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A Resource-Based View of Strategic IT Alignment: How Knowledge Sharing Creates Competitive Advantage

Grover S. Kearns†
Information Systems and Decision Sciences, College of Business Administration, University of South Florida at St. Petersburg, St. Petersburg, FL 33701-5016, e-mail: gkearns@stpt.usf.edu

Albert L. Lederer
School of Management, Gatton College of Business and Economics, University of Kentucky, Lexington, KY 40506-0034, e-mail: lederer@uky.edu

ABSTRACT

A critical decision problem for top management, and the focus of this study, is whether the CEO (chief executive officer) and CIO (chief information officer) should commit their time to formal planning with the expectation of producing an information technology (IT)-based competitive advantage. Using the perspective of the resource-based view, a model is presented that examines how strategic IT alignment can produce enhanced organizational strategies that yield competitive advantage. One hundred sixty-one CIOs provided data using a postal survey. Results supported seven of the eight hypotheses. They showed that information intensity is an important antecedent to strategic IT alignment, that strategic IT alignment is best explained by multiple constructs which operationalize both process and content measures, and that alignment between the IT plan and the business plan is significantly related to the use of IT for competitive advantage. Study results raise questions about the effect of CEO participation, which appears to be the weak link in the process, and also about the perception of the CIO on the importance of CEO involvement. The paper contributes to our understanding of how knowledge sharing in the alignment process contributes to the creation of superior organizational strategies, provides a framework of the alignment-performance relationship, and furnishes several new constructs.

Subject Areas: Competitive Advantage, Information Systems Planning, Knowledge Sharing, Resource-Based View, Strategic Planning, and Structural Equation Modeling.

INTRODUCTION

In a recent London School of Economics survey, chief executive officers (CEOs) and information technology (IT) executives alike revealed that over half of their company's IT investments were aimed at gaining a competitive advantage

†Corresponding author.

(Compass Group, 1998). They admitted, however, that only one-third of these investments were actually profitable.

Nevertheless, in a follow-up survey, CEOs rated IT as the firm's top strategic tool. One CEO stated, "IT is no longer an expense and a burden. IT carries its weight. In fact, it keeps the rest of us afloat" (Compass Group, 1999, p. 10). The CEOs further asserted that the source of competitive advantage was superior management processes and knowledge, not technology per se.

Strategic IT alignment has been shown to be a key predictor of IT investment profitability (Henderson & Venkatraman, 1999) particularly for today's information-intense firms (Sabherwal & King, 1991). Alignment processes that promote knowledge sharing are essential in determining IT profitability (Tallon, Kraemer, & Gurbaxani, 2000). Indeed, identifying and cultivating these processes can improve profitability and result in a competitive organizational asset (Ferrier, Smith, & Grimm, 1999). To achieve success, firms have "had to realign not merely their IT strategy but also their business strategy and to maintain close alignment between the two" (Burns & Szeto, 2000, p. 206). More effective alignment between business and IT strategies has been found to occur where the strategy creation processes increased the dialogue between business and IT managers and the resultant strategies identified implementation responsibilities (Broadbent & Weill, 1993).

The resource-based view of the firm dominates strategic management literature and has also found use in management information systems (MIS) literature (Priem & Butler, 2001). For example, it has been used to examine IS resource performance discrepancies (Teng, Cheon, & Grover, 1995), to provide support for the strategic-grid framework (Raghunathan & Raghunathan, 1990), to link IT capability and firm performance (Bharadwaj, 2000), and to examine the importance of senior leadership and infrastructures to IT assimilation (Armstrong & Sambamurthy, 1999). Resource-based theory is important to our understanding of strategic IT alignment because it provides an understanding of how knowledge sharing can uncover IT-based opportunities and produce superior strategies. In particular, we are interested in the knowledge sharing that takes place between the CIO (chief information officer) and the CEO. Participation of the CEO in IT planning helps to secure top management support (Lederer & Mendelow, 1989), which is critical to IT alignment and is a dominant factor in explaining its use strategically. Participation of the CEO is also critical in producing managerial knowledge of information assets and IT opportunities (Boynton, Zmud, & Jacobs, 1994).

Whether to commit the time of the CEO and CIO to formal planning approaches is a critical decision problem facing top management. Alignment processes can be time-consuming and costly and may appear too formal to match the shorter planning horizons many companies face today. To address this problem, the goals of this paper are to assess, in the context of the resource-based view, three sets of relationships: the influence of information intensity upon strategic IT alignment processes; the influence of strategic IT alignment upon the outcomes or strategies; and the influence of the outcomes upon the use of IT for competitive advantage.

Although the alignment-performance relationship has been demonstrated empirically in past research (Sethi & King, 1994), the present study offers three important differences. First, it extends our understanding of the alignment mechanism

by empirically presenting strategic IT alignment as a set of four constructs: two process constructs that combine IT and business knowledge and two outcome constructs that represent the resultant IT and business strategies. Second, it presents a heretofore untested construct, based on the competitive forces model, to represent the use of IT for competitive advantage. Third, it uses the resource-based view to explain the efficacy of alignment to the use of IT for competitive advantage.

OPERATIONALIZATION OF CONSTRUCTS AND STUDY HYPOTHESES

The Resource-Based View, Strategic IT Alignment, and Competitive Advantage

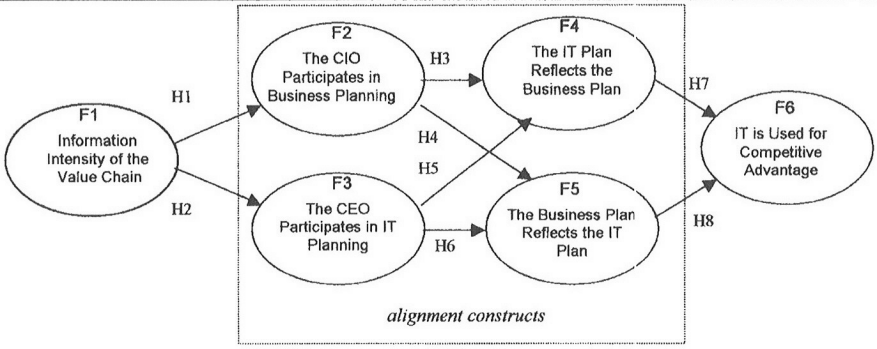
The resource-based view (RBV) differs from the traditional industrial economics theory of the firm, which depends heavily upon alignment with external environmental forces in explaining firm profitability. The RBV, on the other hand, posits that the firm's internal resources are the primary predictors of superior financial performance (Wernerfelt, 1984). Each firm is capable of possessing heterogeneous resources that are difficult to replicate and are not perfectly mobile. If these resources provide a marketplace advantage that cannot easily be duplicated, they have the potential for providing a sustainable competitive advantage.

The contribution of the RBV is the idea that firms should focus attention on developing internal assets and processes (Grant, 1991). Accordingly, firms should foster processes that are inimitable and leverage core resources. For firms dependent upon information, processes that assimilate and use information in a superior manner have the potential for creating a sustainable competitive advantage. Strategic IT alignment is such a process. It is unique to the firm and combines business and IT knowledge in order to support business objectives (Reich & Benbasat, 1996). Alignment also includes those outcomes that are the product of the alignment process, that is, the strategies contained in the business plan and the IT plan.

