveness attribute and its strong loading was also reflected in the high reliability of this scale. Factor 1 was primarily Internal Defensiveness, however two of the Analysis dimensions loaded relatively strongly on this factor, potentially mixing cost control with an analytic focus. The last item in Analysis loaded on Factor 3, the primarily Futurity oriented factor. It was clear ANL3 needed to be rewritten to load with the other two items, based on stressing the analysis and de-emphasizing the business opportunity elements. The reliability analysis supported the requirement for an item rewrite, as all but the combined sample for IS strategy suggested significant increases in alpha based on dropping this items. A suggested reworded item was “We make decisions based on comprehensive situational analyses.” Similarly, item FUT2 needed to stress the long-term component to link it better with Futurity and de-emphasize the capital budget allocation component. A suggested rewording of this item was “We take a long-term view when making investment decisions.”

**Table 5-6 – Rotated Component Matrix**

	1	2	3	4	5	6	7
AGG1	.162	<b>.760</b>	.056	.249	.280	.152	.006
AGG2	.287	<b>.804</b>	.053	.143	.228	.156	-.164
AGG3	-.068	<b>.731</b>	.244	.328	.048	-.203	.159
ANL1	.545	.266	.295	.205	-.315	.268	-.174
ANL2	.618	.254	.240	.256	-.269	.244	-.260
ANL3	.189	.272	.677	.078	.084	.192	-.058
DFX1	.278	.271	.060	<b>.746</b>	.056	.151	.047
DFX2	.182	.339	.092	.595	.236	.319	-.071
DFX3	.443	.145	.136	.571	.184	.055	.298
DFN1	<b>.644</b>	.424	.150	-.042	.284	.124	.254
DFN2	<b>.718</b>	.367	.011	.195	.168	.011	.213
DFN3	<b>.798</b>	-.157	.226	.156	.010	.040	.093
FUT1	.249	-.015	<b>.800</b>	.210	.032	.001	.053
FUT2	.327	.461	.544	.011	-.006	.360	-.027
FUT3	-.005	.023	<b>.706</b>	.044	.280	.037	.154
PRO1	-.026	.100	.254	.642	.456	.024	.041
PRO2	.022	.220	.112	.144	<b>.831</b>	.043	-.041
PRO3	.071	.226	.245	.318	<b>.769</b>	-.076	-.106
RSK1	.162	-.005	.111	.102	-.121	.211	<b>.862</b>
RSK2	-.011	.124	.104	.148	-.032	<b>.806</b>	.066
RSK3	.194	-.035	.086	.067	.028	<b>.839</b>	.146

Factor 5 was focused on the Proactiveness construct, but only two of the items load well on it. PRO1 loaded more on the External Defensiveness construct, potentially due to the link between markets and customers/suppliers. To strengthen the link between this item and the innovativeness-focused items in Proactiveness, a suggested rewording was “We tend to be pioneers in new markets.” By strengthening this link, an additional intended consequence would be to have all three External Defensiveness items load higher on Factor 4, as two of them are just below 0.600. Both Factors 6 and 7 reflected Risk Aversion, however the result that the items loaded on two factors and the low alpha led to the conclusion that this construct was multidimensional. RSK2 and RSK3 appeared to be tapping into the desired conservatism concept while RSK1 appeared to be addressing an experience construct. As the former was intended, it was recommended to reword RSK1 to read “We tend to be risk averse in our decision

making.” The final recommended list of items for the STROBE, STROIS and STROKE instruments is provided in Appendix D.

## **5.6 Discussion**

The discussion focuses on both the scales developed and the Matrix Kappa implications for scale development.

### **5.6.1 Scales and Instruments**

Scales for STROBE (Venkatraman, 1989), STROIS (Chan *et al.*, 1997) and STROKE were generally found to be valid and reliable. Exceptions were in Risk Aversion and Analysis scales. The Risk Aversion scale showed classic signals of multidimensionality – low reliability and two clearly and strongly separated factors. This was addressed by bringing one item conceptually closer to the other two. However the Analysis scale was more unusual – it had acceptable reliability but items that grouped on two different factors. It is of interest to note that had the matrix analysis of the card sort been conducted following the open card sort, the potential problem with ANL3 item could have been determined earlier, as out of 12 sorts (across the three strategy types), it failed to load on one other scale item in three cases and both other items in five additional cases.

A second set of factor analyses was conducted in an attempt to confirm two other combinations of the instrument items. A two-factor forced solution was generated resulting in an external market orientation factor (including Aggressiveness, External Defensiveness and Proactiveness items) and an internal cost-efficiency orientation factor (including Analysis, Internal Defensiveness and Futurity/Risk Aversion items dealing with project and budget decisions). These two factors supported the two extreme dimensions of Miles and Snow’s (1978) typology, where the former factor corresponds to Prospectors and the latter factor to Defenders.

Defenders are stable organizations with predictable and narrow product domains offered at low prices, devoting attention to improving efficiency in their current operations. Prospectors continually seek out new market opportunities and create change and uncertainty in their industries, but the price of their flexibility is a low operational efficiency. This finding would lend conceptual support to Sabherwal and Chan's (2001) cross-mapping of Venkatraman's STROBE attributes and Miles and Snow's strategic types.

A three-factor forced solution was generated resulting in a competitive advantage generating factor (including Aggressiveness, External Defensiveness, Internal Defensiveness items related to cost-reduction, and Proactiveness items related to innovation), a decision-making factor (including Analysis plus Internal Defensiveness, Futurity and Risk Aversion items dealing with performance measurement, project and budget decisions) and a planning factor (including Futurity items regarding planning horizons). These three factors corresponded to Chan *et al.*'s (1997) simplified dimensions of Action, Analysis and Anticipation. While these were simpler constructs, the total variance explained was weaker – 53% for the three-factor solution versus 74% for the seven-factor solution – lending support for the more fine-grained seven-factor approach.

