Strategic users of information technology: a longitudinal analysis of organizational strategy and performance

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While discussed extensively, very few studies have attempted to formally integrate the notions of organizational strategy, competitive advantage, and the strategic use of information technology. Utilizing the typology of Miles and Snow, this study attempts to identify the strategic orientation (prospector, analyzer, defender) of widely cited users of 'strategic information technology' before and after the launch of their innovative systems. Also, measures of financial performance are compared between emergent groups in order to determine if any particular strategic orientation consistently outperforms the others. In general, this study reports four findings. First, it appears that strategic users of information technology are not concentrated along a singular strategic dimension. The firms examined in this study exhibited characteristics associated with each of Miles and Snow’s strategy types. Second, it seems that many firms shifted strategic orientation after the launch of their systems. Interestingly, these shifts were rather dramatic and seem to represent a fundamental change in strategic direction from earlier ‘pre-system’ operating philosophies. Third, case descriptions along with narratives of annual reports suggest that usage or competitive intent of these strategic systems matches the prevailing strategic profile of the initiating firms. In other words, the systems seem to support organizational strategy. Finally, it seems that prospectors and defenders realized significantly higher measures of financial performance immediately after the implementation of ‘strategic information technology’; however, in the long-term no strategic orientation seemed to outperform the others.

Keywords: strategic information technology, organizational strategy, competitive advantage, information technology for competitive advantage

The recent emergence of theoretical literature and case studies which explore the ‘strategic’ and/or ‘competitive’ use of information and information technology (IT)
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provide extensive evidence of the critical role information resources can play in the realization of corporate strategy (Clemons and McFarlan, 1984; Ives and Learmonth, 1984; McFarlan, 1984; Cash and Konsynski, 1985; Clemons and Row, 1991). Clearly, the information system (IS) function has evolved from a reactive ‘organizational handyman’ into a proactive corporate resource capable of distinguishing a firm within its industry. Although information systems will continue to support routinized ‘efficiency’ oriented tasks such as payroll and process control, informed managers are constantly seeking new ways to employ IT in support of corporate objectives. In these instances, the focus of IT planning and deployment shifts from organizational efficiency to effectiveness and the relevant managerial concern becomes: How can information resources contribute to the long term effectiveness of the firm in relation to other industry participants?

A critical component in the development of IT-enabled competitive strategy is the integration of the firm’s strategic and IS plans (King, 1978; Pyburn, 1983). In essence, a level of ‘strategic validity’ is achieved when long-term corporate strategy is formulated with both the existing and potential uses of IT considered. Without this integration, strategic options of the firm can be severely limited as IT architectures resemble the vision of technical rather than strategic planners. Conversely, a ‘link’ between both corporate and IS strategic plans facilitates competitive flexibility (the capability of responding to changing industry conditions) as well as competitive innovation (the capability to ‘change the rules of competition’) (Keen, 1991). Thus, the strategic use of IT can be conceptualized as technological architectures developed, deployed, and used as a result of, and in support of, the overall strategic objectives of the firm.

Much of the early research attention in this area has focused on frameworks for: (1) identifying opportunities, (2) creating managerial awareness, and (3) positioning the firm with respect to its technological abilities and competitive opportunities (Earl, 1988). In addition, case studies which describe the features and competitive implications of strategic IT have been presented as convincing evidence of its ‘industry changing’ ability (Clemons and Row, 1988; Doll, 1989). These important early efforts can best be summarized as descriptive in nature. That is, a description of IT-based competitive advantage was the focus rather than actual empirical measurement of its antecedents, constructs, or subsequent impacts.

Recent literature has extended the notion of strategic IT to include consideration of performance measures and the sustainability of competitive gains over time (Clemons, 1986; Feeny, 1988; Feeny and Ives, 1990). The implications of these works are that ‘true’ IT-based competitive advantage is sustainable and should have a noticeable impact on the overall profitability measures of the firm. Further, it is suggested that differences in unique complimentary resources (resources leverageable with IT) among firms may be an important determinant in the competitive gains realized through development and deployment of strategic IT initiatives (Clemons and Row, 1991). While these concepts are relatively new, they underscore an important agenda for future work in the area of strategic IT. Succinctly stated, research efforts should broaden in scope from descriptive frameworks and case studies to explanatory models of firm and industry-level dynamics. Concepts such as ‘strategy’, ‘performance’, ‘sustainability’ and their changes over time must be measured within the context of strategic IT use. This study undertakes such an agenda. Drawing on methodologies grounded in strategic management and industrial economics, the purpose of this study is to determine the strategic orientation and longitudinal patterns in performance of much-cited strategic users of IT.
Organizational strategy, competitive advantage, and strategic use of information technology

While discussed extensively, very few studies have attempted to formally integrate the notions of organizational strategy, competitive advantage and the strategic use of IT. Some popular perspectives from each of these areas are presented in the following sections.

Organizational strategy

Miles and Snow (1978) formally define organizational strategy as an ongoing process of evaluating purpose as well as questioning, verifying, and redefining the manner of interaction with the competitive environment. This concept has been further refined by strategy theorists as consisting of corporate-level strategies (‘What business should we be in?’) and business level strategies (‘How do we compete in this business?’) (Hambrick, 1980). Ideally, the formulation of business-level strategy is a top-down process which flows directly from corporate-level strategies summarized in the firm’s statement of mission and objectives. Although important, corporate-level strategies are rather static in nature and are not easily operationalized. Conversely, business-level strategies represent dynamic managerial decisions that are continuously made in order to cope with changes in the competitive environment. Since these actions closely reflect continuous organizational processes of adaptation and can be operationalized using objective data (Hambrick, 1980; Cool and Schendel, 1987; Segev, 1989; Tavakolian, 1989), the term ‘strategy’ or ‘strategic orientation’ as used within the context of this research represents business-level strategies.

As noted by Miles and Snow, the complexity of the strategy process can be somewhat simplified by searching for patterns in the behavior of organizations. In other words, observed patterns of emergent behavior can be used to describe the underlying processes of organizational adaptation. The typology developed by these authors identifies defenders, prospectors, analyzers, and reactors as the basic strategic orientation of organizations. Each orientation differs with respect to risk disposition, innovativeness, and operational efficiencies.

- **Defenders** deliberately enact and maintain an environment in which a stable form of organization is appropriate. They attempt to ‘seal off’ a narrowly defined market segment and ignore developments and trends outside their domain. Defenders also invest a great deal of corporate resources in efficiently producing products/services. Levels of ‘organizational slack’ are low in keeping with desired managerial control over corporate operations. Thus, cost efficiencies, tight resource control as well as risk-averse development and operational policies characterize these competitors.

- **Prospectors** respond to their competitive environment in a manner almost opposite to that of defenders. Prospectors constantly seek ways to exploit new products and processes. In essence, higher degrees of ‘organizational slack’ are permitted in order to facilitate innovation. The focus of these firms is market effectiveness versus efficiency. Risk-taking behavior, loose resource control, and less focus on cost efficiencies characterize these firms.

- **Analyzers** lie in between the risky nature of prospectors and the conservative nature of defenders. In essence, this strategic form is a hybrid of the prospector and defender types and represents a viable alternative to the two extremes. Analyzers typically minimize risk while maximizing the opportunities for profit.

- **Reactors** exhibit patterns of adaptability that are both inconsistent and unstable.
Thus, these firms exist in a state of almost perpetual uncertainty. Unlike other strategic types, actions are taken in a reactive versus proactive mode. These firms can be thought of as possessing no formalized mechanisms for competitive adaptability.