The alignment-performance relationship is also predicted by the dynamic capabilities literature. Dynamic capabilities refer to the ability of the firm to reconfigure its internal and external capabilities to address a dynamic environment (Teece, Pisano, & Shuen, 1997). Although the current study does not measure environmental dynamism, it argues that certain organizational processes address a dynamic environment via codification of knowledge into explicit strategies, contributing to a more precise implementation of complex IT-based strategies. By creating a superior alignment process, an RBV asset, a more effective implementation of IT strategies can result, thus producing a competitive advantage.

From an RBV perspective, competitive advantage can result from strategic IT alignment when it represents a complex organizational process that is both heterogeneous and immobile (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). The process of alignment is a capability in itself and should be contrasted with the underlying technology that, because it is equally available to all firms, can rarely convey a sustainable competitive advantage (Clemons & Row, 1991). Advantage occurs when the technology is used to leverage firm resources in some inimitable way (Vitale, Ives, & Beath, 1986). The RBV argues that unique management

Figure 1: Model of strategic IS alignment.



Where F is the latent factor.*

processes, such as IT alignment, can be inimitable. Successful IT alignment depends upon the participation of the CEO and other top managers. This participation is vital to the competitive use of IT and the successful implementation of IT-based strategies (Jarvenpaa & Ives, 1991; Teo & King, 1997).

In this study, the knowledge sharing that stems from collaborative development of both the business plan and IT plan is held to ensure the most advantageous use of organizational knowledge (Goldsmith, 1991) and, because it is firm-specific, is capable of rendering a competitive advantage (Mata, Fuerst, & Barney, 1995). Explicit articulation of the alignment outcomes—that is, business and IT strategies—increases organizational understanding and helps to ensure that these strategies are implemented correctly (Reich & Benbasat, 2000). Properly conceived, the alignment processes and outcomes constitute a unique firm asset capable of producing IT-based competitive advantage.

The study model in Figure 1 consists of six latent factors, or constructs, and their hypothesized relationships. Factor F1 represents information intensity; F2–F3 and F4–F5 depict alignment processes and outcomes, respectively; and F6 signifies IT-based competitive advantage. Thus, in the study model, four constructs represent the alignment mechanism. The first two (F2–F3) are process constructs, representing the exchange of knowledge, and the final two (F4–F5) are outcomes representing the codification of the new knowledge. Knowledge is exchanged via two organizational processes: business planning and IT planning. Knowledge is codified in two organizational documents: the business plan and the IT plan. Obviously, the process and outcome measures must be viewed as separate phenomena as one is action-oriented while the other is a state. Separation of process and outcome into two constructs is also necessary as each represents a different occurrence or a different artifact, respectively. The CIO participation in business planning is distinctly different from the CEO participation in IT planning. Similarly, "the IT plan reflects the business plan" is a state distinctly different from "the business plan reflects the IT plan." Further, the strength of each, and the relationship of each to

other constructs, has its own interpretation that can increase our understanding of the alignment mechanism. A discussion of the constructs and hypotheses follows.

Information Intensity and Planning Participation

The first two hypotheses concern the effect of information intensity on knowledge sharing. In this study, information intensity (FI) is defined as the significance of the information component in value chain activities and is demonstrated by the level of accuracy, frequency of updates, and the magnitude and extent of information employed in operations (Busch, Jarvenpaa, Tractinsky, & Glick, 1991; Teo & King, 1997). Because information is valuable and costly, and because there is "an increasing focus on knowledge as the most important resource for companies," information-intense firms cultivate processes of information acquisition, assimilation, and conversion (Johannessen, Olaisen, & Olsen, 2001, p. 3).

Knowledge sharing, in this study, is of two types. First, it is the transfer of knowledge when the CIO participates in business planning. The CIO participation is indicated by attendance at business planning meetings, formulation of business goals, frequent access to the CEO, and regular informal contacts with other members of top management (Lederer & Mendelow, 1989; Sambamurthy & Zmud, 1999). The CIO knowledge of business activities is assumed to be essential to innovative success and helps offset the "bounded rationality" of CEOs who may be overwhelmed with the complexity of the technology (Sabherwal & King, 1991).

Second, it is the transfer of knowledge when the CEO participates in IT planning. The CEO participation here is indicated by regular contacts with the CIO, involvement on an IT steering committee, knowledge about competitors' uses of IT, knowledge about IT opportunities within the firm, and treatment of IT as a strategic resource (Jarvenpaa & Ives, 1991; Lederer & Mendelow, 1988; Sabherwal, 1999). By viewing participation as two separate constructs, it is possible to represent the knowledge sharing between the IT domain and other business domains.

This cross-participation is necessary to elucidate the tacit knowledge that often remains undiscovered and is not shared in the organizational knowledge base (Johannessen et al., 2001) and to make this personal knowledge explicit at the organizational level. While explicit knowledge might be shared in other ways, tacit knowledge is linked to the individual and must be discovered through a knowledge sharing process. Processes that increase the amount and quality of organizational knowledge can, the RBV explains, create an asset that is valuable, rare, and inimitable (Barney, 1991). Management processes such as alignment can be inimitable because they are often socially complex and causally ambiguous. As Pearlson (2001, p. 193) states, "ultimately an organization's only sustainable competitive advantage lies in what its employees know and how they apply that knowledge to business problems."

Alignment is an organizational process distinct from operational processes that represent a host of routines and procedures that are systematic and predictable. It is a process in which managers participate in the exchange of knowledge and it can be a dynamic capability. Learning processes are expensive, consuming hours of management time, and, because they are socially complex, more difficult to codify. Because they are expensive, CEOs and CIOs are unlikely to participate in

learning processes unless they believe that their efforts will result in a valuable organizational asset such as improved strategies that yield competitive advantage.

The CIOs and CEOs in information-intense firms are expected to have a higher motivation to participate in the strategic IT alignment process because their collaboration may yield superior IT strategies (Bharadwaj, 2000). Increasing investments in IT strategies and infrastructures have increased the consequences and potential importance of such collaboration (Brown & Sambamurthy, 1999). The CIOs would thus spend time understanding business initiatives, and the CEOs would spend time exploring IT opportunities. Hence, the following hypotheses are investigated:

H1: Information intensity is positively associated with the CIO's participation in business planning.

H2: Information intensity is positively associated with the CEO's participation in IT planning.

CIO Participation in Business Planning and Alignment

According to the RBV, organizational processes can provide superior organizational knowledge (Hunt, 2000). Sharing of domain knowledge, achieved when the business plan and the IT plan are developed collaboratively (i.e., the alignment process), helps to ensure the most advantageous use of such knowledge (Goldsmith, 1991). Articulation of this knowledge as alignment outcomes—that is, business and IT strategies—increases organizational understanding, which helps to ensure that these strategies are implemented correctly (Reich & Benbasat, 2000). Because each of the processes and outcomes represents a different phenomenon, the alignment mechanism in this study is modeled as four distinct constructs as shown in Table 1. This approach advances the traditional perception of alignment that is often presented as a single construct and allows for greater examination of how each of the constructs is important to the use of IT for competitive advantage.

Hypotheses 3 and 4 concern the effect of the CIO's participation in business planning (F2) on strategic IT alignment. Alignment is represented as two sets of outcomes: the alignment of the IT plan with the business plan, meaning that the IT plan reflects the business plan or *ITP-reflects-BP* alignment (F4), and the

Table 1: Four alignment constructs.

