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Hock-Hai Teo  
National University of Singapore

Bernard Tan  
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INNOVATION DIFFUSION THEORY AS A PREDICTOR OF ADOPTION INTENTION FOR FINANCIAL EDI

Hock-Hai Teo
Bernard C. Y. Tan
Kwok-Kee Wei
Department of Information Systems and Computer Science
National University of Singapore

Abstract

This study assesses the ability of innovation diffusion theory to predict the adoption intention of organizations for financial EDI. Six factors potentially affecting adoption intention were studied: relative advantage, compatibility, complexity, observability, trialability, and risk (operational and strategic). Both present and future adoption intentions were measured. The questionnaire was developed using a process of conceptual construct validation. It was administered to three key employees of all participating organizations through a survey. Responses were subjected to a process of empirical construct validation. Results show that present adoption intention is dependent on complexity, operational risk, and strategic risk to a greater extent, and relative advantage and observability to a lesser extent. Future adoption intention is contingent upon complexity, observability, and strategic risk to a greater extent, and trialability to a lesser extent. These findings permit financial EDI operators to shape their marketing strategies to encourage adoption.

1. INTRODUCTION

Cash management is the synchronization of cash inflows and outflows to enable an organization to conduct its business at a minimal net cost of cash surpluses and deficits, over a predetermined time horizon (Kallberg, White and Ziemba 1982). It is a critical organizational function (Brigham and Gapenski 1994). It comprises five major activities: accelerating cash receipts; delaying cash disbursements; forecasting cash receipts and disbursements; investing cash excesses; and monitoring the efficiency of these activities. If properly managed, cash management can be a profitable undertaking (Driscoll 1983). However, if mismanaged, it can lead to the dissolution of organizations (Bhide 1988; Pizzey 1991). Therefore, efficient and effective cash management is crucial to organizational survival.

Traditional means to better cash management include cash inventory modeling (e.g., Chand and Morton 1982; Kallberg, White and Ziemba 1982; Orgler and Tauman 1986), cash flow estimation techniques (e.g., Ang, Chua and Sellers 1979; Pohlmam Santiago and Markel 1988; Scott and Petty 1984), cash flow ratio analyses (e.g., Carstlaw and Mills 1991; Casey and Bartczak 1984; Stancill 1987), among others. With advances in computer and communications technologies, technological approaches to better cash management have recently emerged.

Financial electronic data interchange (Financial EDI), a technological approach, allows organizations to instruct banks to effect receipt and disbursement of cash on their behalf via computers. It can improve the efficiency and effectiveness of cash management through rapid transmission of financial information and elimination of paperwork (Baker 1991; Thierauf 1990). However, financial EDI being an interorganizational system, its potential benefits can only materialize if it is widely adopted by organizations. Hence, it is important to comprehend factors that help organizations decide whether or not to participate in a financial EDI. Such knowledge would help operators of financial EDI formulate appropriate marketing strategies to encourage adoption. Widespread adoption, in turn, would contribute to the continual viability of a financial EDI. The innovation diffusion theory (Rogers 1983) provides a basis on which factors promoting financial EDI adoption could be identified.

2. THEORY AND HYPOTHESES

An innovation is an idea, product, or process that is new to an adopter (Hage and Aiken 1967; Rogers 1983; Zaltman, Duncan and Holbeck 1973). When an organization adopts financial EDI, its funds would be received and disbursed electronically instead of being done through checks and currencies. This necessitates fundamental changes in cash management activities and thus constitutes an innovation. Financial EDI is a new approach that
has yet to be widely adopted. Therefore, this study focuses on potential adopters. It seeks to identify factors that drive their adoption intentions (Holak and Lehmann 1990; Mathieson 1991) for financial EDI. Although intention does not always lead to actual adoption, it is significantly related to adoption and is the best available measure for products that are in the early stages of their life cycles (Morrison 1979). Following Azjen and Fishbein’s (1980) suggestion that behavior has a temporal dimension (present and future), adoption intention is assessed from both a present (within a year) and a future (in three years’ time) perspective.

Factors that potentially affect adoption intention of organizations are taken primarily from the innovation diffusion theory (Rogers 1983). This theory posits that five perceived innovation attributes influence adoption: relative advantage, compatibility, complexity, observability, and trialability. Additionally, a sixth perceived attribute is added: risk (Bauer 1960; Olstlund 1974; Webster 1969). Risk is important in a financial EDI context because adoption of this technology could result in negative outcomes. These six factors have been observed to predict future rates of innovation adoption in many instances (Rogers 1983; Olstlund 1974). Following Azjen and Fishbein, Moore and Benbasat (1991) argue that innovations diffuse because of perceptions of using innovations rather than that of innovations themselves. This study assesses the extent to which these six perceived factors of using financial EDI can predict the present and future adoption intentions of organizations for financial EDI.