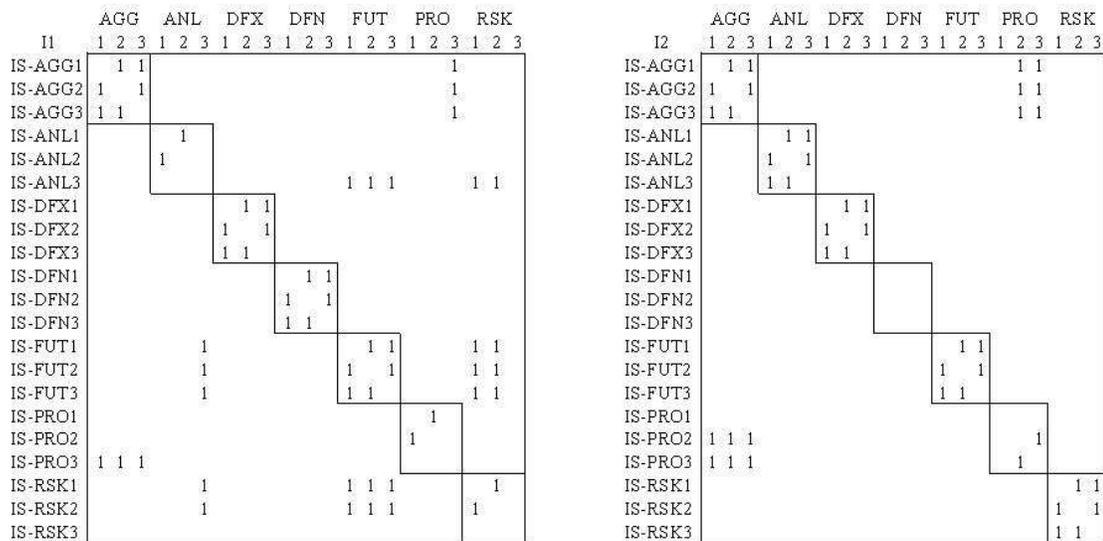
### **5.6.2 Card Sort Analysis**

An important question in judging the usefulness of a new method is how closely it approximates the results of the existing procedure. The root of the average sum of squares differences between the two Kappas was between 0.02 and 0.07 for the three measures. While this absolute difference between the Kappa values would be a strong measure, there were insufficient judges for each sort task to meet the assumptions of these to comment on significance. With the small sample of judges, a possible comparison measure could be the Spearman rank-order correlation coefficient. As the ranks are identical for each of the three

strategy types, it can be seen that the value of P (rho) would be 1 for each set, indicating perfect correlation.

A contrasting question to answer regarding the use of a new procedure is if it makes a difference or not to findings or the process it supports. A possible illustration of the difference can be found by examining judges I1 and I2 in Figure 5-7, whose Cohen's Kappas were nearly identical but whose Matrix Kappas were very different. Both judges had 17 out of 21 right items, yielding a  $P_o$  of 0.81. However, the  $P_{om}$  for I1 was 0.728 and for I2 was 0.844. Examining the matrices in Figure 5-7, while I1 and I2 had a similar number of missing paths (six and five respectively), I1 had many more extra paths defined (14 versus six for I2). At the attribute level, I1 had only two correct - Internal and External Defensiveness – having misassigned several Analysis, Proactiveness and Risk Aversion items to Aggressiveness and Futurity attributes. In comparison, I2 had four attributes completely correct but mistakenly fused Proactiveness and Aggressiveness items into a single attribute and missed the Internal Defensiveness attribute. It

**Figure 5-7 – Comparison Between Judges I1 and I2**



could be argued that I2 had the better outcome, which was not detected by Cohen's Kappa, but was by Matrix Kappa.

The Matrix Kappa statistic appeared to be more sensitive to misassignment of items, particularly where concepts intended as being individual were grouped into homogeneous groups. The inability to discriminate between constructs could then be determined using this statistic, but not necessarily Cohen's Kappa. If this argument were accepted, then the Matrix Kappa statistic could be posited as being a complement to Cohen's Kappa in discriminant validity assessment. This recommendation would require additional research using different data and scales prior to adoption by the research community.

## **5.7 Conclusion**

This paper has proposed two key advances to the IS research tradition: the STROKE instrument and the Matrix Kappa method. The paper concludes with an examination of the limitations, implications and contributions of each.

### **5.7.1 Limitations**

At the completion of the second pilot test, four items were reworded, so prior to other researchers using them in future studies, this new wording should undergo an additional round of validation. The conduct of another card sort and an additional pilot test would be valuable additional confirmation.

Further validation of the Matrix Kappa method is required prior to any suggestion of wide-spread adoption. While validation was conducted using a constructed test data set, a random test data set and two sets of real data, this effort merely pointed to potential benefits of its application. Additional study could include a Monte Carlo simulation to test the characteristics

and limits of the method and an examination of previous studies using Cohen's Kappa for scale development to identify if Matrix Kappa would result in a different outcome.

### **5.7.2 Research Implications and Contributions**

The Strategic Orientation of Knowledge-Based Enterprises instrument contributes to the strategic alignment research tradition by applying an existing, validated scale development approach (Chan *et al.*, 1997) and procedure (Moore and Benbasat, 1991) and applying them to the knowledge strategy domain. The resulting STROKE instrument is proposed as a valid alternative to the strategy-component comparative measure instrument for knowledge strategy in Chapter 2. The two provide different interpretations of realized knowledge strategy, either based on what are elements of the knowledge strategy or how does the knowledge strategy support the business. Researchers can only benefit from having multiple conceptualizations of the knowledge strategy construct from which to choose.

As a methodological contribution, Matrix Kappa is proposed as a complement to other card sort analysis techniques. It has the benefit of meeting Cohen's Kappa assumptions for open card sorts, can be used to discriminate different levels of card sort success that Cohen's Kappa cannot, and can be used equally effectively for open and closed sorts. Additionally, as seen in the case of the ANL3 item and the Analysis scale, the underlying matrix analysis allows for more rigorous open card sorts in scale development, potentially decreasing the need for multiple pilot tests at later stages of instrument testing or the requirement to return to scale development for additional card sorts after a pilot test. By reframing the card sort in terms of nodes-and-paths, a useful statistical tool and an intuitive graphical one have been introduced for researchers to identify problems with item groupings early in the scale development process.

## 5.8 References

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**Appendix A1 – Business Strategic Orientation Items from Item Creation Step**