Process Constructs	Outcome Constructs
Collaborative organizational processes promote knowledge sharing and help to uncover IT opportunities.	Organizational outcomes produced via knowledge sharing provide superior IT and businesses strategies that reflect the melding of business and IT knowledge.
F2	F4
The CIO Participates in Business Planning	The IT Plan Reflects the Business Plan *(ITP-reflects-BP)*
F3	F5
The CEO Participates in IT Planning	The Business Plan Reflects the IT Plan *(BP-reflects-ITP)*

alignment of the business plan with the IT plan, meaning the business plan reflects the IT plan or *BP-reflects-ITP* alignment (F5). The *ITP-reflects-BP* alignment may be expected to occur when the business plan goals and strategies are reflected in the IT plan goals and strategies, and when the ITP reflects external environmental forces (Johnston & Carrico, 1988; King, 1978; Teo & King, 1997). The *BP-reflects-ITP* alignment may be expected to occur when the business plan contains realistic expectations about IT performance, utilizes the strategic capability of IT, and references specific information systems and technologies (Goldsmith, 1991; Lederer & Mendelow, 1989; Sabherwal, 1999). By examining these two distinct phenomena as separate constructs, it is possible to ascertain the importance of each to the alignment process.

When CIOs assist in formulating business goals, they are more likely to understand business objectives and to link IT strategies closely with organizational strategies resulting in *ITP-reflects-BP* alignment (Jones, Taylor, & Spencer, 1995). Their attendance at business planning meetings may lead to increased assimilation of technical with business knowledge for themselves and other executives, and may strengthen both types of alignment (Andreau & Ciborra, 1996). Regular access to CEOs may increase the ability of CIOs to provide knowledge about competitors' uses of IT and to share knowledge about emerging opportunities, again strengthening both types of alignment. By working closely with other managers, CIOs are better positioned to influence the appropriate use of and reflect IT explicitly in the business plan (Armstrong & Sambamurthy, 1999). Hence, the following hypotheses are investigated:

H3: The CIO's participation in business planning is positively associated with the IT plan reflecting the business plan (*ITP-reflects-BP* alignment).

H4: The CIO's participation in business planning is positively associated with the business plan reflecting the IT plan (*BP-reflects-ITP* alignment).

CEO Participation in IT Planning and Alignment

Hypotheses 5 and 6 concern the effect of CEO participation in IT planning (F3) on both forms of alignment. The CEOs "can neither avoid IT nor delegate the issues it raises to others" (Earl & Feeny, 2000, p. 12), because their participation fosters an appreciation for what is meaningful and relevant, and promotes the combining of business with IT knowledge (Tillquist, 2000). Direct participation leads to high levels of comprehensiveness and thus superior organizational knowledge (Segars, Grover, & Teng, 1998).

The CIOs may devise technically oriented strategies that are ignored because they are difficult for other managers to comprehend. But when CEOs have frequent contact with CIOs, IT strategies are more likely to be phrased in practical terms and reflect business realities, which might lead to increased *ITP-reflects-BP* alignment. Past research suggests that other managers are likely to follow the lead of the CEO and be more motivated to become familiar with and make innovative uses of IT (Jarvenpaa & Ives, 1991). Bringing other managers into the process benefits both

forms of alignment. *ITP-reflects-BP* alignment may benefit because CIOs become more knowledgeable about the business environment and are better able to craft strategies that directly support or enable business strategies (Johnston & Carrico, 1988). *BP-reflects-ITP* alignment may benefit because the increased knowledge about IT capabilities and opportunities provides other managers the increased capability of crafting strategies that clearly state the role of IT. Participation by the CEO is necessary so that business strategies are implemented with the appropriate technologies and that key IT initiatives are not abandoned (Keen, 1991). When the CEO participates, other members of top management are likely to follow the CIO's lead. This enhances communication between the CIO and management and facilitates *ITP-reflects-BP* alignment (Papp & Luftman, 1995).

The CEOs have the power to set "clear examples for their colleagues regarding the need to give quality time to IT" (Earl & Feeny, 2000, p. 17). When CEOs participate on IT steering committees to obtain direct knowledge about important projects, business strategies are more likely to utilize the strategic capability of IT (Goldsmith, 1991). Furthermore, CEO understanding of IT opportunities within the firm and awareness of competitors' IT uses may break down the barriers to business-IT collaboration, benefiting *BP-reflects-ITP* alignment (Brown & Sambamurthy, 1999). Such increased understanding may be expected to lead to improvement in the quality of the IT plan (Byrd, Sambamurthy, & Zmud, 1995). Hence, the following hypotheses are investigated:

H5: The CEO's participation in IT planning is positively associated with the IT plan reflecting the business plan (*ITP-reflects-BP* alignment).

H6: The CEO's participation in IT planning is positively associated with the business plan reflecting the IT plan (*BP-reflects-ITP* alignment).

Alignment and Competitive Advantage

Hypotheses 7 and 8 concern the impact of alignment on the use of IT for competitive advantage. In the model, the use of IT for competitive advantage is a performance variable measured by items that directly influence and defend against Porter's (1980) five competitive forces. As the RBV posits, superior IT-based strategies can lower product costs, create product differentiation, increase customer switching-costs, combat competitors, and raise market entry barriers (Parsons, 1983). From Table 2, questions for the five items that measured the performance variable refer to actual IT applications that have been shown to yield competitive advantage and improve organizational performance.

To warrant management's attention, alignment must have a positive and significant association with organizational performance. A few studies have empirically linked alignment to financial profitability measures but with limited success (Weill & Olson, 1989). Organizational complexity makes it difficult to provide a direct link between IT planning and firm profitability because of a multitude of other variables that are omitted from the model. A theoretically plausible alternative is the use of a surrogate measure for organizational performance (Premkumar &

Table 2: Study constructs and survey questions.

Constructs and Survey Questions	Supporting Research
(F1) Information Intensity of the Value Chain	
V1. Information is used to a great extent in our production or service operations.	Busch et al., 1991; Teo & King, 1997
V2. Information used in our production or service operations is frequently updated.	Busch et al., 1991; Teo & King, 1997
V3. Information used in our production or service operations is usually accurate.	Busch et al., 1991; Teo & King, 1997
V4. Many steps in our production or service operations require the frequent use of information.	Busch et al., 1991; Teo & King, 1997
(F2) The CIO Participates in Business Planning The IT executive . . .	
V5. regularly attends business planning meetings.	Lederer & Mendelow, 1989; Sambamurthy & Zmud, 1999
V6. contributes to the formulation of business goals.	Lederer & Mendelow, 1989
V7. has regular informal contacts with top management.	Lederer & Mendelow, 1989; Reich & Benbasat, 2000
V8. has easy access to the CEO.	Raghunathan & Raghunathan, 1990
V9. has frequent contacts with the CEO.	Raghunathan & Raghunathan, 1990
(F3) The CEO Participates in IT Planning The CEO . . .	
V10. plays an important role in the corporate IS steering committee.	Jarvenpaa & Ives, 1991
V11. becomes knowledgeable about competitors' use of IS.	Jarvenpaa & Ives, 1991
V12. has frequent informal contacts with IS management.	Lederer & Mendelow, 1988; Reich & Benbasat, 2000
V13. becomes knowledgeable about IS opportunities within the firm.	Jarvenpaa & Ives, 1991
V14. regards spending on IS as strategic investments rather than expenses to be controlled.	Jarvenpaa & Ives, 1991
(F4) ITP-reflects-BP	
V15. The IS Plan reflects the business plan mission.	King, 1978
V16. The IS Plan reflects the business plan goals.	King, 1978; Tallon et al., 2000
V17. The IS Plan supports the business strategies.	King, 1978; Tallon et al., 2000; Burns & Szeto, 2000

King, 1994; Raghunathan & Raghunathan, 1991) . By using IT-based applications that have been shown to produce competitive advantage as a surrogate for organizational performance, we avoid the confounding of results by variables external to the model.