2.1 Relative Advantage

Relative advantage is the degree to which using an innovation is perceived as being more advantageous than using its precursor. It is manifested in the form of increased efficiency, increased effectiveness, economic gains, and enhanced status (Davis, Bagozzi and Warshaw 1989; Rogers 1983). Tornatzky and Klein (1982) found relative advantage to be an important factor influencing adoption in their meta-analysis of innovation studies. O’Callagan, Kaufmann, and Konsynski (1992) examined EDI adoption in marketing channels and confirmed the importance of relative advantage as a predictor of adoption intention. Holland et al. (1994) investigated the use of financial EDI for global cash management at Motorola and reported that it resulted in tremendous improvements in annual savings ($US6.5 million). Other advantages of EDI usage in a variety of contexts have also been reported (e.g., Kimberly 1991; Sokol 1989; Teo et al. 1994). Hence, relative advantage is hypothesized to vary positively with adoption intention.

\textbf{H1a:} The greater the perceived relative advantage of using financial EDI, the more likely the present intention of an organization to adopt it.

2.2 Compatibility

Compatibility is the degree to which using an innovation is considered consistent with existing organizational values, experience, and needs. In an EDI context, it can be assessed in terms of technical compatibility (with present hardware and software systems) and organizational compatibility (with current objectives and personnel skills) (O’Callagan, Kaufmann and Konsynski 1992). Positive empirical association between compatibility and adoption behavior has been found (e.g., Ettlie, Bridges and O’Keefe 1984; Holak and Lehmann 1990; Tornatzky and Klein 1982). In his study on information technology innovations, Grover (1993) reported compatibility as a predictor of adoption while O’Callagan, Kaufmann and Konsynski found no corresponding relationship between them. Given the overwhelming evidence, compatibility is hypothesized to vary positively with adoption intention.

\textbf{H2a:} The greater the perceived compatibility of using financial EDI, the more likely the present intention of an organization to adopt it.

2.3 Complexity

Complexity is the degree to which using and understanding an innovation is perceived as a difficult task. Bouchard (1993) proposes that complexity in an EDI context can be assessed from both a business and a technical perspective. Researchers have suggested that a complex innovation requires more technical skills and greater implementation efforts to adopt, thus reducing likelihood of adoption (Cooper and Zmud 1990; Dickerson and Gentry 1983; Utterback 1974). Grover’s study on customer-based interorganizational systems shows a negative association between complexity and adoption behavior. Complexity has been widely recognized as an inhibitor to adoption (e.g., LaBay and Kinnear 1981; Rogers 1983; Tornatzky and Klein 1982). Hence, complexity is hypothesized to vary negatively with adoption intention.

\textbf{H3a:} The greater the perceived complexity of using financial EDI, the less likely the present intention of an organization to adopt it.

\textbf{H3b:} The greater the perceived complexity of using financial EDI, the less likely the future intention of an organization to adopt it.
2.4 Observability

Observability is the degree to which an innovation generates results that are observable and can be communicated to others. Zaltman, Duncan and Holbek suggest that showing the results of using an innovation has a strong impact on adoption decision. Rogers and Shoemaker (1971) propose that the ease and effectiveness with which results of using an innovation can be communicated to others have a significant influence on adoption decision. Being an interorganizational system, EDI requires widespread adoption to be effective. Thus, in this context, it becomes even more critical that results be communicated to potential adopters. Kimberly suggests that results of EDI usage could be communicated using cost savings and benefit figures. Several studies have reported no significant relationship between observability and adoption behavior (e.g., Bouchard 1993; Holak and Lehmann 1990). Nevertheless, given strong theoretical support, observability is hypothesized to vary positively with adoption intention.

H4a: The greater the perceived observability of using financial EDI, the more likely the present intention of an organization to adopt it.

H4b: The greater the perceived observability of using financial EDI, the more likely the future intention of an organization to adopt it.

2.5 Trialability

Trialability is the degree to which using an innovation can be carried out on a limited basis prior to adoption. Rogers argues that potential adopters are likely to feel more comfortable with innovations that can be experimented, thus increasing the likelihood of adoption. Zaltman, Duncan and Holbek assert that organizations prefer adopting innovations that can be tried out on a smaller scale because should unexpected negative outcomes occur, these could be easily redressed. Trialability has rarely been examined in studies involving information technology innovations. The exception is the Bouchard study, which reported no significant association between trialability and adoption behavior. However, given strong theoretical support, trialability is hypothesized to vary positively with adoption intention.

H5a: The greater the perceived trialability of using financial EDI, the more likely the present intention of an organization to adopt it.

H5b: The greater the perceived trialability of using financial EDI, the more likely the future intention of an organization to adopt it.