Item	Initial Items	Item Creation Result
BS-AGG1	We strive to be one of the top three firms in each of our markets.	We strive to be one of the top three companies in our market(s).
BS-AGG2	We constantly attempt to be ahead of the competition.	We constantly attempt to be ahead of the competition.
BS-AGG3	We tend to act aggressively in our marketplace.	We tend to act proactively in our market(s).
BS-ANL1	We tend to be number-oriented and analytical in our operations.	We tend to be number-oriented and analytical in our operations.
BS-ANL2	We require detailed, factual information to support our day-to-day decision making.	We require detailed, factual information to support our day-to-day decision making.
BS-ANL3	We develop comprehensive analyses of each business opportunity or challenge we face.	We develop comprehensive analyses of each business opportunity or challenge we face.
BS-DEF1	We develop strong relationships with our suppliers.	We seek close relationships with our suppliers.
BS-DEF2	We develop strong relationships with our customers.	We seek close relationships with our customers.
BS-DEF3	There is a constant drive to improve operating efficiency.	Our focus is on maintaining our current market position.
BS-DEF4	We optimize coordination across our departments and/or product lines.	We consistently search for new methods for reducing costs.
BS-DEF5		There is a constant drive to improve operating efficiency.
BS-DEF6		We use cost control systems to monitor performance.
BS-FUT1	The performance measures reviewed by the senior management team emphasize our long-term business effectiveness.	We use performance measures that emphasize our long-term business effectiveness.
BS-FUT2	Our criteria for budget allocations generally reflect long-term considerations.	Our criteria for capital budget allocations generally reflect long-term considerations.
BS-FUT3		We generally focus on short-term decision making effectiveness.
BS-PRO1	We generally increase capacity before our competitors do the same.	We generally increase capacity before our competitors do the same.
BS-PRO2	We are usually the first ones to introduce various products and/or services in the market.	We are usually the first ones to introduce various products and/or services in the market.
BS-PRO3	We adopt innovations early.	We adopt innovations early.

Item	Initial Items	Item Creation Result
BS-RSK1	Our business decisions generally follow “tried and true” paths.	Our business decisions generally follow past practice and experience.
BS-RSK2	We adopt a rather conservative view when making major decisions.	We adopt a rather conservative view when making major decisions.
BS-RSK3	In general, our mode of operations is less risky than that of our competitors.	In general, we take fewer risks than our competitors.

**Appendix A2 – IS Strategic Orientation Items from Item Creation Step**

Item	Initial Items	Item Creation Result
IS-AGG1	Our systems help us be (or become) one of the top firms in our market(s)	Our systems help us be (or become) one of the top companies in our market(s).
IS-AGG2	Our systems help us stay ahead of (or catch up with) the competition	Our systems help us stay ahead of (or catch up with) the competition.
IS-AGG3	Our systems help us aggressively go after market share	Our systems help us be proactive in our markets.
IS-ANL1	Our systems allow us to be number-oriented and analytical in our operations.	Our systems allow us to be number-oriented and analytical in our operations.
IS-ANL2	Our systems provide us with detailed, factual information to support our day-to-day decision making.	Our systems provide us with detailed, factual information to support our day-to-day decision making.
IS-ANL3	Our systems help us with comprehensive analyses of each business opportunity or challenge we face.	Our systems help us with comprehensive analyses of each business opportunity or challenge we face.
IS-DEF1	Our systems enable us to develop strong relationships with our suppliers.	Our systems enable us to establish close relationships with our suppliers.
IS-DEF2	Our systems enable us to develop strong relationships with our customers.	Our systems enable us to establish close relationships with our customers.
IS-DEF3	Our systems allow us to optimize coordination across our departments and/or product lines.	Our systems allow us to focus on maintaining our current market position.
IS-DEF4	Our systems are focused on helping us to improve operating efficiency.	Our systems help us search for new methods for reducing costs.
IS-DEF5		Our systems are focused on helping us to improve operating efficiency.
IS-DEF6		Our systems enable cost control through performance monitoring.
IS-FUT1	Our systems provide data that supports performance measures emphasizing our long-term business effectiveness.	Our systems provide data that supports performance measures emphasizing our long-term business effectiveness.
IS-FUT2	Our systems provide information supporting budget allocation decisions reflecting long-term considerations.	Our systems provide information supporting capital budget allocation decisions reflecting long-term considerations.

Item	Initial Items	Item Creation Result
IS-FUT3		Our systems provide data that is oriented to short-term decision making.
IS-PRO1	Our systems provide information to allow us to increase capacity before our competitors do the same.	Our systems provide information to allow us to increase capacity before our competitors do the same.
IS-PRO2	Our systems enable us to be the first ones to introduce various products and/or services in the market.	Our systems enable us to be the first ones to introduce various products and/or services in the market.
IS-PRO3	Our systems make it easier for us to adopt innovations earlier than competitors.	Our systems make it easier for us to adopt innovations earlier than competitors.
IS-RSK1	Our systems help us make business decisions that follow “tried and true” paths.	Our systems help us make business decisions using past practice and experience.
IS-RSK2	Our systems provide data to support conservative decision making	Our systems provide data to support conservative decision making.
IS-RSK3	Our systems provide information we need to take fewer risks than our competitors	Our systems provide information we need to take fewer risks than our competitors.

**Appendix A3 – Knowledge Strategic Orientation Items from Item Creation Step**

Item	Initial Items	Item Creation Result
KS-AGG1	We have the knowledge to be (or become) one of the top firms in our market(s)	We have the knowledge to be (or become) one of the top companies in our market(s).
KS-AGG2	Our knowledge helps us stay ahead of (or catch up with) the competition	Our knowledge helps us stay ahead of (or catch up with) the competition.
KS-AGG3	Our knowledge help us aggressively go after market share	Our knowledge helps us act proactively in our market(s).
KS-ANL1	Our knowledge is oriented towards being number-oriented and analytical in our operations.	Our learning is focused on being more number-oriented and analytical in our operations.
KS-ANL2	We learn from the detailed, factual information provided to support our day-to-day decision making.	We learn from the detailed, factual information provided to support our day-to-day decision making.
KS-ANL3	Our knowledge allows us to develop comprehensive analyses of each business opportunity or challenge we face.	Our knowledge allows us to develop comprehensive analyses of each business opportunity or challenge we face.
KS-DEF1	We have knowledge of our suppliers that helps us develop strong relationships with them.	We have knowledge of our suppliers that helps us establish close relationships with them.
KS-DEF2	We have knowledge of our customers that helps us develop strong relationships with them.	We have knowledge of our customers that helps us establish close relationships with them.
KS-DEF3	Our knowledge flows between our departments and/or product lines to improve coordination.	We focus on learning what we need to maintain our current market position.
KS-DEF4	Our knowledge is focused on helping us to improve operating efficiency.	Our knowledge helps us search for new methods for reducing costs.
KS-DEF5		Our learning is focused on helping us to improve operating efficiency.
KS-DEF6		We have the knowledge to implement cost control systems to monitor performance.
KS-FUT1	We learn from performance measure data to influence our long-term business effectiveness.	We learn from performance measure data to influence our long-term business effectiveness.
KS-FUT2	We understand long-term considerations and reflect them in budget allocation criteria.	We focus knowledge acquisition on long-term considerations in order to reflect them in budget allocation criteria.