The RBV recognizes differences in organizational knowledge as a source of competitive advantage (Mata et al., 1995; Peteraf, 1993). Strategies that reflect the

Table 2: (continued) Study constructs and survey questions.

Constructs and Survey Questions	Supporting Research
V18. The IS Plan recognizes external business environment forces.	Johnston & Carrico, 1988; Burns & Szeto, 2000
V19. The IS Plan reflects the business plan resource constraints.	Lederer & Mendelow, 1988
(F5) BP-reflects-ITP	
V20. The Business Plan refers to the IS Plan.	Goldsmith, 1991
V21. The Business Plan refers to specific IS applications.	Sabherwal, 1989
V22. The Business Plan refers to specific information technologies.	Sabherwal, 1989
V23. The Business Plan utilizes the strategic capability of IS.	Goldsmith, 1991; Burns & Szeto, 2000
V24. The Business Plan contains reasonable expectations of IS.	Lederer & Mendelow, 1989
(F6) IT is Used to Create a Competitive Advantage With respect to our company's core products or services and major customers and suppliers, IS has been used to . . .	
V25. provide advantages such as lower costs or product differentiation.	Porter, 1980; Parsons, 1983
V26. make it more costly for our customers to change suppliers.	Porter, 1980; Parsons, 1983
V27. establish electronic links with suppliers or customers.	Porter, 1980; Parsons, 1983
V28. create barriers to keep competitors from entering our markets.	Porter, 1980; Parsons, 1983
V29. influence the buyer's decision to switch to our products.	Porter, 1980; Parsons, 1983

Note that questions have been grouped by construct for clarity.

integration of both business and IT knowledge in a nascent manner are more likely to defend against competitive forces and provide an advantage (Reich & Benbasat, 1996). The RBV theorists explain that organizational capabilities, such as the alignment process, can create sustainable competitive advantage (Schendel, 1994). Performed correctly, the alignment process may lead to superior organizational knowledge that can result in an IT-based competitive advantage.

ITP-reflects-BP alignment may heighten the use of IT for competitive advantage because of the CIO's expanded knowledge of the business mission and goals and the "effective use and exploitation of IT" (Sambamurthy & Zmud, 1999, p. 282). *BP-reflects-ITP* alignment may heighten the use of IT for competitive advantage because the precise knowledge of technology's role promotes improved organizational understanding and better implementation of IT-based strategies.

Some companies do not make explicit reference to the role of IT in their business strategies, leaving that decision to be made during IT planning or even

later during implementation. While such an approach may lend future flexibility, it ignores the value of conveying the precise content and vision of collaboratively created strategies. On the other hand, by referencing specific IT assets to be employed in strategy implementation, *BP-reflects-ITP* alignment not only supports the matching of IT assets with business processes, it provides a specific implementation plan that may increase the likelihood that strategies will be implemented as originally envisioned (Reich & Benbasat, 2000). Hence, the following hypotheses are investigated:

H7: The IT plan reflecting the business plan (*ITP-reflects-BP* alignment) is positively associated with the use of IT to provide competitive advantage.

H8: The business plan reflecting the IT plan (*BP-reflects-ITP* alignment) is positively associated with the use of IT to provide a competitive advantage.

RESEARCH METHODOLOGY

The Research Instrument

This study used a field survey. The questionnaire contained items measuring the six constructs and general demographics. This method was chosen in order to elicit a wide representation by industry and size of firm and to allow for tests of validity and reliability. Measures for each of the constructs were selected for their interpretability and empirical support in prior research. Previous research had used the information intensity construct (Teo & King, 1997). Survey questions used a 7-point Likert-type scale anchored at strongly disagree (1) and strongly agree (7). The questions, now grouped by construct for clarity, and their supporting research appear in Table 2.

Instrument refinement was a two-stage process. First, in an effort to establish content validity, four MIS professors at a doctoral-granting university initially critiqued the instrument. Second, the instrument was piloted on four CIOs and four other executives from four different industries. Comments and suggestions were incorporated into the final instrument.

Using a random sample of 1,200 companies, including all industries except government and nonprofit institutions, surveys were sent directly to CIOs of companies with at least $75 million in annual revenues. The mailing list was purchased from Lighthouse Lists of Ft. Lauderdale, Florida. It was extracted from a large database of U.S. companies identifiable along several attributes that had been updated within the past 18 months. The sample was drawn randomly from over 12,000 firms selected for representation of all industries and availability of the CIO's name. Participants were guaranteed confidentiality of responses and were offered an executive-level summary of responses as an incentive.

This study is based on the perceptions of a single key informant. Some researchers have argued that how managers perceive their environment is more critical to organizational strategy than objective, or archival, measures of the environment (Anderson & Paine, 1975; Hambrick & Snow, 1977). Perceptual

measures provide a picture of the firm's environment from the perspective of a key informant intimately familiar with relationships that cannot be captured by archival data. Perceptual measures are also more likely to reflect the current state of the firm's environment than archival measures that reflect past as well as current relationships.

Use of perceptual measures has been popular in empirical MIS research (Segars et al., 1998) and such measures have been shown to parallel archival data (Tallon et al., 2000). Where archival data are lacking or where it is not feasible to collect data from multiple informants, a structured approach using a formal rationale is recommended. Based on widely recognized guidelines (Huber & Power, 1985), steps were taken to reduce any sources of data inaccuracy.

First, the survey instrument was pretested on senior IT executives who were later asked if they understood and could easily interpret the questions. Second, the most experienced and knowledgeable person in the firm was selected as the single key informant. In this case, it was the CIO. Cogent arguments have been advanced for using the CIO as the key informant for questions regarding the use of IT within the organization. By virtue of their position, CIOs have been exposed to the views of other senior executives as well as those of peers and subordinates. Care was taken to acquire the exact name and title of the CIO in the organizations surveyed. Third, in an effort to reduce any motivation for exaggeration and self-promotion, CIOs were advised that results would be completely anonymous.

In addition to the above coping strategies, data inaccuracies were further reduced by the use of highly informed respondents. This was evidenced by the advanced education, years of service, and high reporting status of the CIOs who participated in the survey. Finally, multiple items were used to measure each of the study constructs and subsequent analysis revealed high internal consistencies for each of the constructs. Together, these tactics and evidence were deemed reasonably sufficient to establish the credibility of the study data.