Clearly, this typology focuses on outcomes rather than the complexities involved in formulating and implementing strategic plans. Nonetheless, the framework provides a convenient mechanism for broadly categorizing strategic thrusts and, more importantly, observing changes in strategic orientation of firms and industries over time. As noted by Hambrick (1983), the framework is parsimonious and appears to account for significant variations across industries. It also allows the strategy construct to be operationalized in other than industry-specific terms. Much literature in the area of strategic management has attempted to uncover differentiating attributes of Miles and Snow's strategic types as well as the impact of environmental factors on the 'appropriateness' of strategic orientation (Snow and Hrebiniak, 1980; Hambrick, 1983; Shortell and Zajac, 1990; Das et al., 1991). A typical view is that particular competitive environments favor certain types of strategies. That is, strategy should favorably align the business with its environment (Porter, 1980). Others, however, have suggested that the various strategic types would perform equally well in any industry, providing that the strategy was well implemented (Snow and Hrebiniak, 1980). Of these views, the former has thus far received the most empirical support (Hambrick, 1983; Shortell and Zajac, 1990).

Although other typologies have been developed and empirically operationalized in an effort to capture the strategy construct (most notably Porter's (1980) generic strategies), the Miles and Snow framework has a number of features which we believe justify its use in relating strategy to patterns of IS management. First, empirical research has shown a general congruence between Miles and Snow's categories and Porter's cost leader and differentiator strategies (Segev, 1989). Although these findings do not suggest that the two typologies are exactly the same, it does suggest that both capture essentially the same fundamental dimensions of strategic behavior. However, unlike Porter's typology, the framework developed by Miles and Snow richly describes underlying attributes of organizational structure and managerial style providing perhaps a more robust insight into strategy and its supporting organizational resources. Secondly, a number of studies conducted within the area of strategic management have rigorously validated the measures associated with the Miles and Snow typology (Hambrick, 1983; Segev, 1989; Shortell and Zajac, 1990). In general, the strategic types have been found valid across three different aspects of strategic behavior: (1) intended versus realized strategy, (2) overall portfolio of products/services offered, and (3) market strategies regarding core business offerings. Additionally, associated measures of these types have exhibited strong properties of reliability and validity (Shortell and Zajac, 1990). Finally, previous studies within IS have successfully employed this typology to explain both patterns in management (Tavakolian, 1989) and use (Das et al., 1991) of IT across organizations. Therefore, in the interest of consistency, and relatedly cumulative research tradition, its use within this context seems appropriate.

**Competitive advantage**

Competitive advantage describes unique characteristics (distinct competencies) which enable the firm to maintain a dominant position within its respective industry. Porter (1980) defines true competitive advantage as meeting three
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conditions—the product or process must: (1) truly alter the industry structure by changing competitive relationships; (2) improve the organization’s position in its existing business through cost reductions or product differentiation; and (3) create new business opportunities that can be extended into new areas.

To be capable of sustained success, any business strategy must be predicated on building and maintaining a competitive advantage (Porter, 1980). To the extent that a firm can capture and maintain the initiative, competitors are forced to respond to the initiator’s moves defensively and to do so under conditions not of their own choosing. As noted by MacMillian (1982) the challenge to top management in capturing and retaining an offensive initiative involves: (1) anticipating what it will take to be an industry leader during the next few rounds of strategic moves; (2) planning a series of moves aimed at throwing competitors off balance, keeping them on the defensive, and giving them little time to launch initiatives of their own; and (3) gaining a shrewd understanding of offensive strategy tactics and what organizational capabilities are needed to carry them out.

A number of tactics can be used by each of Miles and Snow’s strategy types to pro-actively seize competitive advantage. Defenders may resort to price cutting, employing more efficient inbound/outbound logistical systems, making changes in production operations that lower costs, giving more responsive after-sale support to buyers, or developing a lower-cost product design. Prospectors, on the other hand, may pioneer new distribution channels for products, escalate marketing efforts in undeveloped market segments, develop new products/services, or develop product features which substantially change the nature (and market) of existing products. Analyzers may choose a combination of the tactics outlined above. However, they would typically make fewer and slower product/market changes than prospectors and be less committed to stability and efficiency than defenders.

It is important for firms to pursue through such tactics sustained competitive advantage. This refers to the firm’s ability to maintain initial gains in business performance (ie profitability, market share) with respect to competitors. Increasingly, both offensive and defensive tactics used to create or sustain competitive advantage contain some component of information technology as a catalyst. Such instances have created a whole new arena of competition for managers and a new area of inquiry for researchers. Concepts such as ‘technology based strategy’, ‘strategic IT’, and ‘information technology for competitive advantage’ have captured much attention within IS literature and have been a key issue of IS executives for much of the past decade (Niederman et al, 1991). Given the quickening pace of technological development, it is likely that this interest will only increase in the near future.

Strategic uses of information technology

The advancement of communications and computing technologies has heightened the stature of information technologies from an operational resource unrelated to strategic goals to an integral ingredient in strategy formulation and implementation leading to competitive advantage (King, 1978; Parsons, 1983; McFarlan, 1984). Numerous studies have sought to raise managerial awareness regarding the competitive importance of technology and its imperative in the formulation of competitive strategies (Ives and Learmonth, 1984; Porter and Millar, 1985; Wiseman, 1988). Utilizing the ‘five forces’ model of Porter (1980), Parsons (1983) describes the potential competitive influence of advanced IT at the industry, firm, and strategy level.
At the *industry level*, IT may change the very nature of product and service offerings, markets, and/or production economics. A much-cited example of this is McKesson's *Economost* system (Clemons and Row, 1988). This order entry system completely revolutionized the service offerings of drug wholesalers. The ease of electronic ordering and subsequent reporting capabilities of this system were a stark contrast to the industry norm of labor-intensive and inefficient wholesale operations. A subtle but important second-order effect of this technology was market based. That is, previously satisfied retailers quickly demanded from their wholesalers the same services offered by McKesson. Those firms which could deliver survived; those which could not quickly vanished. Other systems cited as having similar industry effects include ATMs (Brady, 1986; Neo, 1988; Clemons, 1990), Air Line Reservation Systems (Doll, 1989) and Point of Sale Systems (Brady, 1986; Neo, 1988).

**Firm level** impacts include the competitive forces of buyers, suppliers, intra-industry rivalry, new entrants, and substitution. An example of IT's impact on these forces is the use of interorganizational systems (IOS) as a means of coordinating activities among members of the firm's value chain (Cash and Konsynski, 1985; Johnston and Vitale, 1988). As noted by Keen (1991), not only must the firm's systems communicate with each other, increasingly they must also be able to communicate with those of suppliers and customers. Thus, strategic partnerships form an important input into the building of the firm's technological platform. A much cited example of this phenomena is American Hospital's (AHS) ASAP (Clemons, 1986; Neo, 1988). With this system, customers can quickly procure products from AHS or other vendors. In addition, AHS is linked to multiple suppliers, thereby guaranteeing ample supply at the best market price. Interestingly, attempts to duplicate this system by competitors with superior technical resources were unsuccessful due to AHS's ability to 'lock in' customers. In this vein, the ability to build vertical and horizontal strategic alliances with IT and erect large barriers to entry can be a competitive bonanza for innovators. For those unable to detect IT-related changes in these competitive forces, the result can be competitive disaster.

The final impact of IT noted by Parsons is on *organizational strategy*. Specifically, IT can impact the ability of the firm to execute a particular generic strategy. The integration of strategic and IT planning facilitates the prioritization and development of systems which will support the strategic objectives of the firm. Related to the impacts discussed above, technological architectures must be fashioned in order to facilitate appropriate response to changes in markets, products, and other modes of competition. Without this integration, strategic alternatives may be limited, rather than enabled by, the firm's collection of IT resources.

Thus far, the majority of evidence supporting the impacts discussed above has been in the form of case studies. Strategic innovators, such as those previously mentioned, are typically studied within the context of initial or short-term competitive impact. An implied conclusion in the vast majority of these studies is that initial gains in competitive performance are sufficient and sustainable enough to justify the sometimes large amounts of corporate resources necessary for planning, developing, and implementing innovative IT. Perhaps deceivingly, these descriptions also suggest that identification of exploitable competitive opportunities, along with enabling technologies, *guarantee* competitive success. Recent research has challenged this notion. In essence, there is a growing realization that competitive gains through strategic uses of IT may be more difficult.
than implied (Vitale, 1986). Additionally, it has been suggested that resource differences between firms may be a determinant in the success and sustainability of IT-based strategy (Clemons and Row, 1991). Such suggestions clearly call for empirical work beyond the frameworks for planning and 'home run' cases which currently dominate the field.