Item	Initial Items	Item Creation Result
KS-FUT3		Our knowledge is best suited to short-term decision making.
KS-PRO1	We generally have the knowledge to increase capacity before our competitors do the same.	We generally have the knowledge to increase capacity before our competitors do the same.
KS-PRO2	We have a strong innovation capability that enables us to be the first ones to introduce various products and/or services in the market.	We have a strong innovation capability that enables us to be the first ones to introduce various products and/or services in the market.
KS-PRO3	We have the expertise needed to recognize innovations that merit early adoption.	We have the expertise needed to recognize innovations that merit early adoption.
KS-RSK1	Our knowledge helps us make business decisions that follow “tried and true” paths.	Our knowledge helps us make business decisions that follow “tried and true” paths.
KS-RSK2	We have a base of knowledge that supports conservative decision making.	We have a base of knowledge that supports conservative decision making.
KS-RSK3	Our knowledge is oriented towards taking fewer risks than our competitors.	We focus our learning on finding ways to take fewer risks than our competitors.

## Appendix B – Items Changed after Open Card Sort

Code	Item
BS-AGG3	We focus on being a market leader.
BS-ANL2	We require detailed, factual information to support our decision making.
BS-DFX1	We seek close relationships with our suppliers.
BS-DFX2	We seek close relationships with our customers.
BS-DFX3	We integrate forwards with customers and backwards with suppliers.
BS-DFN1	We consistently search for new methods for reducing costs.
BS-DFN2	There is a constant drive to improve operating efficiency.
BS-DFN3	We use cost control systems to monitor performance.
BS-PRO1	We tend to move proactively into new markets.
BS-RSK1	Our business decisions generally follow ‘tried and true’ paths.
BS-RSK3	We generally are reluctant to embark on risky projects.
IS-AGG3	Our IS helps us focus on being a market leader.
IS-ANL2	Our IS provide us with detailed, factual information to support our decision making.
IS-DFX1	Our IS enable us to establish close relationships with our suppliers.
IS-DFX2	Our IS enable us to establish close relationships with our customers.
IS-DFX3	Our IS enables us to integrate forwards with customers and backwards with suppliers
IS-DFN1	Our IS help us search for new methods for reducing costs.
IS-DFN2	Our IS are focused on helping us to improve operating efficiency.
IS-DFN3	Our IS enable cost control through performance monitoring.
IS-FUT1	Our IS provide performance metrics that emphasizes our long-term business effectiveness.
IS-PRO1	Our IS enables us to move proactively into new markets.
IS-RSK1	Our IS help us make business decisions following ‘tried and true’ paths.
IS-RSK3	Our IS our IS enables us to move proactively into new markets.
KS-AGG3	Our knowledge helps us to be (or become) a market leader.
KS-ANL2	We learn from detailed, factual information provided to support our decision making.
KS-ANL3	We have the knowledge needed to develop comprehensive analyses of each business opportunity or challenge we face.

Code	Item
KS-DFX1	We have knowledge of our suppliers that helps us establish close relationships with them.
KS-DFX2	We have knowledge of our customers that helps us establish close relationships with them.
KS-DFX3	We have the required knowledge to integrate forwards with customers and backwards with suppliers
KS-DFN1	Our knowledge helps us search for new methods for reducing costs.
KS-DFN2	We have the knowledge to improve operational efficiency
KS-DFN3	We have the knowledge to implement cost control systems to monitor performance.
KS-FUT1	We learn from performance metrics how to influence our long-term business effectiveness.
KS-FUT2	We focus knowledge acquisition on long-term considerations in order to reflect them in capital budget allocation criteria.
KS-FUT3	Our knowledge is best suited to support short-term decision making.
KS-PRO1	Our learning abilities enable us to move proactively into new markets.
KS-RSK3	We have the knowledge required to identify and avoid risky projects.

### Appendix C – Items Used in Pilot Testing

	Business Strategic Orientation	Information Systems Strategic Orientation	Knowledge Strategic Orientation
AGG1	We strive to be one of the top three companies in our market(s).	Our IS help us be (or become) one of the top companies in our market(s).	We have the knowledge to be (or become) one of the top companies in our market(s).
AGG2	We constantly attempt to be ahead of the competition.	Our IS help us stay ahead of (or catch up with) the competition.	Our knowledge helps us stay ahead of (or catch up with) the competition.
AGG3	We try to be a market leader.	Our IS helps us try to be a market leader.	Our knowledge helps us try to be a market leader.
ANL1	We tend to be number-oriented and analytical in our operations.	Our IS allow us to be number-oriented and analytical in our operations.	Our learning is focused on becoming more number-oriented and analytical in our operations.
ANL2	We require detailed, factual information to support our decision making.	Our IS provide us with detailed, factual information to support our decision making.	We can learn from detailed, factual information provided to support our decision making.
ANL3	We develop comprehensive analyses of each business opportunity or challenge we face.	Our IS help us develop comprehensive analyses of each business opportunity or challenge we face.	We have the knowledge needed to interpret comprehensive analyses of each business opportunity or challenge we face.
DFX1	We seek close relationships with our suppliers.	Our IS enable us to establish close relationships with our suppliers.	We have knowledge of our suppliers that helps us establish close relationships with them.
DFX2	We seek close relationships with our customers.	Our IS enable us to establish close relationships with our customers.	We have knowledge of our customers that helps us establish close relationships with them.
DFX3	We integrate forwards with customers and backwards with suppliers.	Our IS enables us to integrate forwards with customers and backwards with suppliers.	We have the required knowledge to integrate forwards with customers and backwards with suppliers.
DFN1	We generally search for new methods for reducing costs.	Our IS help us search for new methods for reducing costs.	Our knowledge helps us search for new methods for reducing costs.

	Business Strategy	Information Systems Strategy	Knowledge Strategy
DFN2	There is a constant drive to improve operating efficiency.	Our IS are focused on helping us to improve operating efficiency.	We have the knowledge to improve operational efficiency.
DFN3	We use cost control systems to monitor performance.	Our IS enable cost control through performance monitoring.	We have the knowledge to implement cost control systems to monitor performance.
FUT1	We use performance measures that emphasize our long-term business effectiveness.	Our IS provide performance metrics that emphasize our long-term business effectiveness.	We learn from performance metrics how to influence our long-term business effectiveness.
FUT2	Our criteria for capital budget allocations generally reflect long-term considerations.	Our IS provide information supporting capital budget allocation decisions reflecting long-term considerations.	We focus knowledge acquisition on long-term considerations in order to reflect them in capital budget allocation criteria.
FUT3	We generally focus on short-term decision making effectiveness.	Our IS provide data that is oriented to short-term decision making.	Our knowledge is best suited to support short-term decision making.
PRO1	We tend to move proactively into new markets.	Our IS enables us to move proactively into new markets.	Our learning abilities enable us to move proactively into new markets.
PRO2	We are usually the first ones to introduce various products and/or services in the market.	Our IS enable us to be the first ones to introduce various products and/or services in the market.	We have a strong innovation capability that enables us to be the first ones to introduce various products and/or services in the market.
PRO3	We adopt innovations early.	Our IS make it easier for us to adopt innovations earlier than competitors.	We have the expertise needed to recognize innovations that merit early adoption.
RSK1	Our business decisions generally follow 'tried and true' paths.	Our IS help us make business decisions following 'tried and true' paths.	Our knowledge helps us make business decisions that follow 'tried and true' paths.
RSK2	We adopt a rather conservative view when making major decisions.	Our IS provide data to support conservative decision making.	We have a base of knowledge that supports conservative decision making.
RSK3	We generally are reluctant to embark on risky projects.	Our IS help us to avoid risky projects.	We have the knowledge required to avoid risky projects.