Survey Results

The post office returned 152 of the surveys stating that the addressee had moved and a forwarding address was unavailable. Thus, these surveys were never received by the intended CIOs. (This may reflect high CIO turnover rates.) Subjects returned 161 usable surveys over a six-week period. Phone calls to 400 of the companies revealed that many of the surveys had been intercepted by the CIO's secretary and discarded in accordance with company policy. As one CIO stated, "We receive tons of these each year and have simply chosen to ignore them." Another CIO agreed to participate "if the survey can get past my secretary." Other CIOs cited lack of time, company policy regarding confidentiality, and lack of any IT planning function as reasons for not responding. Of the 400 contacted, 88 (or 22 percent) stated the surveys were discarded without their knowledge. Because these surveys failed to reach their intended target, who thus lacked any knowledge of their existence, they should be excluded in the response rate calculation (Armstrong & Overton, 1977). The unadjusted response rate was 13.4 percent (161/1,200). Subtracting the 152 returned surveys and the projected 264 discarded ones (22 percent of 1,200) reduces the total surveyed to 784 (1,200 – 152 – 264). Thus, the adjusted response

Table 3: Survey response by industry.

Industry	Frequency	%
Manufacturing	52	32.3
Wholesale/Retail	24	14.9
Utilities & Communications	20	12.4
Finance/Legal	10	6.2
Construction	8	5.0
Publishing/News	7	4.3
Computers	5	3.1
Consumer Products	4	2.5
Petroleum	3	1.9
Aerospace	2	1.2
All Other	26	16.2
Total responses	161	100.0

rate would be 20.5 percent (161/784). Although low, the rate was similar to that experienced by other surveys when sampling the senior officer (Byrd & Turner, 2001).

Analysis of Nonresponse Bias

Table 3 presents the frequency of survey response by major SIC (standard industrial classification) industry grouping. Characteristics of the CIOs and respondent companies are presented in Table 4. On average, respondents were well educated and experienced within the IT area. About 30 percent of the companies had annual revenues exceeding $500 million.

Nonresponse bias was investigated first by comparing the average values for each of the constructs for weekly time intervals in which the completed surveys were received (Armstrong & Overton, 1977). T-tests of the mean differences for each of the constructs failed to reveal any significant differences or trends over the six-week period. Second, the chi-square differences between respondents and nonrespondents for annual sales revenues and number of employees were calculated and found to be insignificant. Together these tests suggested the absence of nonresponse bias in the data (Sabherwal, 1999; Teo & King, 1997).

DATA ANALYSIS

Study data were analyzed using structural equation modeling (SEM), in which parameters are estimated by minimizing the discrepancy between the model implied covariance matrix and the observed covariance matrix (Jöreskog & Sörbom, 1989). Structural equation modeling is a confirmatory approach that provides explicit test statistics for establishing convergent and discriminant validity important to MIS research (Straub, 1989). A maximum likelihood discrepancy function approach was adopted using EQS, a multivariate analytical software product that allows for a wide variety of statistics, robust standard errors for parameter estimates and mean-adjusted chi-square tests of model fit. The EQS software includes the

Table 4: Characteristics of respondent CIO.

	Average years
College education	5.1
Experience in industry	17.5
Experience with company	12.2
Experience in IS area	20.8
Characteristics of Respondent Companies	
Annual Sales Revenue	Percent of Companies
$5 billion and above	5.0
$1 billion to below $5 billion	14.3
$500 million to below $1 billion	11.8
Less than $500 million	52.8
Not reported	16.1
Total	100.0%
Company Employees	Percent of Companies
8,000 and above	7.1
4,000 to below 8,000	12.8
1,000 to below 4,000	42.3
500 to below 1,000	19.9
Below 500	17.9
Total	100.0%

Satorra-Bentler scaled chi-square and Yuan-Bentler distribution-free statistics on data that may not be multivariate normally distributed.

The robustness of SEM using maximum-likelihood estimating for a multifactored model that explains a phenomenon such as alignment has been demonstrated in prior MIS research (Jöreskog & Sörbom, 1989; Segars et al., 1998). A two-phase approach was used. In the first phase, a confirmatory factor model (e.g., the measurement model) was used to measure the fit between the theorized model and observed variables. In the second phase, results of the measurement model were used to create a path-analytic model to investigate the relationships hypothesized in this study.

The Measurement Model

Modifications were made to the original measurement model consisting of all six constructs in order to achieve a proper fit. The EQS software identifies cases that contribute most highly to kurtosis. The single set of observations that contributed most highly to kurtosis was omitted, reducing the total number of sets of observations to 160. Based upon the Lagrange multiplier test and the Wald test, the model was respecified by omitting three multidimensional variables—V8, V9, and V23. Unifactorial variables simplify evaluation, and an acceptable remedy is to drop multidimensional variables when sufficient items remain to operationalize the construct (Anderson & Gerbing, 1988). Standardized factor loadings and

Table 5: Properties of the final measurement model.

Construct and Indicators	Standardized Loading	t-value	Reliability	Variance Extracted Estimate
Value Chain (F1)		.88[a]	81[b]	.51
V1	.81	11.55	.65[c]	
V2	.93	13.99	.83	
V3	.64	8.52	.41	
V4	.76	11.21	.57	
CIO Participation (F2)		.92	.83	.67
V5	.91	14.29	.83	
V6	.98	16.29	.96	
V7	.66	9.06	.44	
CEO Participation (F3)		.93	.82	.54
V10	.70	9.62	.49	
V11	.84	12.63	.71	
V12	.78	11.25	.61	
V13	.91	14.40	.83	
V14	.85	12.82	.72	
ITP-reflects-BP Alignment (F4)		.96	.88	.59
V15	.94	15.40	.88	
V16	.97	16.40	.91	
V17	.91	14.59	.83	
V18	.71	9.99	.50	
V19	.61	8.30	.38	
BP-reflects-ITP Alignment (F5)		.95	.85	.59
V20	.89	13.98	.80	
V21	.93	14.87	.86	
V22	.90	13.84	.79	
V24	.68	9.39	.47	
Competitive Advantage (F6)		.76	.67	.34
V25	.75	9.92	.56	
V26	.48	5.79	.23	
V27	.61	7.61	.37	
V28	.67	8.62	.45	
V29	.61	7.58	.37	

[a]Cronbach Alpha Coefficient [b]Composite Reliability [c]Indicator Reliability

measures of reliability and validity for the final measurement model are presented in Table 5.

Reliability and validity

Interitem reliability was established by the six Cronbach alpha coefficients and composite reliability indices that exceed the recommended minimum of .70 (Fornell & Larcker, 1981; Nunnally, 1978). Content validity was supported by the standardized factor loadings, which are generally high (only one is less than .60) and significant ($t > 2.96$) for all measures. Goodness of fit was measured by multiple indices to negate bias associated with use of a single index (Hair, Anderson, Tatham, & Black, 1995). The indices used for this study were the ratio of chi-square to degrees of freedom (χ^2/df), the Tucker Lewis or nonnormed fit

Table 6: Final measurement model measures of goodness of fit and reliability.

Test Statistic	Study Value	Recommended Value
Chi-Square	437.724	
Degrees of Freedom (*df*)	284.000	
χ^2/df	1.541	≤2.00
Reliability Coefficient	0.965	≥0.70
Nonnormed Fit Index	0.952	≥0.90
Comparative Fit Index	0.958	≥0.90
Bollen Fit Index	0.959	≥0.90
Root Mean-Square Error of Approximation	0.047	≤0.05
Average Absolute Standardized Residual	0.048	≤0.10

index, the comparative fit index, the Bollen fit index, the root mean-square error of approximation, and the average absolute standardized residual. Although chi-square is also recognized as a measure of goodness of fit, it is affected by the size of correlations within the model and, for small samples, can produce inaccurate probability values (Hartwick & Barki, 1994). Because it is not uncommon for significant chi-square values to coexist with good model fit, it was replaced with the χ^2/df ratio (Marsh, Balla, & McDonald, 1988). These same measures have been used in past MIS research (Sabherwal, 1999; Segars et al., 1998).