This section has set forth a conceptualization of organizational strategy, competitive advantage, and the strategic use of IT. Both strategic management and IS literature suggest that progressive firms formulate strategic plans based on current and forecasted use of technological resources within their respective industries. In many instances, this strategic use of IT has revolutionized the underlying patterns of business activities within industries. However, given the theorized interdependence of strategy and IT, little research has attempted to measure the actual strategic orientations of these 'much heralded' users. Further, the existence and sustainability of competitive gains have been ignored by case studies which typically focus on broad short-term impacts while ignoring performance evaluation and competitive adjustments. In order to gain a richer understanding of the strategy–IT link and its potential for creating competitive advantage, the constructs of 'strategy', 'sustainability', and 'performance' must be operationalized and studied within the context of strategic IT use. Only then can theory evolve from its current state of ungeneralizable descriptions to causal models reflecting both organizational and industry-related contingencies regarding the use and success of strategic IT.

Research questions

Based on our prior discussion of organizational strategy, competitive advantage, and strategic uses of IT, we formulate two basic research questions:

- Are there differences in strategy (strategic orientation) among organizations which utilize IT as a strategic resource and is this use of technology consistent with prevailing strategic direction?
- Are there performance (competitive advantage) differences among resulting strategic orientations and are they sustainable?

Utilizing the typology of Miles and Snow (1978) along with associated operationalizations developed in the strategic management literature (Hambrick, 1980, 1983; Cool and Schendel, 1987; Segev, 1989), this study seeks to address these questions. As noted earlier, IS literature abounds with case descriptions of strategic IT users. In addition, much literature in the area of strategic management and organizational economics has been devoted to operationalizing the construct of strategy. Therefore, it seems appropriate that these lines of research be merged in order to determine the nature of IT based strategy, its change over time, and differences in performance between strategic orientations.

Methodology

In order to adequately address the research questions posed by this investigation, three broad methodological issues must be considered: (1) selection of firms which utilize IT as an integral component of their competitive strategy; (2) development of a well-grounded procedure for operationalizing strategy; and (3) development of a procedure to measure initial and longitudinal performance which, at least in part,
may be attributable to the implementation of an IT-based competitive strategy. Each of these considerations is detailed in subsequent sections.

Sample selection — the strategic IS cases

'Strategic IS cases' form the sample population for this study. A literature review of relevant IS research and 'trade press' was undertaken to locate these cases. As a starting point, a 1986 *Information Week* article (Brady, 1986) which asked a panel of 11 IS experts (Emery, Ives, Johnson, King, McFarlan, McLean, Millar, Scott-Morton, Thompson, Wetherbe, Wiseman) to select the top strategic IS systems, was used to develop an initial sample set. Many of these cases were included by Neo (1988) in a content analysis of 14 strategic IS cases. Next, popularized cases were identified based on a review of additional published materials, including: MISQ; *Communications of the ACM*; ICIS Proceedings; *Information & Management*; *JMIS*; *Harvard Business Review*; Planning Review; *Harvard Business School Cases*; Computerworld; CIO; *Information Week*; and popular IS textbooks. On the basis of this search, 60 well-documented cases were identified as strategic applications of IS (see Appendix A). These information systems range across several industries and represent both process and product oriented systems.

Content analysis was used to determine the launch dates of each of the 60 identified strategic systems. This technique has gained increasing importance in IS research and provides an objective method in determining the content of written documentation (Neo, 1988; Jarvenpaa and Ives, 1990). Launch dates were designated as the date on which the IT or IS was generally available (in the case of a product technology), or widely in use (in the case of a process technology). The initial process of launch date determination involved copying 25 years of annual bibliographic references from the Funk and Scott listing of corporate events. This time period was chosen because it was believed that none of the 60 cases was launched prior to 1966. This search resulted in excess of 1000 pages of bibliographical citations. These references were read and all titles of the reference that related to IS or IT were highlighted.

A second researcher reviewed these citations and determined whether the phrase was relevant enough to warrant referring to the actual magazine and journal article cited in the bibliographical reference. A file for each case was established. In some cases the Funk and Scott reference specifically announced the launch of a system. In other cases it was necessary to review the referenced article to determine the date. In several cases it was necessary to telephone company representatives to determine the appropriate date. In eight cases it was impossible to determine the launch dates from any source; these cases were eliminated from the sample.

Next, the authors reviewed the directory of the COMPUSTAT II financial data set of industrial firms. COMPUSTAT II was selected because of its widespread use in finance, strategy, and accounting literature. Based on this review, an additional 17 firms were dropped from the sample because all or some of the years of annual financial data were missing. Reasons for missing or incomplete data included: acquisitions or mergers, existence of subsidiaries in which a clear stream of financial data could not be determined, and/or inconsistencies in financial reporting. Based on this review, 35 firms with launch dates and complete COMPUSTAT II data sets remained for further analysis.

Industry data was then gathered via the COMPUSTAT II financial database. COMPUSTAT aggregates firms within industries based on Standard Industrial Classification (SIC) code. SIC is the US governmental standard for classification of
firms based on the primary product(s) and/or service(s) produced. Determination of these product(s)/service(s) is made from the firm's mission statement of the 10K report filed annually with the US Securities and Exchange Commission (SEC). In addition to mission statement, the SEC requires all firms to list major competitors. These listings are used in conjunction with product/service descriptions in determination of SIC groupings. Defined in terms of the SIC scheme, the 'industry' is generally the accepted unit of analysis in industrial organization economics and strategic management (Bain, 1956; Montgomery, 1975; Scherer, 1980; Palipu, 1986; Fiegenbaum et al, 1990). For each firm the authors carefully checked the face validity of other firms classified within the same SIC. Inconsistencies, possible mis-classification, or potential cross-clarification resulted in the removal of five additional firms from the sample. The remaining sample tended to have a strong banking representation and lacked non-US firms. However, other attributes such as size, scope, and diversity of industry tended to be fairly consistent across the selected and non-selected samples.

Strategy operationalization

Much industrial organization and strategic management literature has been devoted to identifying generic business strategies or strategy types based on 'strategic indicators' such as the scope or domain of the business; resource deployment in marketing, production, and research and development (R&D); asset management; and production efficiencies (Snow and Hrebiniak, 1980; Hambrick, 1983; Cool and Schendel, 1987; Douglas and Rhee, 1989; Tavakolian, 1989; Fiegenbaum et al, 1990; Das et al, 1991). Typically, these constructs are operationalized through either secondary 'accounting' data such as total sales, total assets, R&D expenditures, and marketing expenditures etc or primary data such as survey or interview. Subsequently, multivariate grouping techniques such as factor or cluster analysis are employed to identify sets of homogenous firms (sometimes referred to as strategic groups). The intent of these studies has been to examine the link between strategy, environment, and performance in order to determine appropriate investment strategy and/or future business direction. As noted by Douglas and Rhee (1989), a number of typologies of business and competitive strategies have been identified, some based on a priori conceptual frameworks, others on empirical studies. In addition, the number and precise nature of strategy types may vary depending upon the specific variables included and methodology employed.