**Appendix D – Recommended STROBE, STROIS and STROKE Items**

	STROBE	STROIS	STROKE
AGG1	We strive to be one of the top three companies in our market(s).	Our IS help us be (or become) one of the top companies in our market(s).	We have the knowledge to be (or become) one of the top companies in our market(s).
AGG2	We constantly attempt to be ahead of the competition.	Our IS help us stay ahead of (or catch up with) the competition.	Our knowledge helps us stay ahead of (or catch up with) the competition.
AGG3	We try to be a market leader.	Our IS helps us try to be a market leader.	Our knowledge helps us try to be a market leader.
ANL1	We tend to be number-oriented and analytical in our operations.	Our IS allow us to be number-oriented and analytical in our operations.	Our learning is focused on becoming more number-oriented and analytical in our operations.
ANL2	We require detailed, factual information to support our decision making.	Our IS provide us with detailed, factual information to support our decision making.	We can learn from detailed, factual information provided to support our decision making.
ANL3	We make decisions based on comprehensive situational analyses.	Our IS help us develop comprehensive situational analyses to aid decision making.	We have the knowledge needed to interpret comprehensive situational analyses used in decision making.
DFX1	We seek close relationships with our suppliers.	Our IS enable us to establish close relationships with our suppliers.	We have knowledge of our suppliers that helps us establish close relationships with them.
DFX2	We seek close relationships with our customers.	Our IS enable us to establish close relationships with our customers.	We have knowledge of our customers that helps us establish close relationships with them.
DFX3	We integrate forwards with customers and backwards with suppliers.	Our IS enables us to integrate forwards with customers and backwards with suppliers.	We have the required knowledge to integrate forwards with customers and backwards with suppliers.
DFN1	We generally search for new methods for reducing costs.	Our IS help us search for new methods for reducing costs.	Our knowledge helps us search for new methods for reducing costs.

	Business Strategy	Information Systems Strategy	Knowledge Strategy
DFN2	There is a constant drive to improve operating efficiency.	Our IS are focused on helping us to improve operating efficiency.	We have the knowledge to improve operational efficiency.
DFN3	We use cost control systems to monitor performance.	Our IS enable cost control through performance monitoring.	We have the knowledge to implement cost control systems to monitor performance.
FUT1	We use performance measures that emphasize our long-term business effectiveness.	Our IS provide performance metrics that emphasize our long-term business effectiveness.	We learn from performance metrics how to influence our long-term business effectiveness.
FUT2	We take a long-term view when making investment decisions.	Our IS provide information supporting capital budget allocation decisions reflecting long-term considerations.	We focus knowledge acquisition on long-term considerations in order to reflect them in capital budget allocation criteria.
FUT3	We generally focus on short-term decision making effectiveness.	Our IS provide data that is oriented to short-term decision making.	Our knowledge is best suited to support short-term decision making.
PRO1	We tend to be pioneers in new markets.	Our IS enables us to be pioneers in new markets.	We have the knowledge needed to be pioneers in new markets.
PRO2	We are usually the first ones to introduce various products and/or services in the market.	Our IS enable us to be the first ones to introduce various products and/or services in the market.	We have a strong innovation capability that enables us to be the first ones to introduce various products and/or services in the market.
PRO3	We adopt innovations early.	Our IS make it easier for us to adopt innovations earlier than competitors.	We have the expertise needed to recognize innovations that merit early adoption.
RSK1	We tend to be risk averse in our decision making.	Our IS support our tendency to be risk averse in our decision making.	Our knowledge supports our being risk averse in our decision making.
RSK2	We adopt a rather conservative view when making major decisions.	Our IS provide data to support conservative decision making.	We have a base of knowledge that supports conservative decision making.
RSK3	We generally are reluctant to embark on risky projects.	Our IS help us to avoid risky projects.	We have the knowledge required to avoid risky projects.

## **Chapter 6**

### **Conclusion**

In this concluding chapter, a summary of the research is presented, research implications are discussed, managerial implications are noted, limitations are outlined, and opportunities for future research are described.

#### **6.1 Summary**

The aim of this dissertation was to extend strategic alignment thought into the knowledge management domain by explicitly including the concept of knowledge strategy into the discussion of strategic alignment. The path it took started with synthesizing existing knowledge strategy literature to form a base of understanding; integrating knowledge strategy into the strategic alignment hypothesis by creating aligned portfolios of existing business, information systems (IS) and knowledge strategies; examining instances where the strategic alignment hypothesis may not hold using those aligned strategic portfolios as a framework; and developing a new conceptualization of knowledge strategy by extending the concept of strategic orientation to the knowledge domain. A brief summary of each paper is provided.

##### **6.1.1 Chapter 2**

A set of knowledge strategy dimensions were identified from the literature that is both useful on its own and can be used to describe knowledge typologies. Two existing knowledge strategy typologies were investigated and assessed in terms of the knowledge strategy dimensions. The key finding of the study was that the typology of Bierly and Chakrabarti (1996) was shown to be of a higher order than that of von Krogh, Nonaka and Aben (2001). This was

apparent in the ability to create differing portfolios of probing, appropriating, expanding and leveraging strategies that could support exploiter, explorer or innovator strategies.

### **6.1.2 Chapter 3**

A model of strategic alignment between business, information system and knowledge strategy was presented and tested using survey data. It was found that the combination of aligned information and knowledge strategies with their associated business strategy resulted in higher performance for defenders, analyzers and prospectors and that the alignment of non-viable strategies led to worse performance than individual non-viable strategies alone. Both the profile deviation analysis and covariation analysis indicated that knowledge strategy may dominate performance considerations in strategic alignment. Results were not homogeneous, with the most significant to least significant results being non-viable, balanced, proactive and conservative portfolios, reflecting previous mixed findings regarding proactive and conservative strategies in IS strategic alignment studies (Denford and Chan, 2007).