Table 6 presents measures of reliability and goodness-of-fit for the final measurement model. All indices were well within the recommended ranges and the final measurement model was deemed acceptable (Bentler, 1990; Bollen, 1989).

Evidence of construct validity was provided by measures for content validity, convergent validity, and discriminant validity (Venkatraman & Ramanujam, 1987). Content validity was based upon the pilot test (Cronbach, 1971). Convergent validity was established by the high factor loadings and high levels of significance for the indicator variables (Schwab, 1980). Evidence for discriminant validity was established by three tests.

First, the variance-extracted test assessed the amount of variance explained by the construct as compared to the amount ascribed to random measurement error (Fornell & Larcker, 1981). From Table 5 it can be seen that five of the six constructs explain 50 percent or more of the variance (e.g., the variance-extracted estimate). While it is desirable that the constructs exhibit estimates of .50 or larger, it is common for the estimate to be below .50 even when reliabilities are acceptable (Hatcher, 1994, p. 331). The formula for the variance extracted estimate is $\Sigma L_i^2/(\Sigma L_i^2 + \Sigma \mathrm{Var}(E_i))$, where L_i is the standardized factor loadings for that factor, and $\mathrm{Var}(E_i)$ is the error variance associated with the individual indicator variables.

Second, a chi-square difference test was performed to assess discriminant validity between all constructs. The test was performed in three steps: (1) estimate the standard measurement model in which all constructs are free or "unconstrained," (2) create a "constrained" model in which the correlation between the two constructs of interest is set at 1, and (3) compute the chi-square difference statistic for the two models. If the chi-square statistic for the unconstrained model is significantly lower than for the constrained model, then discriminant validity has been established and the first model is accepted as the preferred model (Anderson & Gerbing, 1988).

Table 7: Correlation coefficients for model constructs.

	(p <.01)					
	F1	F2	F3	F4	F5	F6
F1	1.00					
F2	.34	1.00				
F3	.33	.63	1.00			
F4	.40	.57	.47	1.00		
F5	.24	.58	.60	.59	1.00	
F6	.59	.64	.51	.64	.49	1.00

Table 8: Test for discriminant validity. Measurement model (unconstrained): $\chi^2 = 437.7, df = 284$.

Constrained Model	χ^2 $df = 285$	χ^2 Difference	Significant at p = .001
F1/F2	732.1	294.4	Yes
F1/F3	706.7	269.0	Yes
F1/F4	692.3	254.6	Yes
F1/F5	866.4	428.7	Yes
F1/F6	524.1	86.4	Yes
F2/F3	646.3	208.6	Yes
F2/F4	686.3	248.6	Yes
F2/F5	606.6	168.9	Yes
F2/F6	520.5	82.8	Yes
F3/F4	842.8	405.1	Yes
F3/F5	725.3	287.6	Yes
F3/F6	548.7	111.0	Yes
F4/F5	754.6	316.9	Yes
F4/F6	521.7	84.0	Yes
F5/F6	554.0	116.3	Yes

Table 7 presents the factor correlations for the final measurement model. As theorized, all constructs are positively related and, while some have strong correlations, all are well below the suggested cutoff of 0.90 (Bagozzi & Phillips, 1991). Table 8 presents the chi-square values for each of the 15 constrained models. The chi-square differences are also chi-square distributed with one degree of freedom. As shown, all of the differences are significant with $p < .001$. Hence, each construct captures a phenomenon that is unique from all other constructs, suggesting strong properties of discriminant validity.

Third, a confidence interval test was performed on each set of the six study factors. For each test, the confidence intervals did not include the value of 1.0, thus rejecting the hypothesis that the population correlation between the factors is 1.0. This means that the factors in each set are indeed measuring a separate phenomenon and that the model would lose explanatory power if any sets of measures were combined into a single construct. The preceding tests confirmed the reliability and goodness of fit for the six-construct measurement model.

The structural model

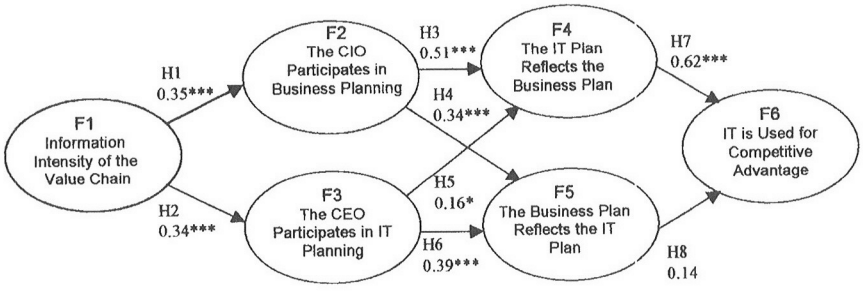
A structural model was specified based on the final measurement model and the hypothesized paths. However, initial fit indices revealed room for model improvement. The Lagrange multiplier test identified several pairs of disturbance terms and error terms that, if allowed to covary, would improve model fit. Correlated errors indicate that the variation in the measurements is produced by something other than or in addition to the underlying theoretical concepts and random error (Venkatraman & Ramanujam, 1987). Allowing these terms to covary did not detract from the theoretical meaning of the model. Specifically, the three pairs of terms were the error terms associated with the variables V15–V16 and V26–V28 and the disturbance terms associated with the constructs F2 and F3.

RESULTS

The final revised research model with path coefficients appears in Figure 2. The disturbance term for F6 is .71 and the coefficient of determination is .50 ($R^2 = 1 - (.71)^2 = .50$), indicating that the model accounts for approximately half of the variation in the performance variable. Thus, the model is reasonably successful in positively relating strategic IT alignment to the use of IT for competitive advantage for information intense firms.

Table 9 shows that the measures of reliability and goodness of fit for the final structural model were all well within the prescribed ranges. The nonnormed fit index, the comparative fit index, and the Bollen fit index all exceeded the prescribed lower limit of .90, and the χ^2/df ratio was well below the prescribed upper limit of 2.0. Thus, the final structural model was accepted as supporting the theorized model. Table 10 shows that six of the eight hypotheses were supported with $p < .01$, H5 was supported with $p < .05$, and H8 was not supported.

Figure 2: Final structural model with path coefficients.



*, **, *** significance level of t-values is p< .05, .01, .001 respectively.
Dependent variable $R^2 = .50$.

*, ** refers to significance with $p < .05, .001$ respectively. Dependent variable $R^2 = .50$.

Table 9: Final structural model measures of goodness of fit and reliability.

Test Statistic	Study Value	Recommended Value
Chi-square	440.585 p = .0000	
Degrees of Freedom	287	
χ^2/df	1.540	≤2.00
Reliability Coefficient	0.959	≥ 0.70
Nonnormed Fit Index	0.953	≥0.90
Comparative Fit Index	0.958	≥0.90
Bollen Fit Index	0.959	≥0.90
Root Mean-Square Error ofApproximation	0.047	≤0.05
Average Absolute Standardized Residual	0.062	≤0.10

Table 10: Support for study hypotheses.