2.6 Risk

Risk is the degree to which using an innovation may result in unfavorable outcomes (Webster 1969). Ostlund suggests that it has two dimensions: performance risk (whether an innovation really produces positive outcomes) and psychosocial risk (concern for what others think of using the innovation). Webster suggests that risk is a function of the amount of new investments required for innovation adoption. Since EDI adoption requires substantial investments (Bakos 1991; Hansen and Hill 1989; Teo et al. 1994), adopting financial EDI is a risk to organizations. Bouchard reported that organizations tend to adopt EDI based on the collective action of others, which illustrates the psychosocial risks involved. Organizations may be reluctant to adopt financial EDI if the risk level is too high. Hence, risk is hypothesized to vary negatively with adoption intention.

H6a: The greater the perceived risk of using financial EDI, the less likely the present intention of an organization to adopt it.

H6b: The greater the perceived risk of using financial EDI, the less likely the future intention of an organization to adopt it.

3. RESEARCH METHODOLOGY

Empirical research on innovation diffusion has been substantial and diverse (e.g., Rogers 1983; Tornatzky and Klein 1982). However, this body of literature is plagued with severe conceptual and methodological problems (Meyer and Goes 1988; Moore and Benbasat 1991; Tornatzky and Klein 1982). Several measures can be taken to overcome such problems. First, several (rather than one) innovation characteristics should be simultaneously examined to evaluate their relative impact. Second, organizational adoption outcomes should be determined using the responses of several (rather than one) individuals. Third, reliable and replicable measures should be developed. Fourth, antecedents specific to each innovation (rather than across diverse innovations) should be constructed. This study was designed with these principles.

3.1 Question Generation

The literature on innovation diffusion, marketing, cash management, and interorganizational systems was reviewed. Where available, questions that demonstrated high reliability and validity from prior empirical work were adapted. Where unavailable, questions were constructed from key statements in the literature. Ajzen and Fishbein and Kaplan and Duchon (1988) suggest that context is important when assessing behavior. Thus, cash management literature and advice from a financial EDI operator were used to frame questions that made sense to
potential respondents. All questions were phrased from the perspective of non-adopters (Moore and Benbasat 1991) and anchored on a seven-point scale from extremely disagree (1) to extremely agree (7).

Existing items on relative advantage were either too general or too idiosyncratic to specific innovations. Hence, all questions for this construct were developed. Based on cash management literature, this construct was operationalized as improvements to the cash receipt process, cash disbursement process, cash planning and forecasting process, capital investment decision process, use of excess cash, and financial image. Twelve questions were developed. Some questions on compatibility were adapted from Grover while others were constructed from statements in O’Callagan, Kaufmann and Konsynski. Questions covered technical and organizational compatibility. Consistency with existing information technology infrastructure and data resources constitute technical compatibility. Consistency with organizational objectives, financial procedures, and employee knowledge and skills constitute organizational compatibility. Six questions were generated.

Questions on complexity were adapted from Bouchard, from Dickerson and Gentry, and from Grover. These questions assessed difficulties in areas such as understanding and using financial EDI, auditing and tracing errors, and visualizing the cash collection and disbursement cycle. Six questions were created. Questions on observability were modified from Moore and Benbasat. Items assessing the clarity, visibility, and communicability of results of using an innovation were modified for the financial EDI context. Items gauging visibility of an innovation itself were dropped because, being an intellectual product, financial EDI could not be physically seen. Six questions were generated.

Questions on trialability were modified from Moore and Benbasat. These questions assessed the extent to and period with which an organization could try out financial EDI on a smaller scale with fewer transactions, without committing substantial resources. Four questions were generated. Questions on risk were drawn from Holak and Lehmann, from Ostlund, and from Webster. Questions covered performance, psychosocial, and investment risks. Performance risks include more frauds, damages to financial records, and disruption to business operations. Psychosocial risks include loss of customers and poorer relationships with suppliers. Investment risks were assessed by the chance of successful usage of financial EDI and the worthiness of the investments involved. Eight questions were created.

Following Holak and Lehmann, this study investigates innovation acceptance in terms of adoption intention. Intention to adopt financial EDI is defined as the degree of willingness of the respondents to make full use of financial EDI as the best course of action. Hence, present and future adoption intention for financial EDI are assessed by asking potential respondents to indicate, on a scale of 1 to 7, the likelihood of adopting financial EDI within a year and in three years’ time respectively.

3.2 Conceptual Construct Validation

Conceptual construct validation was carried out following Moore and Benbasat. Each question was printed on a card. Several identical sets of cards were created. Four rounds of sorting the cards were carried out, each involving four judges who were information systems faculty members or graduate students with an accounting background. Each judge participated only in one round. In Round 1, four sets of cards were shuffled and each was presented to a judge for sorting. The judges sorted the cards into independent constructs and provided their own labels for constructs. In Round 2, each judge sorted a shuffled set of cards according to given constructs. Based on these results, ambiguous questions were reworded. Rounds 3 and 4 were repeats of Rounds 1 and 2, respectively, to ensure stability and clarity of questions.