### **6.1.3 Chapter 4**

Case studies provided examples of alignment and misalignment in Chapter 4. They were used to populate a framework linking alignment and performance to investigate cases in which the strategic alignment hypothesis may or may not hold. Four explanations for firms' location in the model were provided, focusing on appropriate versus inappropriate alignment, conscious versus unconscious misalignment, antagonistic alignment versus misalignment, and strategic alignment versus misalignment. In addition, the findings were also explained in terms of firms' understanding of the environment and of their own strategies and alignment. The key finding was the importance of remaining conscious of the environment when examining internal strategic alignment.

### **6.1.4 Chapter 5**

This paper undertook the development of a new instrument for studying knowledge strategy and its alignment. Based on the Strategic Orientation of Enterprises (STROBE) of Venkatraman (1989b) and Strategic Orientation of Information Systems (STROIS) of Chan, Huff, Barclay and Copeland (1997), the Strategic Orientation of Knowledge-Based Enterprises (STROKE) instrument was designed to capture the orientation of knowledge strategy employment in firms. During the process of development, a new statistic was developed to aid in the validation of card sorts during the scale development step of instrument creation.

## **6.2 Research Implications**

While a significant goal of a dissertation is to demonstrate that research can be conducted, it is important to conduct research that contributes to the discipline. There are several implications of this research that are grouped by whether they contribute to theory, methodology or instruments.

### **6.2.1 Theory**

A key goal in the dissertation was to synthesize, extend and ultimately contribute to theory in the domains of knowledge strategy and alignment. In Chapter 2, the proposed hierarchical relationship between the two typologies illustrated how each could be used for different levels of analyses. That they operated at different level is an insight useful to researchers as it provides guidance as to how each typology could be used in future research. Chapter 3 extended theory by empirically demonstrating how knowledge strategy can be considered part of a portfolio of strategically aligned strategies also including business strategy and information systems strategy. Chapter 4 extended Miller's (1992) research by focusing on portfolios of strategies in place of structure and process as elements of internal fit that may be appropriate or

inappropriate to the external environment. It also added to Sauer and Burns' (1997) research by identifying cases of misalignment that may be beneficial. Finally, the paper integrated these contributions to support the position that misalignment is at times necessary to address environmental change (Hirschheim and Sabherwal, 2001) and extended this research into the knowledge domain. Chapter 5 provided an alternative conceptualization of knowledge strategy, introducing the concept of strategic orientation in to the field of knowledge management.

### **6.2.2 Methodology**

Research must make proper and effective use of existing methodologies, but can also make methodological contributions to the discipline. Chapter 3 demonstrated the value of pairing different conceptualizations of fit in alignment studies, as the results from the profile deviation and covariation approaches supported each other, and Chapter 4 also demonstrated the use of a fit as matching approach. Matrix Kappa was proposed in Chapter 5 as a complement to other card sort analysis techniques. This validation statistic has the benefit of meeting Cohen's Kappa assumptions for open card sorts, can be used to discriminate different levels of card sort success that Cohen's Kappa cannot, and can be used equally effectively for open and closed sorts. By reframing the card sort in terms of nodes-and-paths, a useful statistical tool and an intuitive graphical one were introduced for researchers to identify problems with item groupings early in the scale development process.

### **6.2.3 Instruments**

While the dissertation used several existing instruments, it also contributed to their research tradition by furthering their validation and contributed new instruments to the discipline. The establishment of a common set of knowledge strategy dimensions upon which to compare strategies in Chapter 2 provided a structure with which to study knowledge strategies in firms or

to discuss other typologies. Chapter 3 validated the use of the Bierly and Chakrabarti (1996) typology as a conceptual match for the business strategy typology of Miles and Snow (1978) and the IS strategy typology of Sabherwal and Chan (2001), giving it the potential for future research paired with these other typologies. Chapter 4 demonstrated how environmental factors can influence strategic alignment, reinforcing the need for environmental control variables. Specifically, there were cases where fit with the environment was of greater concern than internal strategic alignment. The development of the STROKE instrument in Chapter 5 was novel and an extension of research in strategic orientations. It is hoped that it will be used in future research. The secondary factor analyses provided further support for two other typologies. First, the linkage between Miles and Snow's (1978) typology and STROBE-based instruments (Sabherwal and Chan, 2001) was demonstrated using a two-factor solution. Second, the Action, Analysis and Anticipation reduced dimensions for strategic orientation (Chan, Huff and Copeland, 1998) were supported using a three-factor solution.

### **6.3 Managerial Implications**

While it is critical to contribute to MIS as a research domain, as a member of a professional discipline it is equally important to provide value to industry and practice. The implications in this section can be grouped by whether they provide frameworks or models that lead to managers to insights regarding the firm or provide levers that can be used by managers to influence the firm.

#### **6.3.1 Frameworks and Lenses**

Value can be provided to practice through the introduction of frameworks and lenses for managers to view their firms. In Chapter 2, the concept of portfolios of operational knowledge strategies supporting a particular grand knowledge strategy may help managers conceptualize

knowledge strategy in the firm. With this knowledge, managers can set a grand knowledge strategy and select an appropriate portfolio of operational knowledge strategies to enact it. For example, a manager may decide that to differentiate the firm from others, they need to develop new knowledge to support new business areas. This would require an explorer grand strategy which would be best served by employing probing and appropriating operational strategies to enact it.

The findings in Chapter 3 point to the importance of managers considering knowledge strategy when addressing alignment within the firm. The findings indicated that knowledge strategy may have the great importance to alignment and, through alignment, to performance. Ignoring knowledge strategy may mean ignoring an important contributor to firm performance. This realization may lead managers to become more conscious of their knowledge strategies, actively managing them and aligning them with business and IS strategies.

Chapter 4 points to the fact that investments in self-knowledge and environmental knowledge permit the firm to best position itself and make decisions regarding strategic alignment. Again, this recognition of the value of different types of strategies and forms of alignment may lead managers to become more aware of them. Specifically, awareness of what strategies are being used in the firm can be used to determine if alignment exists; awareness of the environment and the firm's degree of internal alignment can be used to determine if alignment is beneficial.

Finally, the STROKE instrument in Chapter 5 has the potential to provide managers with insights into the strategic orientation of their knowledge strategy and how it relates to other firm strategic orientations. Strategic orientations can be considered akin to the competitive personality of the firm. If different parts of the organization have different strategic orientations, they would likely not be supporting each other at best, or at worst could be working at cross purposes.

Understanding strategic orientations would provide managers the ability to ensure a common competitive approach for the firm.