Hypothesis	Supported	Beta	t-value
H1: Information intensity of the value chain is positively associated with the CIO's participation in business planning.	YES	.35**	4.25
H2: Information intensity of the value chain is positively associated with the CEO's participation in IT planning.	YES	.34**	4.01
H3: The CIO's participation in business planning is positively associated with the IT plan reflecting the business plan.	YES	.51**	5.39
H4: The CIO's participation in business planning is positively associated with the business plan reflecting the IT plan.	YES	.34**	3.70
H5: The CEO's participation in IT planning is positively associated with the IT plan reflecting the business plan.	YES	.16*	1.69
H6: The CEO's participation in IT planning is positively associated with the business plan reflecting the IT plan.	YES	.39**	4.15
H7: The IT plan reflecting the business plan is positively associated with the use of IT to provide competitive advantage.	YES	.62**	5.72
H8: The business plan reflecting the IT plan is positively associated with the use of IT to provide competitive advantage.	NO	.14	1.42

*, ** refer to significance with $p < .05, .001$ respectively.

DISCUSSION

The first study goal was to examine the influence of information intensity on the knowledge sharing processes of strategic IT alignment. Information intensity was found to be positively and significantly associated with the participation of the CIO in business planning (H1) and the participation of the CEO in IT planning (H2).

As the RBV predicts, firms for which information is a valuable resource will use knowledge sharing to enhance organizational knowledge. Thus, we would expect CIOs of information-intense firms to engage in business planning and focus on the optimal matching of IT resources to support business strategies and to ensure that business strategies properly reflect IT's role. We would also expect CEOs of such firms to have similar interests and engage in IT planning to ensure the maximum return from IT and to realize its strategic value.

The second study goal was to assess how the knowledge sharing processes of strategic IT alignment influence the outcomes. Two forms of knowledge sharing were expected to influence two sets of outcomes. Participation by the CIO in business planning was strongly associated with both the *ITP-reflects-BP* (H3) and *BP-reflects-ITP* (H4) outcomes. These findings are consistent with the expectation that the CIO's participation in business planning meetings, contribution to business goal formulation, regular contacts with top management, and access to the CEO improves alignment of IT strategies with business strategies and promotes the identification of explicit information systems and technologies in business strategies.

Also, although participation by the CEO in IT planning was not strongly associated with *ITP-reflects-BP* (H5), it was strongly associated with *BP-reflects-ITP* alignment (H6). This latter finding is consistent with the expectation that when the CEO becomes more knowledgeable about IT opportunities within the firm, understands how the competition uses IT, and treats IT as a strategic resource, the role of IT will more likely be made explicit in business strategies. Given that the RBV posits that organizational processes are capable of crafting superior strategies, why then was a more significant relationship between the CEO's participation and *ITP-reflects-BP* (H5) lacking?

The weaker support for H5 suggests that the CIO does not perceive increased CEO participation as influencing the alignment between IT strategies and business strategies. Because data reflect only the perceptions of the CIO, it is possible that (1) CEO participation in IT planning does not influence *ITP-reflects-BP* alignment, or (2) the CIO is incorrect and such a relationship really does exist.

The first possibility for weak support for H5, that CEO participation in IT planning does not influence *ITP-reflects-BP* alignment, suggests that either the CEO does not understand the value of such alignment or is not mindful of the importance of his or her role in supporting such alignment. Moreover, the CEO may simply view *ITP-reflects-BP* alignment as the responsibility of the CIO. Alternatively, the CEO's lack of technical knowledge may create a reluctance to question decisions. As a result, the CEO's participation would not influence *ITP-reflects-BP* alignment (H5).

Support for this interpretation may lie in the mean CIO participation and CEO participation responses, 5.1 and 4.4 respectively. The mean difference was statistically significant using a paired t-test ($p < .001$). That CIO participation in business planning was significantly higher than CEO participation in IT planning raises questions about the seriousness of CEO commitment to IT and why such participation does not predict *ITP-reflects-BP* alignment.

Given the high cost and strategic value of IT investments, CEO enthusiasm is warranted and could be expected to lead to increased IT planning participation and a stronger association between IT strategies and business strategies. Why then does CEO participation not predict *ITP-reflects-BP* alignment? The answer may

be found in a recent study. Earl and Feeny (2000) observed that many CEOs voice support for IT planning but fail to become involved or participate in IT planning. This could explain the weak relationship between CEO participation and *ITP-reflects-BP* alignment. If so, information-intense firms may not benefit from the best strategies when the CEO does not become truly involved in the IT planning process.

The second possibility for weak support for H5, that the CIO is incorrect and CEO participation does predict *ITP-reflects-BP* alignment, has implications for the CIO's perceptions. The CIO should be capable of providing accurate responses to the construct measures. Could false assumptions or a lack of appreciation for the CEO's role on the part of the CIO have understated the strength of the relationship? It would be interesting to understand the source of this bias if it exists.

The third study goal was to assess how the outcomes influence IT-based competitive advantage. The outcome *ITP-reflects-BP* alignment (H7), but not *BP-reflects-ITP* alignment (H8), was positively and significantly related to the use of IT for competitive advantage. In light of the favorable impact of *ITP-reflects-BP* alignment on IT-based competitive advantage, the lack of a significant relationship between *BP-reflects-ITP* and IT-based competitive advantage may simply reflect the lack of necessity for explicit references to IT in the business plan. In other words, competitive advantage can still exist without *BP-reflects-ITP* alignment.

Support for this interpretation may lie in the *ITP-reflects-BP* and *BP-reflects-ITP* alignment mean responses, 5.3 and 4.4 respectively. The mean difference was significant using a paired t-test ($p < .001$). The lower mean for *BP-reflects-ITP* alignment may suggest that explicit references to IT in the business plan are not deemed necessary to the use of IT for competitive advantage. Lack of these explicit references, however, may reduce the efficacy of strategy implementation. If the learning process of alignment produces a higher level of understanding between the CEO and CIO, the knowledge should be codified by explicit articulation of specific information systems and technologies to be used in business strategies. In dynamic environmental contexts, such as those heavily influenced by technology, implementation of decisions is subject to significant causal ambiguity (Lippman & Rumelt, 1982). This means that well-crafted strategies may be poorly implemented and lose their potential impact because the step-by-step thinking that occurred during strategy formation is not later available. Careful articulation of the ideas expressed during strategizing helps to expose the vital steps and increases the likelihood that the strategy will be implemented as originally envisioned.

Firms differ in the extent to which they articulate and codify the shared domain knowledge and individual experiences of their managers, particularly in the specificity of their strategies (Winter, 1987). Knowledge sharing during the alignment process, if explicitly captured, may be the key to transforming the process into a dynamic capability and strengthening the alignment-performance relationship.

Implications for Researchers

Empirical assessment of ITP process dimensions has been lacking (Segars et al., 1998). The study model herein provides researchers with several interesting areas for future exploration. Future research is needed to (1) further examine the relationship of CEO participation to *ITP-reflects-BP* alignment; (2) further examine the

relationship of *BP-reflects-ITP* alignment to the use of IT for competitive advantage; (3) assess and contrast the attitudes and actions of the CEO in IT planning; (4) increase our understanding of industry effects on the model; and (5) further validate the study constructs.