Variable selection. Consistent with, and utilizing studies which formally model aspects of organizational strategy, this study operationalizes strategic orientation within the context of Miles and Snow's typology. As discussed earlier, this typology identifies four strategic types based on degree of innovation in product or market development. Further, three of these strategies (prospector, analyzer, defender) can be pursued with equal success within any industry, regardless of the market environment. Much empirical research has operationalized and investigated the functional attributes or policies that characterize these viable strategy types (Snow and Hrebinia, 1980; Hambrick, 1983; Cool and Schendel, 1987; Douglas and Rhee, 1989; Tavakolian, 1989; Fiegenbaum et al, 1990; Das et al, 1991). In addition, their effectiveness and performance under different environmental conditions such as stage of product life cycle, high vs low growth markets, and industry innovativeness have been examined using cross-sectional and longitudinal data. In general, these studies conclude that firms classified as either analyzers,
defenders or prospectors differ with respect to functional attributes such as research and development (R&D) and marketing expenditures. Specifically, self-reported prospectors seem to exhibit higher expenditures in ‘innovativeness’ measures such as R&D and marketing, while defenders exhibit higher financial concentration and higher ‘efficiency’ measures along variables such as capital intensity, employee productivity, and cost of production. Further, differences have been found to exist in the effectiveness of the various strategies depending on environmental context (Hambrick, 1983; Shortell and Zajac, 1990).

In contrast to the three viable strategic types, reactors typically have no formal strategic orientation. In essence, these organizations exist in a state of perpetual uncertainty and therefore are likely to succumb to the competitive pressures of their particular industry (Miles and Snow, 1978). Given the profile of the final sample (see Appendix A) in terms of size, management structure and history, it seems certain that none of these organizations would exhibit traits associated with the reactor strategy. Additionally, because most studies within strategic management also focus on established entities, attributes of this orientation have thus far not been thoroughly investigated or operationalized within this stream of research (Shortell and Zajac, 1990). Given these considerations and past practices in similar studies, the reactor strategy is not considered within this analysis.

Consistent with past studies, the dimensions of competitive scope, risk disposition, innovativeness and operational efficiency are operationalized in order to capture the differentiating characteristics of defenders, prospectors and analyzers. Table 1 outlines these ‘strategic dimensions’; their associated operationalizations; and the characteristics of analyzers, prospectors and defenders.

**Scope** variables including assets, sales and inventory are utilized as measures of firm size. Segmentation along this dimension provides an initial indication of strategic orientation based on market strength and breadth of asset base. Studies conducted on both intra-industry (Cool and Schendel, 1987; Segev, 1989) and inter-industry firms (Douglas and Rhee, 1989) utilize similar or exact operationalizations as those listed in Table 1.

**Risk disposition**
- Current ratio: Low .................. High
- Quick ratio: Low .................. High
- Times interest earned: Low .................. High
- Equity to debt: Low .................. High

**Innovativeness**
- R&D intensity: High .................. Low
- Marketing intensity: High .................. Low
- Slack resources: High .................. Low
- Sales over total assets: High .................. Low

**Operational efficiency**
- Cost efficiency: Low .................. High
- Employee efficiency: Low .................. High

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<th>Variable</th>
<th>Measurement</th>
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<th>Analyzer</th>
<th>Defender</th>
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<td>Quick ratio</td>
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<td>Times interest earned</td>
<td>Operating income over interest expense</td>
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<td>Equity to debt</td>
<td>Owner’s equity over long-term debt</td>
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<td>Marketing intensity</td>
<td>Marketing expense over sales</td>
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<td>Sales over total assets</td>
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<td>Cost efficiency</td>
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expectation that size is unique to a particular strategic orientation (i.e., prospectors, analyzers, and defenders, may be small or large), the use of this variable in numerous studies of this nature along with its ability to discern differences in organizational resources which may be influential in the success of IT-based strategy (Clemons and Row, 1991) necessitate its inclusion.

Risk disposition is concerned with management's willingness to utilize financial or operating leverage in pursuit of competitive goals. Similar to studies by Fiegenbaum et al. (1990), Cool and Schendel (1987), Dess and Davis (1984), as well as Miller and Bromiley (1990), multiple ratios are utilized to operationalize this construct. As argued by these authors, these operationalizations yield insight into management's complexion concerning risk taking, not only in terms of utilizing financial leverage but also in terms of investing in riskier business ventures. Within the context of Miles and Snow's typology, prospectors would be classified as 'risk takers', thus these firms would be expected to exhibit smaller ratios than either defenders or analyzers. In contrast, the highest measures should be associated with 'risk averse' defenders. Intuitively, analyzers should fall near the middle of these extremes.

Prospectors constantly search for ways to expand current products and markets through innovation. Conversely, defenders serve a very well defined niche with very little emphasis on innovation. As a strategic construct, innovativeness has most often been operationalized using marketing and R&D expenditures over sales (Snow and Hrebiniak, 1980; Hambrick, 1983; Cool and Schendel, 1987; Das et al., 1991). Clearly, more innovative firms would be expected to exhibit higher levels of these measures. Recent work by Chakravarthy (1986) suggests that the ability of firms to generate organizational slack may also be an important indicator of innovativeness. In essence, levels of organizational slack refer to the firm's 'internal capital' or the ability to generate cash flow for purposes of reinvestment. Consistent with the recommendations of Chakravarthy (1986), multiple measures are used as proxies of available organizational slack.

Operational efficiency is concerned with managerial control over operations and assets. As noted earlier, defenders are much more attuned to operational efficiency than either prospectors or analyzers. Thus, these firms should exhibit higher measures of cost efficiency and employee efficiency. Again, previous literature in the area of strategic management provide the foundation for these operationalizations (Snow and Hrebiniak, 1980; Hambrick, 1983; Cool and Schendel, 1987; Das et al., 1991).

Determination of group membership. Within most research of this nature, hierarchical cluster analysis is typically employed to determine the presence of similar groups along variables of interest (Harrigan, 1983, 1985; Cool and Schendel, 1987; Douglas and Rhee, 1989; Fiegenbaum et al., 1990). Although several clustering algorithms exist, Ward's minimum variance criterion was chosen for this analysis based on past practice (Harrigan, 1985) and its accuracy in identifying clusters in several simulation studies (Punj and Stewart, 1983). The clustering criteria of this technique is minimization of total within-group sums of squares. In other words, objects (in the present case firms) are assigned to clusters (or groups) based on how similar they are to existing members along the variables of interest. As the clustering algorithm progresses, it eventually joins all objects into a single cluster. Hence, cluster solutions range from a single cluster containing all firms to n clusters each containing a single firm. In determining the appropriate cluster solution, the statistic pseudo $F$ is used. This statistic is defined as the mean
square between groups divided by the mean square within groups. Various clustering solutions are plotted against pseudo F. 'Jumps' or 'elbows' in the plot are then used to identify the appropriate number of clusters to retain. Examination of other statistical criterion, namely root mean square and semipartial $R^2$ square, are often used to confirm visual conclusions.

Once clusters of firms have been identified, multivariate analysis of variance (MANOVA) techniques can be employed to explore the existence of performance differences. Measures such as return on assets (ROA), return on sales (ROS), return on equity (ROE), and market share are typically tested across the emergent clusters for overall effects. Univariate statistical techniques are then employed to determine specific group differences (Harrigan, 1985; Cool and Schendel, 1987; Fiegenbaum et al., 1990). Although several benchmarks for organizational performance exist, analysis of similar studies suggests the use of profitability measures. This is also consistent with research conducted by Woo and Williard (1983) of performance criteria used in strategic management. Through factor analysis, these authors uncovered four orthogonal factors identified as profitability, relative market position, change in profitability and cash flow. Of these factors, profitability demonstrated the highest factor magnitude. Chakravarthy (1986) also notes the value of profitability measures as performance criteria in distinguishing outstanding firms. Consistent with past studies and the suggestions of these observers, multiple profitability measures are employed in this study. Specifically, ROA, ROS and ROE will be used as measures of organizational performance.