Conceptual validity of constructs was evaluated based on the percentage of questions correctly placed in the intended constructs. Results were generally good with minor exceptions. For instance, two judges placed some questions on complexity under the risk construct in Round 1. Some questions on relative advantage were consistently placed under the observability construct. After rewording of these questions, no problems were detected in Round 3, which indicated sufficient stability and clarity. After four rounds, the constructs were deemed to possess adequate conceptual validity. Table 1 presents the results for Round 4.

After sorting, the questions were pretested on the chief financial officers of three organizations. They were asked to comment on the clarity and relevance of the questions and instructions. From their feedback, two questions were eliminated. The question on compatibility asked whether financial EDI would affect financial procedures. It was unnecessary because information systems, by nature, would alter procedures drastically. The question on relative advantage measured disbursement effectiveness. It was inappropriate because paying faster would be disadvantageous, rather than advantageous. In the end, forty questions remained. There were no problems with the instructions.

3.3 The Respondents

The target respondents were key employees of organizations listed in the Singapore Stock Exchange. Among these organizations, six banks were excluded because, as financial EDI operators cum users, their responses could be biased. The remaining organizations were contacted by phone. Those who had not adopted financial EDI were invited to participate. Excluding those involved in pretesting, 158 organizations agreed to participate.
Altogether, 474 questionnaires were sent to the chief executive officers, chief financial officers, and chief information officers of the participating organizations. They were selected because they were likely to decide on financial EDI adoption.

3.4 The Survey

The definition and description of financial EDI were included to reduce confusion. Respondents could also clarify their doubts through phone calls. A parcel comprising a cover letter stating the purpose of the study, a copy of the questionnaire, and a self-addressed return envelope with postage was sent to each target respondent. After two weeks, follow-up phone calls were made to all individuals who had not responded. Similar phone calls were made after another two weeks. Additional parcels were sent to 28 individuals who misplaced theirs. These measures helped increase the response rate. Responses were received from 112 individuals, yielding a 24% response rate. Among these, seven were incomplete despite phone calls to these individuals. The remaining 105 responses (from 33 chief executive officers, 40 chief financial officers, and 32 chief information officers) were used for data analyses.

4. DATA ANALYSES AND RESULTS

Responses were subjected to bias test and empirical construct validation before being used to test the hypotheses. The hypotheses were assessed at a 5% significance level.

4.1 Response Bias Test

Paid-up capital was chosen as the criterion for response bias test because it reflected the ability of organizations, given their willingness, to adopt financial EDI. Paid-up capital of organizations was weighted by their respective number of responses and non-responses. The weighted paid-up capital for responses and that for non-responses were then compared using the t-test at a 5% significance level. Results showed that respondents and non-respondents did not differ in terms of paid-up capital (F = 0.25, p = 0.61).

4.2 Empirical Construct Validation

Responses to questions on the six constructs potentially affecting adoption intention were subjected to empirical validity and reliability tests (Kerlinger 1986). Empirical validity was assessed using factor analysis specifying a six-factor solution (Cook and Campbell 1979). All factors had eigenvalues greater than 1.0, indicating their eligibility for selection (Johnson and Wichern 1992). The factor structure revealed two interesting patterns (see Table 2).

First, trialability and compatibility did not emerge as separate factors. Given their conceptual distinction, this result seems to suggest a causal relationship among them. For example, organizations might need opportunities to try out financial EDI on a limited scale before they could decide if it was compatible.
<table>
<thead>
<tr>
<th>Question</th>
<th>Factor</th>
<th>Construct (Cronbach’s alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adv01</td>
<td>0.56</td>
<td>Relative advantage</td>
</tr>
<tr>
<td>Adv02</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>Adv03</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>Adv04</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>Adv05</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>Adv06</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>Adv07</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>Adv08</td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>Adv09</td>
<td>0.60</td>
<td></td>
</tr>
<tr>
<td>Adv10</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>Adv11</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>Com01</td>
<td>0.47</td>
<td>Compatibility</td>
</tr>
<tr>
<td>Com02</td>
<td>0.47</td>
<td></td>
</tr>
<tr>
<td>Com03</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Com04</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>Com05</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>Cpx01</td>
<td>0.80</td>
<td>Complexity</td>
</tr>
<tr>
<td>Cpx02</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>Cpx03</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>Cpx04</td>
<td>0.74</td>
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</tr>
<tr>
<td>Cpx05</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Cpx06</td>
<td>0.66</td>
<td></td>
</tr>
<tr>
<td>Trl01</td>
<td>0.66</td>
<td>Trialability</td>
</tr>
<tr>
<td>Trl02</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>Trl03</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>Trl04</td>
<td>0.67</td>
<td></td>
</tr>
</tbody>
</table>