Little empirical evidence exists that relates collaborative business and IT planning to higher IT success (Sabherwal, 1999). According to RBV, the alignment-performance relationship may explain why one organization is successful in the use of IT for competitive advantage while other firms are not. This study reveals that CIO participation in business planning does influence both forms of alignment (H3 and H4) and that *ITP-reflects-BP* alignment is positively associated with the use of IT for competitive advantage (H7). However, this study also reveals that CEO participation in IT planning has weak influence on *ITP-reflects-BP* alignment (H5). Researchers should seek an explanation of why such an important task has been relegated to the CIO. Theory suggests that CEO participation on IT steering committees, knowledge about IT opportunities within the firm, and knowledge about competitors' uses of IT will lead to more collaborative sharing of knowledge between other members of management and the CIO. This collaboration results in superior organizational knowledge that enables managers to create a closer mapping of IT goals and strategies to business goals and strategies. Is this theory incorrect? If so, why? Could it be that CEO participation was too weak to stimulate collaboration? Or, could it be that the knowledge sharing did not produce superior organizational knowledge? Future research should answer these questions to explain the lack of support for H5, or seek some other explanation.

Weak support for H5 is especially interesting in contrast to the strong and highly significant support for H6. That is, the same CEO actions lead to a more explicit declaration of the IT role in business strategies. Hence, understanding the failure of H5 may be all the more rewarding.

The relationship between *BP-reflects-ITP* alignment and the use of IT for competitive advantage (H8) was not statistically significant whereas the relationship was strong and significant for *ITP-reflects-BP* alignment (H7). Why this incongruity? Theory suggests that alignment improves organizational knowledge of the IT role in business strategies and this enhanced knowledge is used to implement IT-based competitive advantage. Is it possible that *BP-reflects-ITP* alignment does not provide enhanced knowledge? Or, is it possible that this enhanced knowledge is not useful in creating IT-based competitive advantage? Future research should answer these questions to explain the lack of support for H8, or seek some other explanation.

The current study suggests that CEO participation in IT planning may be weak. Recent research, however, has shown CEOs to highly value IT as a strategic tool (Compass Group, 1999). Therefore, researchers might be interested in contrasting this attitude of CEOs with their actual support and participation in IT planning. Why do CEOs appear to articulate support but apparently not provide it? Researchers may also be interested in further examination of the precise manner in which CEOs do choose to participate.

This study, using data from virtually all industries, revealed that information-intense firms in this study were more likely to practice alignment processes than

other firms. Future research could use the model to examine industry-specific effects to determine if certain industries have higher information intensity and whether this leads to greater alignment participation by the CEO and CIO.

The underlying measures of the study constructs were supported by MIS research but, with the exception of information intensity, had not been previously tested. Further validation of these constructs in future research would increase their credibility and the generalizability of the findings.

Finally, the model accounted for only half of the variability in the dependent variable. Other factors that influence the use of IT for competitive advantage should be sought out.

In summary, this paper makes several important contributions. It increases our understanding of how knowledge sharing, by allowing the exchange of both explicit and tacit domain knowledge, can impact IT and business strategies. It provides an explanatory framework of the alignment-performance relationship within the context of the resource-based view. It also provides empirical support for the relationship between information intensity and the sharing of domain knowledge. By separating alignment into four separate constructs, it advances our understanding of the alignment mechanism as a multidimensional phenomenon. By showing a positive and significant relationship between alignment and the use of IT for competitive advantage, the study provides empirical support for the efficacy of alignment. Last, it provides several new constructs grounded in the RBV and MIS theory.

Implications for Practitioners

Study results indicate that information-intensive firms participate more in business and IT knowledge sharing than do other firms. The CIOs in information-intensive firms might now anticipate that their competitors are placing greater emphasis on this sharing of knowledge. Thus, in order to be competitive, CIOs in information-intense firms should increase their efforts to establish and refine the alignment mechanism: participate in business planning, develop informal relationships with the CEO and other executives, and educate management about the competitors' uses of IT.

In this study, participation of the CIO in business planning influenced the content of both the business plan and the IT plan. Moreover, the content of the IT plan influenced IT competitiveness. Thus, CIOs can act proactively to increase the value of IT. Participation in business planning and formation of business strategies can improve the quality of the related IT strategies. Such participation also encourages the direct reference of specific information systems and technologies within the business plan. Where managers are not IT-literate, CIOs might encourage "experimentation and exploration with new technologies" (Agarwal & Karahanna, 2000, p. 688). Nevertheless, this research suggests that CIOs who currently participate in business planning should do so even more.

Study results also indicate that CEO participation does not influence *ITP-reflects-BP* alignment and that *BP-reflects-ITP* alignment does not influence the use of IT for competitive advantage. However, the underlying reasons are not clear. Perhaps under some circumstances, strong CEO participation could improve

alignment between IT strategies and business strategies, and explicit declaration of the IT role in business strategies could lead to greater IT-based competitiveness. Thus, because such competitiveness is so important, more research is needed before organizations should abandon either CEO participation in IT planning or *BP-reflects-ITP* alignment.

Limitations

While using a surrogate for organizational performance avoids the influence of external variables, the use of IT for competitive advantage is not strictly equivalent to improved financial performance. Information technology investments intended to reduce costs, differentiate products, establish switching costs, or create electronic relationships do not always improve firm performance. Another potential limitation is the possible bias associated with data collected from a single key informant. Use of perceptual measures raises potential concerns regarding generalizability, reliability, and validity. Although tactics were used to reduce data inaccuracies, the use of multiple respondents would have been preferred. The use of a single informant is prevalent within MIS research, but always remains a source of bias when interpreting study results.

CONCLUSIONS

Strategic IT alignment is a costly yet important issue that may impact the return on IT investments. As such, it remains an important topic for managers. This paper advances our understanding of the alignment mechanism. Mainly, it increases our understanding of how knowledge sharing can impact IT and business strategies and it provides an explanatory framework of the alignment-performance relationship within the context of the resource-based view.

Despite recent research that suggests IT planning cannot be relegated to the CIO, this study suggests that the CIO remains primarily responsible for aligning IT strategies with business strategies. Thus, the portrayal of the CEO as being highly supportive of IT's strategic role is partly contradicted. This study suggests that CEO participation is lukewarm and that strategic IT alignment remains the primary burden of the CIO. It also raises an important question: Does the lack of a significant relationship between *BP-reflects-ITP* and the use of IT for competitive advantage imply missed opportunities? [Received: January 22, 2002. Accepted: December 4, 2002.]

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Grover S. Kearns is assistant professor at the College of Business of the University of South Florida at St. Petersburg. He holds a PhD in decision sciences and information systems from the University of Kentucky, an MBA from the University of Texas at Austin, and BA degrees in both management and accounting, and is a licensed CPA. Prior to his current position he was director of planning for an electric utility. His research focuses on MIS strategic planning, and electronic and global commerce. He has presented his research at the Decision Sciences Institute Conference, the International Conference on Information Systems, and other venues, and published in *Decision Sciences, Journal of Strategic Information Systems, Computer Personnel,* and elsewhere.

Albert L. Lederer is professor in the C. M. Gatton College of Business and Economics of the University of Kentucky. He holds a PhD in industrial and systems engineering from the Ohio State University, an MS in computer and information sciences from Ohio State, and a BA in psychology from the University of Cincinnati. He has over 10 years of industry experience in information systems. His research focuses on information systems planning. It has been published in *Decisions Sciences, MIS Quarterly, Journal of MIS, Information Systems Research, Communications of the ACM,* and elsewhere.