**Strategic and performance measurement by stages**

Changes in organizational performance and/or strategic orientation can be attributable to a multitude of controllable organizational variables as well as uncontrollable environmental variables. However, as noted by several IS researchers (McFarlan, 1984; Vitale, 1986; Clemons and Row, 1991), IT utilized as a strategic resource involves enormous outlays of both financial and human resources. These systems tend to be broad-based in their organizational and/or market impact and therefore should have a direct influence on the firm's financial measures (Clemons, 1986; Clemons and Row, 1991). Thus, it seems plausible that measurement of strategic variables before and after implementation of such systems can yield insight into the contribution of these systems in maintaining or changing the firm's strategic orientation. In essence, the time order of events provides the means to infer some degree of causality between implementation of strategic IT and changes in strategic orientation and performance. Therefore, for each firm, measures of organizational strategy and performance are formulated in three stages:

* **Stage 1 (pre-launch):** The five-year period before system launch.
* **Stage 2 (post-launch 1):** The period from system launch to five years post-system launch.
* **Stage 3 (post-launch 2):** The period from five years post-system launch to 10 years post-system launch.

Utilizing objective variable proxies and multivariate clustering techniques previously discussed, strategic orientation will be operationalized for the set of sample firms in each of these time periods. Also, measures of financial performance are compared between emergent groups in each time period in order to determine if any particular strategic orientation consistently outperforms the others. To
reduce the impact of environmental and inter-industry influence, all data used in this analysis is standardized.* Capturing variables in standardized form helps eliminate differences in magnitude and variation which are likely to be observed in cross-industrial analysis (Douglas and Rhee, 1989). In essence, each observation will contain information about that particular firm’s position relative to the industry average across the variables of interest. Such information can be meaningfully compared with other firms within differing industries. Year-to-year fluctuations are controlled by averaging data across each five-year period. Doing so helps offset the effects of accounting changes and environmental impacts which are temporary, yet may confound conclusions regarding overall patterns in corporate resource allocation and profitability (Hambrick et al., 1982).

The use of these techniques is consistent with other studies performed within and between industry boundaries (Harrigan, 1985; Cool and Schendel, 1987; Hambrick et al., 1989; Segev, 1989; Fiegenbaum et al., 1990). However, research designs of this type are complex and a great deal of care must be taken in eliminating confounding influences. In Appendix B we include a table outlining the methodological issues and associated control measures pertinent to this particular study.

Results

Nature and change in strategic orientation

Within each stage examined, a four cluster solution was manifested by the strategic variables. In each of these periods large ‘elbows’ in the plots of pseudo $F$ were observed suggesting a well-defined structure of organizational strategies among the sample firms. In each of the time periods (S1, S2 and S3) and for each strategic variable, the standardized scores of firms comprising each cluster were averaged. These mean values can be interpreted as the average distance in standard deviations the firms in each respective cluster lie away from their industry averages. For example, if a cluster’s mean score on the measure ‘assets’ is 2.00, then on average the firms within this cluster lie two standard deviations above the overall average for their respective industries (implying significantly large firms). Table 2 summarizes the mean scores and sizes of each cluster across the three time periods examined. Utilizing these measures, strategic orientations were labeled as: large scale analyzers, moderate scale prospectors, large–moderate defenders and large scale prospectors.

Interestingly, in all time periods each of the three strategic orientations seems present among this sample of strategic IS users. Additionally, each identified cluster seems to consist of firms that are of moderate to large scale. Differences among these emergent clusters, however, are readily evident along the dimensions of risk disposition, innovativeness and operational efficiency. As shown in the columns of Table 2, both large and moderate scale prospectors exhibit standardized scores which are indicative of riskier operating practices. Unlike the ‘risk averse defenders’ and ‘middle ground analyzers’, the firms of these clusters utilize greater amounts of financial leverage in their approach to competitive practice. Thus, it can

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* Standardized data are obtained by dividing mean corrected data by the respective deviation $(x - \mu)/\sigma$. The mean of a standardized variable is zero with variance equal to one. Hence these Z-scores indicate how far above or below the mean (in terms of standard deviations) a particular observation falls. Such measures are useful in the present research context as they eliminate differences in scale across industries.
Table 2  Mean scores of emergent strategic orientations

<table>
<thead>
<tr>
<th>Strategic variables</th>
<th>Large scale prospectors</th>
<th>Moderate scale prospectors</th>
<th>Large scale analyzers</th>
<th>Large-Moderate defenders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S1 n=4</td>
<td>S2 n=9</td>
<td>S3 n=13</td>
<td>S1 n=4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S2 n=4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S3 n=5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S1 n=9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S2 n=12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S3 n=12</td>
</tr>
<tr>
<td>Scope</td>
<td>2.50 2.54 2.61</td>
<td>1.06 0.98 1.14</td>
<td>2.20 2.25 2.14</td>
<td>1.70 1.67 1.56</td>
</tr>
<tr>
<td>Assets</td>
<td>2.34 2.40 2.43</td>
<td>0.97 1.10 1.04</td>
<td>2.12 2.15 2.11</td>
<td>1.13 1.21 1.25</td>
</tr>
<tr>
<td>Sales</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk disposition</td>
<td>-0.45 -0.33 -0.38 -0.79</td>
<td>-0.66 -0.79 -0.68</td>
<td>0.11 0.08 0.10</td>
<td>1.61 1.53 1.73</td>
</tr>
<tr>
<td>Current ratio</td>
<td>-0.44 -0.33 -0.35 -0.66</td>
<td>-0.66 -0.58 -0.55</td>
<td>0.08 0.14 0.11</td>
<td>1.40 1.42 1.35</td>
</tr>
<tr>
<td>Quick ratio</td>
<td>-0.23 -0.35 -0.38 -0.74</td>
<td>-0.80 -0.74 -0.78</td>
<td>0.01 0.09 0.03</td>
<td>1.53 1.55 1.54</td>
</tr>
<tr>
<td>Times interest earned</td>
<td>-0.28 -0.35 -0.33 -0.26</td>
<td>-0.23 -0.26 -0.28</td>
<td>-0.22 -0.26 -0.27</td>
<td>0.62 0.77 0.83</td>
</tr>
<tr>
<td>Equity to debt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovativeness</td>
<td>1.56 1.63 1.61</td>
<td>1.36 1.24 1.40</td>
<td>0.05 0.10 0.04</td>
<td>-0.98 -0.80 -0.86</td>
</tr>
<tr>
<td>R&amp;D/total sales</td>
<td>1.28 1.33 1.41</td>
<td>1.44 1.32 1.38</td>
<td>0.03 0.05 0.06</td>
<td>0.60 0.53 0.58</td>
</tr>
<tr>
<td>Marketing/total sales</td>
<td>0.75 0.78 1.10</td>
<td>1.02 1.11 1.06</td>
<td>0.78 0.67 0.66</td>
<td>1.11 1.09 1.01</td>
</tr>
<tr>
<td>Cashflow/investment</td>
<td>0.93 0.94 0.93</td>
<td>1.12 1.17 0.91</td>
<td>0.96 0.95 0.98</td>
<td>0.66 0.72 0.80</td>
</tr>
<tr>
<td>Sales/total assets</td>
<td>0.71 0.81 0.80</td>
<td>0.95 0.99 0.97</td>
<td>0.29 0.33 0.33</td>
<td>0.56 0.44 0.43</td>
</tr>
<tr>
<td>Sales/work capital</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational efficiency</td>
<td>-0.51 -0.42 -0.44 -0.71</td>
<td>-0.71 -0.10 -0.55</td>
<td>0.15 0.09 0.10</td>
<td>1.65 1.71 1.69</td>
</tr>
<tr>
<td>Sales/COGS</td>
<td>-0.95 -0.91 -0.82 -0.85</td>
<td>-0.85 -0.41 -0.57</td>
<td>0.22 0.18 0.13</td>
<td>1.55 1.53 1.44</td>
</tr>
<tr>
<td>Sales/employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All figures are standardized based on respective industry (SIC) data.
S1: Stage 1 — five-year period prior to system implementation.
S2: Stage 2 — five-year period after system implementation.
S3: Stage 3 — five-year to ten-year period after system implementation.

be inferred that these firms also exhibit higher thresholds for riskier competitive investment. The identified prospectors also exhibit greater levels of innovativeness. Higher levels of R&D and marketing expenditures, coupled with the availability of slack resources, suggest a greater willingness and ability by these firms to innovate within their competitive environments. Conversely, the observed clusters of defenders and analyzers exhibit a lower tendency to innovate, particularly as indicated by marketing and R&D intensity. Defenders do, however, exhibit significantly greater levels of operational efficiency compared with prospectors or analyzers. As shown in Table 2, measures of cost and employee efficiency underscore the cost focus of firms within this strategic group.