Adv = Relative advantage
Com = Compatibility
Cpx = Complexity
Obs = Observability
Trl = Trialability
Rsk = Risk
Table 2. Results of Empirical Construct Validation (continued)

<table>
<thead>
<tr>
<th>Question</th>
<th>Factor</th>
<th>Construct (Cronbach's alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obs01</td>
<td>0.71</td>
<td>Observability</td>
</tr>
<tr>
<td>Obs02</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>Obs03</td>
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<td></td>
</tr>
<tr>
<td>Obs04</td>
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<td></td>
</tr>
<tr>
<td>Obs05</td>
<td>0.69</td>
<td></td>
</tr>
<tr>
<td>Obs06</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td>Rsk01</td>
<td>0.54</td>
<td>Operational risk</td>
</tr>
<tr>
<td>Rsk02</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>Rsk03</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>Rsk04</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>Rsk05</td>
<td>0.56</td>
<td>Strategic risk</td>
</tr>
<tr>
<td>Rsk06</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Rsk07</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>Rsk08</td>
<td>0.77</td>
<td></td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>12.38</td>
<td>5.27</td>
</tr>
<tr>
<td>Variance explained (%)</td>
<td>31</td>
<td>13</td>
</tr>
<tr>
<td>Cumulative variance (%)</td>
<td>31</td>
<td>44</td>
</tr>
</tbody>
</table>

Adv = Relative advantage  Cpx = Complexity  Obs = Observability  Com = Compatibility  Trl = Trialability  Rsk = Risk

with their organizational and technical environments. Since an empirically unidimensional construct need not be conceptually unidimensional (Bollen and Hoyle 1990), trialability and compatibility were treated as two separate constructs. Nevertheless, their relationship warrants further investigation. Second, questions on risk loaded onto two separate factors. The first consists of questions measuring performance risk, dealing with risk issues that are operational in nature, within the control of organizations, and have a short-term impact on organizational performance. The second consists of questions measuring psychosocial and investment risks, addressing risk issues that are strategic in nature, not controllable by organizations, and have a long-term impact on organizational viability. Given this result, the risk construct was split into two sub-constructs: operational risk and strategic risk.

Factor loadings were examined to identify questions that load onto more than one factor or fail to load onto any factor (see Table 2). Two questions on compatibility, measuring compatibility of financial EDI use with organizational and information systems objectives, and one question on observability, measuring ease of
quantifying benefits, loaded onto their intended and the relative advantage constructs. The first two questions might have loaded this way because financial EDI could confer relative advantage on organizations by supporting compatible objectives. The third question might have loaded this way because financial EDI would be perceived to confer relative advantage on organizations if its benefits could be easily quantified. However, because these questions also loaded onto their intended constructs and did not affect reliability adversely, they were retained in their intended constructs. All constructs had Cronbach’s alphas that satisfied Nunnally’s (1978) reliability criteria of 0.7 (see Table 2).

4.3 Hypotheses Tests

Correlations for all pairs of factors were computed. Results indicated that these factors were not strongly correlated and could be used in multiple regression simultaneously without problems due to multicollinearity. Multiple regression analyses were undertaken to identify factors that could predict present and future intention of adopting financial EDI by organizations.

The model relating the six factors to present adoption intention was significant at 1% and explained 38% of its variance. Complexity, operational risk, and strategic risk were predictors of present adoption intention. The effects of relative advantage and observability on present adoption intention were only marginally significant (see Table 3). Low complexity, low operational risk, and low strategic risk were associated with high present adoption intention. H3a and H6a were supported. H1a and H4a were marginally supported. H2a and H5a were not supported at all.

The model relating the six factors to future adoption intention was significant at 1% and accounted for 37% of its variance. Complexity, observability, and strategic risks were predictors of future adoption intention. Triability’s impact on future adoption intention was marginally significant (see Table 3). Low complexity, high observability, and low strategic risk were associated with high future adoption intention. H3b and H5b were supported. H6b was partially supported. H5b was marginally supported. H1b and H2b were not supported at all.

5. DISCUSSION AND IMPLICATIONS

The results provide support for innovation diffusion theory (Rogers 1983) as a predictor of financial EDI adoption intention of organizations. Specifically, different factors accounted for present and future adoption intention. Present adoption intention is dependent on complexity, operational risk, and strategic risk to a greater extent, and relative advantage and observability to a lesser extent. Future adoption intention is contingent upon complexity, observability, and strategic risk to a greater extent, and triability to a lesser extent.