### **6.3.2 Managerial Levers**

In addition to providing means to examine their firms, researchers can also provide guidance for managers in how to effect change in their firms. Chapter 3 showed how the alignment of business, information systems and knowledge strategies was, in general, positively related to high firm performance. This finding provides managers with a path to higher performance – aligning each strategy with the others. It also reinforced that a combination of poorly chosen strategies can have a greater negative effect than a single poor strategy. Conversely, if a firm is in the unfortunate position of having a portfolio of non-viable strategies, then the manager should know that any strategic change to a viable strategy would be beneficial.

Chapter 4 demonstrated that for those firms without a clear understanding of the external environment but without a good view of their strategies, maintaining an internally consistent set of strategies is a logical and potentially high performing approach. Should the environment be markedly inappropriate for the particular cohesive portfolio, however, then this approach could result in low performance in spite of alignment. Understanding of both the environment and one's firm leaves the organization free to select between strategic alignment and misalignment. Self-knowledge and knowledge of the environment can then be seen to lead to higher performance as trade-offs between alignment with the environment and strategic alignment can be consciously made.

## **6.4 Limitations**

No research is perfect and the various studies in the dissertation are no exception. However, the impact of the flaws in the research has been carefully examined and, while they

lead to caveats in the generalization of findings, on the whole the findings are supportable. Specific issues are identified in terms of methodology, sampling and data.

#### **6.4.1 Methodology**

Methodological limitations refer to issues that were raised in the application of various research methodologies that may limit the generalizability or applicability of results. In Chapter 2, there was a weakness in the application of ideal strategies, where firms were classified by 'best fit'. There were no 'perfect fits' in the group, but firms were treated as perfect fits to ideal types, potentially overstating the differences between the firms.

At the completion of the second pilot test in Chapter 5, four items were reworded. Prior to other researchers using them in future studies, this new wording should undergo an additional round of validation. The conduct of another card sort and an additional pilot test would also provide valuable additional confirmation.

#### **6.4.2 Sampling**

Sampling issues were related to the implications of selecting a particular sample frame for the studies. For the analysis in Chapter 2, the issue is that while the original types were derived from large firms, the sample was of smaller firms. While each of the types was represented in the sample, it is possible that the relationships between them are related to the organizations' sizes. This may be addressed by the fact that while the original research was based on large firms, each was conducted at the business unit level and the firms studied in this research can be considered single business unit firms. This would minimize the difference between origin and application of the types.

For Chapter 4, the issue is in regards to replicability and generalizability. While theory was tested across the different cases, it is acknowledged that sample frame of eight small and

medium enterprises in three industries may require some judicious consideration when generalizing the study's findings. Specifically, the eight firms fit neatly into the four model cells. This is not to suggest a proportion of firms that may be found in each quadrant. Additionally, while two observations per cell were appropriate for the case study method used, further development of this model may be advisable using greater numbers of firms and survey data.

#### **6.4.3 Data**

Issues with data are centered on shortcomings in the development of the scales and instruments, particularly in areas of validity and reliability. There was a weak factor in the knowledge strategy construct from Chapter 3 that did not behave as anticipated from pretests. While it was not fully satisfactory, as dropping it from the analysis had little statistical significance and retaining it had theoretical importance, it was retained. Additionally, while the constructs showed acceptable reliability and construct validity, they were not completely satisfactory in discriminant validity, and so could not be used to fully substantiate the relative contributions of proactive, balanced and conservative portfolios.

In the Chapter 5 STROKE development, two scales were found deficient after the second pilot test and required rework. The Risk Aversion scale showed classic signals of multidimensionality, which was addressed by bringing one item conceptually closer to the other two. The Analysis scale had acceptable reliability but items that grouped on two different factors, so an item was significantly reworded. The changes proposed stem from scale development and instrument testing analyses, but will require further validation to fully confirm their accuracy and appropriateness.

As noted above, there are several limitations to these studies. However, the limitations can be addressed and the research and managerial implications are considerable, making this

dissertation a significant contribution to the research tradition in knowledge strategy and strategic alignment.

## **6.5 Future Research from the Papers**

Research often poses more questions than it resolves; this dissertation was no exception. Future research stemming from the recommendations in each paper can be grouped according to whether they call for additional investigation into a phenomenon, application of a tool or technique, or further examination of variance models.

### **6.5.1 Investigation**

Future research opportunities can come in the form of areas that require further investigation to resolve a specific issue or explore a particular phenomenon. The inference in Chapter 3 that knowledge strategy could have a more significant effect on firm performance than business strategy is likely controversial and will require further research to confirm or refute. This also provides an opportunity for investigating the relative contribution of different functional strategies to alignment. As rationales were provided in Chapter 4 for firms existing in off-diagonal cells of the strategic alignment hypothesis matrix but not empirically tested, additional research into situations where the strategic alignment hypothesis does not hold is recommended.

### **6.5.2 Application**

Another type of research to be conducted is the validation and application of tools, techniques and procedures. The knowledge strategy dimensions from Chapter 2 reflect the key dimensions of two well-supported typologies. These six knowledge strategy dimensions – operationalized into ten – offer a validated conceptualization of strategy that can be used in other research. Similarly, future study and further validation of the STROKE instrument from Chapter

5 is invited, as the strategic orientation dimensions provide a new and important way to conceptualize knowledge strategies. From a techniques point of view, the lack of a clear relationship between environment and alignment recommends the use of holistic conceptualizations of fit such as profile deviation, covariation and gestalts to study, only the first two of which were demonstrated in this dissertation. Finally, further validation of the Matrix Kappa method is required, potentially including Monte Carlo simulation to test the characteristics and limits of the method and to see if previous studies using Cohen's Kappa for scale development to identify if Matrix Kappa use would recommend a different outcome.

### **6.5.3 Models**

Research can also come in the form of refining models through the introduction of other moderating, mediating or control variables. Chapter 2 suggests that a future research opportunity is to determine whether similar portfolios of knowledge strategy are maintained in different sized organizations. The mixed findings for proactive and conservative portfolios also demonstrate a continued requirement for study into the alignment and misalignment of more conservative or aggressive firms, where strategic type is the variable of interest. Finally, the inconsistencies in findings regarding the strategic alignment hypothesis noted in Chapter 4 can be attributed to those firms who appear to incorrectly select a cohesive strategy portfolio due to miscomprehension of the environment and those firms who correctly choose a misaligned portfolio to match the requirements of their understanding of the environment. This conclusion leads to a recommendation for strategic alignment researchers to carefully determine control variables for the environment and for the firm's perceptions of the environment when conducting studies.