Upon further analysis of emergent clusters over the three periods, it was discovered that their membership was not consistent. That is, a significant number of firms had shifted group membership over these time periods, suggesting a fundamental change in strategic direction. Figure 1 illustrates the initial and final membership of sample firms among the identified strategic orientations. Over the stages examined, a single shift in membership occurred between Stages 1 and 2. Interestingly, no change in strategic orientation was observed between Stages 2 and 3. As illustrated in Figure 1, firms lying within the intersection of the respective strategic orientations shifted membership in the direction indicated by the arrow.

Eight firms which were clustered in Stage 1 as moderate-scale prospectors (Mellon, Banc One, Digital Equipment, Bergen, Federal Express, Baxter, Corestates, First Chicago) shifted strategic orientation in Stage 2 to defender. In addition, five firms classified in Stage 1 as defenders (CIGNA, Dow Jones, Nucor, McKesson, Air Products) shifted in Stage 2 to prospector. Interestingly, the cluster
of analyzers remained stable across the entire period examined. In all, 17 firms (57 per cent) remained stable in terms of group membership across the three stages.

**Performance differences among strategic orientations**

Given the identification of strategic orientations across the stages of systems life, assessment of performance differences between these emergent orientations was undertaken for insight into those strategies which may be more leverageable through IT. As noted earlier, the profitability measures ROA, ROS and ROE are used as indicators of performance differences between observed strategies. Like the data used to operationalize strategic orientation, these variables are standardized to eliminate scale and variation differences between industries. Given the potential correlation among these measures, a multivariate analysis of variance (MANOVA) is employed to determine overall effects. If an effect is detected, then univariate tests are utilized to determine the nature of pairwise differences.

Table 3 contains the results of the MANOVA formulated during Stage 1. As shown, no overall effect is detected among emergent strategic orientations. Thus, group membership was not useful in explaining patterns of performance among the

<table>
<thead>
<tr>
<th>MANOVA Profitability measures</th>
<th>F</th>
<th>p &gt; F</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on assets (ROA)</td>
<td>2.16</td>
<td>0.0621</td>
<td>No significant overall effect</td>
</tr>
<tr>
<td>Return on sales (ROS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return on equity (ROE)</td>
<td></td>
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</table>

Journal of Strategic Information Systems 1994 Volume 3 Number 4
two groups of prospectors and remaining groups of defenders and analyzers before the launch of their strategic IT initiatives.

Stage 2 is measured from time of systems launch through the ensuing five years. As noted earlier, a total of 13 firms (43 per cent) shifted strategic orientation between Stages 1 and 2. Table 4 reveals the results of MANOVA tests formulated during this second time period. As shown, a significant overall effect is observed. Thus, these strategic orientations are different among at least one of the performance measures tested. Utilizing Scheffe's multiple comparison test, both ROA and ROS were found to be significantly higher for large scale prospectors vs large scale analyzers. In addition, large-moderate scale defenders demonstrated significantly higher ROA and ROS measures than large-scale analyzers. These findings seem to suggest the existence of an 'initial impact' of system implementation. That is, the two extremes of the strategic continuum (defender and prospector) seem to be more initially leverageable than the 'compromise' or middle-of-the-road strategic orientation associated with analyzers.

Analyzing performance differences from five to 10 years beyond systems implementation (Stage 3) yields insight into the sustainability of the differences in performance uncovered in Stage 2. That is: Arc the prospector and defender strategies more leverageable in the long run? In addition, the delayed emergence of a leverageable strategic orientation can be detected. The findings of Table 5 seem to indicate that in the long run no strategic orientation differentiates itself in terms of the performance criteria tested. Specifically, no difference in performance measures among strategic orientations was detected.

Discussion

In general, the preceding analysis has revealed three important findings. First, it appears that strategic users of IT are not concentrated along a singular strategic dimension. The firms examined in this study exhibited characteristics associated with each of the three strategic orientations of Miles and Snow. Secondly, it seems that many of the firms shifted strategic orientation after the launch of their systems. Interestingly, these shifts were from one extreme of Miles and Snow's typology to the other (ie prospector to defender or defender to prospector). Finally, it seems that prospectors and defenders, as opposed to analyzers, were more initially successful in terms of the performance criteria tested. However, neither of these orientations were found to be significantly better in the long run (five to 10 years after systems launch). In the sections that follow we more fully develop the

<table>
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<tr>
<th>MANOVA</th>
<th>Profitability measures</th>
<th>F</th>
<th>p &gt; F</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Return on assets (ROA)</td>
<td></td>
<td></td>
<td>Significant overall effect</td>
</tr>
<tr>
<td></td>
<td>Return on sales (ROS)</td>
<td>4.0</td>
<td>0.0024</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Return on equity (ROE)</td>
<td></td>
<td></td>
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</tbody>
</table>

Univariate analysis

Scheffe's Multiple Comparison Test (p < 0.05, Df = 26)

ROS, ROA for large-scale prospectors significantly higher than large-scale analyzers
ROS, ROA for large-scale defenders significantly higher than large-scale analyzers
Table 5 Comparison of financial performance between strategic orientations: Stage 3 (5–10 year post-launch period)

<table>
<thead>
<tr>
<th>MANOVA profitability measures</th>
<th>F</th>
<th>p &gt; F</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on assets (ROA)</td>
<td>1.75</td>
<td>0.1294</td>
<td>No significant overall effect</td>
</tr>
<tr>
<td>Return on sales (ROS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return on equity (ROE)</td>
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</table>

practitioner and research implications of these findings. We will also seek to uncover qualitative evidence which might lend support and further insight into the patterns uncovered through the statistical methodology.

**Strategic orientation**

The fact that each of Miles and Snow’s generic strategy types was well represented by the sample firms seems somewhat contrary to earlier thinking which suggests that only innovative, riskier management styles and strategic orientations are necessary to exploit advanced IT (MacMillian, 1982; Wiseman and MacMillian, 1984). However, consistent with early and current thinking (Clemons and Row, 1991), all firms exhibited large degrees of scale relative to their competitors. This may suggest that size is an important prerequisite for the large amounts of financial and human resources necessary to formulate and implement IT-based strategy. In essence, scope may lessen the competitive risk of developing these strategic technologies. However, because of the breadth of resources and market activity associated with size, it may also be inversely proportional to the impact of the system on profitability. Importantly, it should be remembered that the sample drawn was not random and consisted of well known systems; therefore, a bias may exist towards larger firms. However, the magnitude of the scope variables seems to suggest that market breadth and asset base may be important foundation factors in implementing IT-based strategy.

Notwithstanding the scale characteristics of this sample, managers should view this set of findings with some degree of optimism. It is interesting that many of these strategic users (analyzers and defenders) generate and invest only moderate amounts of capital for the purpose of research and development. These same firms are also rather conservative in their approach to financing the operations of the firm. Thus, it would seem that IT-based strategy is not restricted to pioneering firms with huge R&D budgets and risk-taking managerial practices. Perhaps a more realistic view of this phenomenon is that strategic opportunities to employ IT can be found through internal analysis of operations and enhancement of pre-existing systems. Such an analysis is typically inexpensive and risk-free in comparison with developing and implementing completely new technologies and, as this analysis seems to suggest, may be just as effective as more innovative courses of action.