5.1 Discussion of Results

Relative advantage was a weak predictor of present but not future adoption intention. Thus, organizations may be more willing to adopt financial EDI immediately if they can see the advantages of doing so. When making decisions on financial EDI adoption in the future, organizations may be driven more by the popularity and extent of use (Bouchard 1993) than by the advantages. Compatibility did not affect present and future adoption intention.

This insignificant result may be due to the nature of the respondents, which are large organizations with vast resources and experience (Welsh and White 1981). Given their experience, they could reduce organizational incompatibility by developing coping mechanisms. Given their resources, they can acquire knowledge and skills to handle technical incompatibility. Thus, compatibility may not be a major concern.

Complexity was a predictor of present and future adoption intention. This shows that organizations may be unwilling to adopt financial EDI if they consider it beyond their ability to comprehend and use (Grover 1993). Observability was a weak predictor of present adoption intention and a strong predictor of future adoption intention. Thus, organizations may be more willing to adopt financial EDI if they can see others, particularly their business partners, benefitting from it (Bouchard 1993).

Triability was a weak predictor of future but not present adoption intention. This result may be due to the fact that financial EDI is a complex technology. The impact of organizational assimilation of financial EDI takes time to manifest itself. Hence, when making decisions on immediate financial EDI adoption, organizations may not consider triability a useful decision criterion. However, when making decisions on financial EDI adoption in the future, organizations can benefit by being able to examine the impact of financial EDI usage carefully before full adoption (Zaltman, Duncan and Holbek 1973).

Operational and strategic risks were predictors of present adoption intention. Since financial EDI is currently a new approach and has yet to be widely adopted, its impact remains largely unknown. Moreover, substantial resources are required during adoption (Bakos 1991). Hence, organizations that consider financial EDI risky may be unwilling to adopt it at present. Strategic risk was a predictor of future adoption intention but operational risk was not. With the passage of time and a possible increase in financial EDI usage, organizations can see how other adopters handle their operational risk issues. Since these issues are controllable, organizations that intend to adopt financial EDI in future need not worry about them. Conversely, strategic risk issues are less controllable because they are interorganizational in nature, and represent sunk investments that are inherent in the adoption of financial EDI. Hence, they are likely to remain as important organizational factors in the decision of financial EDI adoption in the future.
Table 3. Results of Multiple Regression Analyses

<table>
<thead>
<tr>
<th>Factor</th>
<th>Present adoption intention</th>
<th>Future adoption intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative advantage</td>
<td>$F = 2.94$ p = 0.09*</td>
<td>$F = 0.93$ p = 0.34</td>
</tr>
<tr>
<td>Compatibility</td>
<td>$F = 0.34$ p = 0.56</td>
<td>$F = 1.65$ p = 0.20</td>
</tr>
<tr>
<td>Complexity</td>
<td>$F = 9.22$ p &lt; 0.01**</td>
<td>$F = 10.70$ p &lt; 0.01***</td>
</tr>
<tr>
<td>Observability</td>
<td>$F = 2.96$ p = 0.09*</td>
<td>$F = 4.88$ p = 0.03**</td>
</tr>
<tr>
<td>Trialability</td>
<td>$F = 1.66$ p = 0.20</td>
<td>$F = 3.55$ p = 0.06*</td>
</tr>
<tr>
<td>Operational Risks</td>
<td>$F = 9.10$ p &lt; 0.01***</td>
<td>$F = 0.41$ p = 0.53</td>
</tr>
<tr>
<td>Strategic Risks</td>
<td>$F = 4.57$ p = 0.04**</td>
<td>$F = 6.87$ p &lt; 0.01***</td>
</tr>
</tbody>
</table>

*** p < 0.01  ** p < 0.05  * p < 0.10

5.2 Implications for Practice

These results provide clues on how financial EDI operators can more effectively encourage adoption. Periodically, these operators can use surveys to find out which organizations are contemplating financial EDI adoption at that moment and in the future. Different sales strategies, addressing factors influencing present and future adoption intention, can be targeted at the former and latter organizations respectively.

Factors affecting adoption intention can be addressed in various ways. The additional gains from financial EDI usage over traditional cash management methods, and the means with which these gains come about, can be highlighted and explained to organizations. This can help raise their perceptions of relative advantage. Complexity can be reduced through education. Seminars can be conducted to explain and demonstrate the features of financial EDI to organizations. Training and consulting services can be made available to both current and potential adopters of financial EDI. Observability can be raised through information exchange. Successful adopters can be invited to share their experience and benefits in seminars. Site visits to successful adopters can be arranged. Perceived trialability can be enhanced by permitting an incremental adoption approach. Organizations can be encouraged to try out financial EDI with a few business partners on a small number of transactions. A successful trial can lead to greater subsequent usage. To allay fears of operational risks, the means with which adopters cope with these issues successfully can be made available. Security, backup, and other measures to alleviate such risks can be disseminated. All these measures can help induce adoption of financial EDI. If many organizations have adopted and benefited, fears of negative perceptions by business partners and having to make substantial investments would be allayed. This can help to reduce fears of strategic risks.