## 6.6 Long-Term Future Research

As stated at the end of Chapter 1, while the Knowledge Strategic Alignment Model includes structural alignment, it was not within the scope of the dissertation. As such, it forms the basis for the large part of future research originating from this dissertation. This would involve developing further the concepts of structural alignment and empirically testing the full Knowledge Strategic Alignment Model. Structural alignment has been identified as “the degree of structural fit between IS and the business” (Chan, 2002, p. 98) and represents the half of the model not explored in the dissertation. In fact, more than half the model relationships were not explored, as in the absence of structural components, the three different functional fits also could not be tested.

The basis for the relationships among business, IS and knowledge strategies is established in this dissertation. Whether termed structural alignment (Chan, 2002), operational integration (Henderson and Venkatraman, 1993) or infrastructure alignment (Croteau, Solomon, Raymond and Bergeron, 2001), the underlying concept is that internal to the organization, alignment of various structural components with each other contributes to competitive advantage (Powell, 1992). At the structural level, several studies have examined the performance impacts of alignment between business and IS processes and organizations (Tavakolian, 1989; Burn, 1996; Sabherwal, Hirschheim and Goles, 2001; Bergeron, Raymond and Rivard, 2004). The existence of knowledge structures and their relationships with business and IS structures have been less well developed. Similarly, the functional alignment between strategies and structures has been examined in business (Egelhoff, 1982; Hitt and Ireland, 1986; Miller, 1986, 1992a; Powell, 1992) and IS (Bergeron, Raymond and Rivard, 2004; Burn, 1996; Heine, Grover and Malhotra, 2003; Sabherwal *et al.*, 2001). The importance of aligning knowledge strategies and structures has been hypothesized (Mentzas, 2002) but not empirically studied.

Business and knowledge structural alignment has been studied to a lesser degree than business and IS structural alignment but is starting to attract research attention. Some work has been done on the alignment of business and knowledge processes (Diakoulakis, Georgopoulos, Koulouriotis and Emiris, 2004), but this is tangential to actual structures and may fall more into the realm of capabilities. One study examined alignment between knowledge characteristics and organizational structures, classifying types of organizations based on the observability and embeddedness of knowledge (Birkinshaw *et al.*, 2002). This may be closer to the goal of this future research stream, as the types of knowledge in a firm may dictate the infrastructure needed to support it. The linkage between knowledge and business structures at the governance level can be seen in the internal mechanisms for knowledge transfer. Linkages have been found between corporate structure and KM governance, where divisionalized organizations tended to have more centralized knowledge governance forms and mostly standing KM functions (Schroeder, Pauleen and Huff, 2007). The internal structure of an organization can vary from mechanistic to organic (Miller, 1986), which can be compared to the knowledge structure of a firm varying from market-based to community-based (Cohen, 1998). Additionally, the applicability of internal knowledge structures can vary regarding the degree of formality, ranging from officially established project teams and formal work groups to informal networks and unofficial communities of practice (Wenger and Snyder, 2000). It has already been demonstrated that the different mechanisms for knowledge transfer are appropriate for different organizational forms (Slaughter and Kirsch, 2006), so the concept of alignment between knowledge and business structure may be postulated.

Knowledge and IS structural alignment has been studied even less than business and knowledge structural alignment. The alignment of IS and knowledge processes has generally been focused around research on knowledge management systems (KMS) (Alavi and Leidner, 2001; Gallupe, 2001; Staples, Greenaway and McKeen, 2001; Adams and Lamont, 2003). As the

conceptualization of IS and knowledge strategy both include infrastructure and governance components, discussion can be divided into these two areas.

IS infrastructure and knowledge infrastructure may have a degree of overlap, as KMS are “a class of information systems applied to managing organizational knowledge” (Alavi and Leidner, 2001, p. 114). Knowledge infrastructure extends beyond technology into human elements (Choi and Lee, 2002), as systems cannot replicate the deep tacit knowledge of human beings nor eliminate personal relationships (Walsham, 2001). This interrelationship itself may indicate the degree of alignment needed for high performance.

On the governance level, centralization and locus of authority are key concerns in both the IS (Sambamurthy and Zmud, 1999) and knowledge (Schroeder *et al.*, 2007) domains, with similar results found regarding their relationships with organizational structure. Finally, given that business to IS strategy (Chan *et al.*, 1997; Sabherwal and Chan, 2001), business to knowledge strategy (Kearns and Sabherwal, 2007; Snyman and Kruger, 2004), knowledge to IS strategy (Chan, Denford and Jin, 2009), business to IS structure (Sabherwal *et al.*, 2001; Bergeron, Raymond and Rivard, 2004) and business to knowledge structure (Birkinshaw *et al.*, 2002; Schroeder *et al.*, 2007) links have been established to varying degrees, it may be reasonable to anticipate the last component of the model exists.

Knowledge assets have been conceptualized as forming the linkage between knowledge strategy and structure (Mentzas, 2002). In addition, a case for functional knowledge can be seen in different forms that relationships take. Acquisition, licensing, brokerage and outsourcing were four external relationships identified. Comparing these to Bierly and Chakrabarti's (1996) knowledge strategy types, acquisition involves exploration of new areas, licensing involves exploitation of existing knowledge, brokerage represents an innovative strategy balancing acquisition and dissemination, while outsourcing reflects an absence of knowledge or knowledge

strategy. On an infrastructure level, the systems required to the different strategies of von Krogh *et al.* (2001) would be markedly different, as different knowledge requirement result in different knowledge management systems (Marwick, 2001).

Finally, on a governance level, centralization is a hallmark of conservative organizations (Miller, 1986), so the more conservative organizational types (defender) using a conservative knowledge strategy (exploiter) may be expected to use a conservative knowledge strategy. This would parallel the findings on centralization in IS structures in the defender type (Tavakolian, 1989). Taken together, relationships, infrastructure and governance can lead to an expectation of knowledge alignment being a form of functional alignment.

This rough outline of the relationships and theory supporting the role of knowledge structure in structural alignment points to the next step in the research program started by this dissertation.

## **6.7 Conclusion**

At the outset of this proposal, a research question was posed: What is the role and performance impact of knowledge strategy in strategic alignment? A common thread that runs through these papers is that knowledge strategy has an important role and a significant performance impact on firms. The fact that it has not been empirically studied much to date provides an open field for research into an area that has much potential to contribute to both research and practice. Twenty years after a call for research in the area of alignment in information systems (Boynton and Zmud, 1987), this still remains a rich, rewarding and enduring field of research. To answer another question regarding alignment – What have we learned? (Chan and Reich, 2007): We have learned a great deal... and there is much more to come.

## 6.8 References

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