**Shifts in strategic orientation**

A second finding of this study concerns the shift in strategic orientation by firms from Stage 1 to Stage 2. Here, our results imply that IT may have facilitated the adoption of a different strategic orientation for some firms. Interestingly, these shifts were from one extreme of Miles and Snow’s typology to the other. A rather large number of prospectors shifted to defenders, while a lesser number of defenders shifted to prospectors. From Stage 2 to Stage 3, no shift in strategic orientation was detected. To further explore the nature of these strategic shifts and
the role of IT in supporting strategic direction, annual reports of ‘transition firms’ (those firms which changed strategic orientation during Stages 1 and 2) were analyzed. In these reports, we specifically sought direct references regarding the system, firm strategy, and competitive or technological imperatives for changing strategy.

Defenders to prospectors. Of the transition firms which shifted from defender to prospector, the annual reports of Nucor Steel, American Air Products, and McKesson provide the most interesting commentary on changing strategic priorities and the role of IT in implementing the needed change. In each of these instances, a fundamental shift from ‘defender’ tactics of cutting costs and improving productivity to ‘prospector’ tactics of developing value added services and new markets is evident. As noted in these narratives, IT seems to be a substantial factor in enabling this strategic change.

**McKesson — System Launch 1975**

*(5 years post-system launch — 1979–80)*

**Internal efficiencies . . . (Defender Tactic)**

‘Our internal organizations have been designed to minimize distribution costs to the greatest extent the company can achieve.’ ‘Productivity gains as a result of order entry technologies have been enormous. The number of warehouses have been cut in half. Inventory turns seven times a year, so fast that it is generally owned less than two weeks after payment is made to the manufacturer.’ (McKesson 1979, 1980 Annual Reports)

*(6–7 years post-system launch — 1981–82)*

**Specialized needs of market niches . . . (Prospector Tactic)**

‘Although the order entry system is the most visible of McKesson’s offerings, several other “value added” systems are available for retail pharmacies, many provided on an à la carte basis, with additional services supplied for additional fees.’ ‘McKesson also offers services targeted toward the specialized needs of different market segments.’

‘Value added services are now a profit center. With current pressures on distribution firms, more and more of the profit for these entities must come from value added services.’ (McKesson 1981, 1982 Annual Reports)

**Air Products and Chemicals — System Launch 1981**

*(System launch)*

**Proven capabilities for future growth . . . (Defender Tactic)**

‘Engineering skill, innovative technology and marketing concepts, reliable products and processes, and the ability of management at all levels to perform well, have enabled Air Products to maintain a leadership position in most of its business throughout the world. Our computerized system for directing outbound logistics has enabled us to significantly lower our operating costs. These capabilities will be even more important to the company in the future as we seek new avenues of growth.’ (Air Products and Chemicals 1981 Annual Report)

*(2 years post-launch)*

**Creating market opportunities . . . (Prospector Tactic)**

‘Even in today’s recessionary environment there are opportunities for developing new businesses. By being alert to these opportunities and responsive to customer needs, the company has built a customer base that bridges a changing world.’ ‘To further probe the future, Air Products has established a technical diversification department. It is charged with seeking out and developing to the point of profitability new
technology-based businesses for the company. These new businesses are being carefully selected to take advantage of the company's unique strengths while meeting emerging societal needs.' (Air Products and Chemicals 1982 Annual Report)

(2 years post-launch)

Keeping costs competitive but looking for opportunities . . . (Prospector Tactic)

'Controlling costs and improving productivity are corporate imperatives in the current environment of slower growth and increased competition. These are not new objectives for Air Products. The company has a history of being a low-cost producer of industrial gases and chemicals. Staying ahead of competition today and tomorrow, however, requires new techniques and tools.' (Air Products and Chemicals 1982 Annual Report)

Nucor Steel — System Launch 1982
(System launch 1982)

Focus on productivity . . . (Defender Tactic)

'The major strength of the company is in constructing plants economically and operating them efficiently. These mills utilize modern steelmaking techniques and produce steel at a cost competitive with steel manufactured anywhere in the world. We believe we are one of the nation's lowest cost steel producers. For a number of years our prices for our steel products have been equal to or lower than foreign steel prices.' (Nucor 1982 Annual Report)

(2 years post-system launch 1984)

New products and processes . . . (Prospector Tactic)

'We are continuing to modernize our facilities and expand our businesses.' . . . we are particularly interested in new processes and new techniques in steelmaking.' 'In recent years, Nucor Steel's product line has been broadened to include a wider range of steel products.' (Nucor 1984 Annual Report)

Prospectors to defenders. Of the transition firms which switched from prospector to defender, the most clear qualitative evidence of technology-related strategic change was found in the annual reports of Bergen Brunswig, Federal Express, and First Chicago. As noted in the excerpts of these reports, IT seems to be aiding these firms in implementing tactics of cost cutting, productivity enhancement, and market focusing which are typically associated with defenders. Interestingly, these reports, similar to those presented earlier, seem to suggest that adoption of such practices is a fundamental departure from past operating philosophies.

Federal Express — System Launch 1980
(System launch)

Pioneering new products and processes . . . (Prospector Tactic)

'Implementation of COSMOS (Customer Oriented Service and Management Operating Systems) is an example of the advances which gave Federal Express the capacity to deliver a better “product” to the customer with a growing return to the company.' 'In its day-to-day operations, the underlying concept of Federal Express is growth-oriented and continually evolving . . . ' 'Even though the broad market for express package service has shown a healthy growth, Federal Express and its market have been growing much more rapidly. This growth has not been achieved by increasing market share at the expense of competitors, but from the creation and development of a market that is itself an integral part of the growth and development of contemporary post-industrial society.’ (Federal Express 1980 Annual Report)
(2–3 years post-launch)

**Improving productivity . . . reducing costs . . . (Defender Tactic)**

'In several major areas we finalized investments in expanded capacity and more productive systems for the future. Even so, our profitability was outstanding due to our continuous emphasis on productivity.' 'Federal Express management is dedicated to improving productivity and reducing costs.' 'Recurring themes throughout the company's internal activities are enhanced productivity, maximum utilization of resources, flexibility in dealing with change, and constant emphasis on planning.' (Federal Express 1981, 1982 Annual Reports)

**Bergen — System Launch 1972**

(6 years post-launch)

**Productivity reaches new high . . . (Defender Tactic)**

'Another factor contributing to our greatly improved earnings has been our progress in increasing productivity.' 'This further improvement was made possible by the increasing acceptance by our customers of our ULTRAPHASE order-entry and management system. In August 1977, 70 per cent of our drug wholesaling volume was received from customers on one or more of our order entry systems. In August 1978, this figure increased to 82 per cent. Increased use of order entry by our customers plus management and employee effectiveness in improving productivity have been key elements in our successful pursuit of productivity and increased earnings.' (Bergen 1978 Annual Report)

(6 years post-launch)

**Focus on key markets . . . (Defender Tactic)**

'While capitalizing on order-entry technology to increase volume, we also have used strategic planning to change our mix by concentrating on more profitable customers, operating units, and products. In doing so we discontinued service to unprofitable customers — reducing our drug wholesaling list to some 4,400 accounts from almost 8,000 about five years ago.' 'Management of Bergen Brunswig Corporation has determined to place total emphasis on the area we know and do best: Domestic Health Products Distribution.' 'By concentrating its marketing thrust on chains and large independents, Bergen Brunswig sales to these customers in 1978 rose 28 per cent over 1977.' 'A major factor in that growth has been our success beginning in 1977 in getting new and existing large customers to adopt our advanced ULTRAPHASE order-entry and management system.' (Bergen 1978 Annual Report)

(6 years post-launch)

**Technology investment for controlling costs . . . (Defender Tactic)**

'Order entry has helped control operating expenses. We are committed to electronic data processing and have made higher than industry average investments in this area to obtain technological superiority. Notwithstanding the required expenditures we have achieved significant reductions in operating expenses. Besides helping increase sales this technological advantage along with economies of scale has helped Bergen Brunswig cut operating expenses as a percentage of sales and other revenues by about a fifth below the industry average.' (Bergen 1978 Annual Report)