The questionnaire used in this study is available from the authors upon request. Although this study identifies factors that influence adoption intention, these factors may also be predictors of actual adoption. Davis, Bagozzi and Warshaw have provided empirical support for an intention-behavior link. Further research is needed to verify this assertion. Nevertheless, this study demonstrates that some factors from innovation diffusion theory can predict adoption intention for financial EDI. However, given the mixed results of this study and that financial EDI requires trading partners for it to be used at all, further research exploring the possibility of critical mass theory should be pursued.

6. REFERENCES


THE CONTRIBUTION OF IT TO THE BOTTOM LINE: 
A CONTINGENCY PERSPECTIVE OF STRATEGIC DIMENSIONS

François Bergeron
Département des systèmes d'information organisationnels
Faculté des sciences de l'administration
Université Laval

Louis Raymond
Département des sciences de la gestion
Université du Québec à Trois-Rivières

Abstract

The relationship between information technology and business performance has been a focus of IS research in recent years. However, few solid results have been found as of yet which empirically link them together. Some problems remain with the definition and measurement of IT, organizational performance and “fit” between technology and organizational strategy. Thus stronger empirical evidence is required before concluding with certainty that IT can lead to greater business performance. In view of this, an empirical study was conducted among 126 business firms to validate a research model linking strategic orientation and strategic IT management to performance. Using both a perceptual (growth and profitability) and an objective measure of performance (ROA), this study provides new and interesting empirical evidence for the strategic conditions under which information technology contributes to the bottom line. The main thrust of the findings is that peak performance is achieved by firms that combine a strong strategic orientation with a strategically oriented IT management.

1. INTRODUCTION

In the last decade, business organizations have invested huge sums in information technology, yet the profitability of these investments has not been fully demonstrated. While Roach (1987) was one of the first seriously to question the bottom line implications of IT, it was not until 1993 and following intensive research that a first study by Brynjolfsson and Hitt (1993) found computer ROI to average 54%. Unfortunately, this conclusion was limited to computer capital and could not be extended to information systems. A further study by the same researchers indicated that computers have not resulted in measurable improvements in business performance (Hitt and Brynjolfsson 1994).

However two other investigations, using a contingency framework, did find positive results. The first one by Raymond, Paré and Bergeron (1993) concluded that organizations having a sophisticated structure and sophisticated information technology performed better than others. The second study by Chan and Huff (1993) demonstrated that organizations with a strong strategic orientation and strategically oriented information systems were the ones that achieved peak performance. These were two important results in the pursuit of evidence that information technology is profitable for business, but the measures of performance were of a perceptual (subjective) nature. Although perceptual measures have been shown to be as valid as objective measures (Dess and Robinson 1984; Venkatraman and Ramamujum 1987), one is left with a doubt as to why, if such an impact on organizational performance exists, no relationship ever shows up in objective measures such as return on assets (ROA), as reported in financial statements.

This study intends to show that under specific conditions, namely the strategic orientation of the business and the strategic management of information technology, organizations perform better both in terms of perceived (subjective) growth and profitability, and in terms of return on assets, an objective financial ratio. These results will provide additional insight into the conditions under which information technology is profitable to organizations.
2. BACKGROUND

Research on the profitability of information technology has mainly produced mixed results, often non-generalizable, and sometimes contradictory (Weill and Olson 1989; Powell 1992). While the objective is quite simple and easily understandable (i.e., to show that information systems contribute to the bottom line), most IS studies have not yet been very successful in achieving it.

The profitability of information systems in organizations is a subject that has been tackled for several years, with inconsistent results. For instance, in the insurance industry, Bender (1986) found that low performing firms had either very high or very low information systems budgets. In the banking sector, Turner (1985) did not find any relation between information systems budgets and performance. In Cron and Sobol’s study (1983), it was observed that firms making an intensive use of information technology showed either a very high or a very low level of profitability. Harris and Katz (1991) concluded that the most profitable firms are those that spend a higher proportion of their operating expenses on IT. Weill and Olson could not demonstrate the existence of a link between IT investment and organizational performance. Using chronological series on more than 700 banks over an eight year period, Alpar and Kim (1990) were unable to confirm a relationship between information processing expenses and return on equity, therefore bringing into question the results obtained by Bender, Cron and Sobol, and Harris and Katz.