**First Chicago — System Launch 1983**

(1 year post-launch)

**Market focus . . . (Defender Tactic)**

'Over the past three years, First Chicago Corporation has developed a set of long-term strategic objectives to guide the planning and resource allocation process. These objectives address the five broad lines of business that we are pursuing . . . Within these, we have identified specific market niches or initiatives, in which we feel
confident we can achieve significant success.' 'Our commitment to this strategic focus has strengthened over the last year with progress becoming apparent in each of our primary businesses.' 'Fundamental changes in payments systems — technological, regulatory and competitive — present opportunities that are being addressed through aggressive marketing, resource allocation and operating efficiency. We have elected to emphasize areas where we can differentiate ourselves through unique value-adding features or where we can establish the necessary scale of operations to achieve a cost advantage.' (First Chicago Corporation 1984 Annual Report)

(1 year post-launch)

*Increased efficiency, reduced costs . . . (Defender Tactic)*

'To increase efficiency and reduce costs, we are consolidating processing activities where legal and geographic constraints allow. Also, investments in hardware and software in recent years have culminated in the worldwide installation of the copyrighted F.I.R.S.T. system. This integrated, real-time transaction system reduces back-office costs, increases control of risk exposure, improves management and trading information and provides customer relationship data that is useful for developing our marketing plans.' (First Chicago Corporation 1984 Annual Report)

The empirical evidence of strategic change, along with these narratives, highlight the importance of IT in enabling a 'change of course' in competitive orientation. While the causes of the strategic changes observed in this analysis are beyond the scope of this particular research design, it seems clear that IT was a strong driver in implementing the strategic tactics deemed necessary for competition by the planners in many of these firms. The stability of strategic grouping in Stage 3 seems to further corroborate these fundamental shifts in strategic orientation. Such findings should serve as healthy reminders to top-planners of IT's importance in setting and changing strategic course. Perhaps even more importantly, managers must be prepared to adapt to changing competitive conditions in light of IT-based strategic change by powerful industry competitors. Firms caught off-guard by such changes may find their cost structures and/or product lines obsolete, with little prospect for developing near-term competitive responses.

Interestingly, many of the system descriptions provided in Appendix A seem to match the prevailing strategic thrust of their respective firms. For instance, systems developed by defenders such as Deere, Toys'r'Us, and Digital are primarily inventory management systems. Such technology would greatly enhance the efficiency orientation of this strategic type. Conversely, systems developed by prospectors such as Merrill Lynch, Gannette, IBM, and Xerox have as their focus product or service innovation. Hence a large degree of strategy—technology congruence seems to exist within these entities. These observations provide further evidence of the technology—strategy link in coping with competitive pressures and the value of the strategy construct in explaining patterns of IT use.

*Performance implications*

A final finding of this study concerns the existence of performance differences among emergent strategic orientations. Prior to systems launch, no strategic orientation was determined to be superior as measured by multiple performance criteria. However, immediately after systems launch, both large-scale prospectors and defenders outperformed analyzers. Interestingly, these findings suggest that the extremes of Miles and Snow's three strategic patterns were superior in realizing an initial impact from implementation of competitive IT. Somewhat surprising were the results of Stage 3; here it was determined that no strategic orientation was
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superior among the performance criteria. Thus, it would seem that in the long-run no strategic orientation is significantly better in terms of generating bottom line impacts from the development and implementation of strategic IT. These findings reinforce the arguments of many observers who suggest that the flexibility of new technologies make them potential competitive weapons in both innovative and operational contexts (Parsons, 1983). Hence, not only are each of the strategy types leverageable with IT, but each seems to to be equal in its ability to enhance the long-term profitability of the initiating organization.

The findings of this study illustrate the growing importance of information technology in supporting the strategic objectives of the firm. Whether prospector, analyzer, or defender, IT may provide an important capability in realizing and sustaining competitive advantage. Clearly, the firms in this analysis were different with regard to strategic orientation, yet each is commonly cited as a 'first mover' in deploying IT for the purpose of establishing competitive advantage. Perhaps as important, no strategic orientation proved to be consistently better than the others in terms of relative profitability. Hence, it would seem that long-term competitive gains are essentially the same whether IT creates new products or processes (prospector use), simply improves productivity and/or reduces costs (defender use), or combines elements of both innovating and cost cutting (analyzer use).

Conclusions

In many instances, studies of this nature raise as many questions as they answer. It is clear that information technology will only become a more critical strategic resource as data highways become established and end-users begin to fully utilize ever-improving office technologies. What is less clear is how these technologies can be molded into the overall strategic plan of the organization and how much use translates into competitive advantage. Beyond its intent, empirical results, and implications, this study should remind interested observers of the potential difficulties of conducting research within this domain. Clearly, a number of uncontrollable factors related to industry, firm, and environment inhibit the precise testing and identification of cause and effect relationships between strategic intent, IT, and financial performance. However, such confounding effects do not diminish the importance of conducting empirical research within this area. Instead, techniques should be developed, tested, and improved upon such that the research questions characteristic of this domain can be modeled and answered with a meaningful degree of validity. Although we believe this study has taken a step in this direction, the reported findings must be qualified.

Similar to many studies conducted within strategic management, the research questions addressed by this study are very encompassing. Questions such as: What is strategy? How does IT support strategy? and What strategies are most successful? are extremely relevant and seemingly straightforward. However, formally answering these questions with any degree of scientific rigor is at best problematic. It is perhaps too exacting to address such questions with statistical techniques. Yet, interviews and case studies suffer from the biases of those describing and those reporting corporate events. Within this study we have attempted to corroborate statistical findings with more qualitative corporate data. Such an approach is perhaps the best way to address the larger issues inherent within this area of inquiry. Our statistical methodology allowed us to identify strategic characteristics of firms while descriptions provided in case studies and annual reports allowed us to discern if the relationship between intended strategy
and IT use was valid. Although we believe this study advanced the merging of these extremes, our work should be viewed as preliminary. Clearly, much additional work remains to be done in addressing research issues in the realm of strategic IT.

It is also important to note that the statistical methodology employed within this analysis utilized indirect measures of the actual traits of interest. Hence, these variables contain a component of measurement error. Although it is safe to say that grouped firms are homogenous along sets of these variables, it cannot be stated with perfect certainty that they are indeed prospectors, analyzers, or defenders. Other strategic typologies with differing sets of indicators could possibly yield findings different from those reported here. Further, the use of clustering algorithms is not as statistically precise as principle components or factor analysis techniques in determination of group numbers (or number of factors). Although the groups in this analysis were readily identifiable upon analysis of the pseudo $F$ statistic, no statistical basis in terms of significant values guided ultimate determination of group number. Hence, it is possible that different multivariate grouping techniques would suggest different numbers of groups with somewhat different membership. However, given the number of observations required for these techniques and associated statistical assumptions, it is likely that cluster analysis will continue to be the method of choice in research designs of this type (Harrigan, 1983, 1985).

A final caveat concerns the strategic systems themselves. As shown in Appendix A, these systems are quite varied in their purpose, scope, and potentially, in their contribution to strategy and financial performance. Although this study uncovered several consistencies between the functionality of these systems and strategic orientation, it has not measured the magnitude of system influence on strategic orientation or financial performance. Therefore, we can only say that patterns in strategy and IT use seem present across the time periods examined, not that one directly influences the other.

Despite these limitations, the findings of this study seem to confirm the existence of strategy–IT congruence. In essence, the systems examined within this study seem to match the prevailing strategic thrust of their initiators. Further, in some instances it seems that the system may have played a major role in implementing a new strategic orientation. Although such effects have long been thought to exist, their exact nature in terms of timing, description, and financial implications have gone unrecognized. Hopefully, this study has contributed significantly in systematically describing these effects and, as importantly, stirred debate regarding viable approaches to measuring constructs of interest within this area.

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