The level of generalizability of such results is a concern for IS research. The previously cited studies sampled organizations in information-intensive industries such as insurance and banking. One is left to wonder if similar results could be obtained in industries where IT has a less fundamental role. Defining information technology is another problem. There is no common agreement on what is to be included in a conceptualization of IT (Weill and Olson 1989), nor is there any consensus on what factors should be included in a cost-benefit analysis. Indeed, financial models used to assess the profitability of IT have various limitations (Clemens and Weber 1990): the intangible benefits are ignored (e.g., strategic advantage, quality improvement, higher flexibility), benefits are summarized into savings on labor and material, and capital costs used in net present value calculations vary widely among enterprises.

There are also different points of view on the measurement of organizational performance (Foster 1986; Gannon and Khoury 1988; Dawson, Neupert, and Stickney 1980). Although return on assets has often been used and recommended as an appropriate measure (Benbasat and Dexter 1979; Cron and Sobol 1983; Yap and Walshman 1986; Keats 1988; Weill and Olson 1989; Weill 1990), perceptual (subjective) measures of organizational performance have also been frequently used (Venkatraman 1989; Chan and Huff 1993; Raymond, Paré and Bergeron 1993).

2.1 Contingency Models

Aside from methodological issues, many studies suffer from the lack of a general theoretical framework (Swanson 1987). Seemingly contradictory results might in fact be truly valid. The absence of control of contingency aspects might be a reason why dissimilar results are obtained from what seem to be similar studies. This possibility has been clearly indicated by Dennis, Nunamaker and Vogel (1990/1991) in their comparison of laboratory and field research on electronic systems, where they concluded that differences in findings were not inconsistent, but rather reflected different situations. Contingency theory, as a subset of organization theory, provides a valuable theoretical framework and helps build a cumulative research tradition in information systems (Jivari 1992). The importance of using a contingency model is well justified in the works of Venkatraman and Camillus, (1984). Using contingency theory, Raymond, Paré and Bergeron found that IT sophistication was positively related to organizational performance in small and medium-sized firms. Chan and Huff concluded that the fit between IS strategy and organizational strategy was associated with business performance. Again, both studies used only perceptual measures of business performance.

Overall, it can be concluded that a contingency approach is a promising path to follow in the attempt to demonstrate the profitability of information technology in organizations. This study pursues these latter efforts in attempting to establish a link between information technology and organizational performance. It seeks to answer the following research questions: What are the links between the strategic orientation of an organization, its strategic management of information technology, and its performance? Are effects on business performance observable in terms of both perceptual and objective measures?

3. RESEARCH MODEL AND HYPOTHESES

The research model, presented in Figure 1, hypothesizes relationships between the strategic orientation of the firm, its strategic management of information technology and its business performance.

3.1 Strategic Orientation

The strategic orientation of a firm is considered to be a crucial aspect in determining bottom line results (Steiner 1979). A firm that is more strongly oriented toward differentiation, cost leadership or focus, can achieve a competitive advantage. This translates into higher rates of sales, profits and returns.
In strategic management research, Miller (1987) found a positive association between strategy and performance under various conditions. Venkatraman found various dimensions of strategy to be positively related to organizational performance, defined in terms of perceived growth and profitability. A study by Zahra and Covin (1993) also found similar results. Economic measures of business performance are preferred by strategy researchers over the more global concept of organizational effectiveness upon which organization theorists focus (Venkatraman and Ramanujam 1987). It is thus expected that a positive relationship between the strategic orientation of a firm and its performance will be observed. Given that the present study is in the information systems rather than strategic management domain, the purpose of the following hypothesis is to increase the validity of the research model and of the empirical data analysis.

**Hypothesis 1:** Strategic orientation is positively related to business performance.

Bergeron, Buteau and Raymond (1991) have ascertained that organizations basically use two approaches in managing IT. The alignment approach (e.g., BSP, CSF) is characterized by the adoption and implementation of information technologies intended to support the organization's goals and business strategy. In this case, the firm's strategic orientation directly influences the way in which the IS function will be planned and managed. The impact approach is one where IS planning and management drives the firm in the process of formulating a new vision and implementing corresponding strategic goals (e.g., Porter's value chain, Wiseman's strategic opportunities). In the latter case, the IS function influences the strategic orientation of the firm and leads to major changes in the way it does business.

Much has been written on the link that should exist between the IS function and organizational strategy (Henderson and Venkatraman 1992; Feeny, Edwards and Simpson 1992; Henderson and Sifonis 1988; Lederer and Mendelow 1990; Lederer and Sethi 1988; Weiss and Birnbaum 1989). However, there is still some uncertainty concerning the direction of the causal link between technology and strategy (Powell 1992). Strategic orientation can thus be viewed as playing a direct role in strategic IT management, and vice-versa. This leads us to the second hypothesis:

**Hypothesis 2:** Strategic orientation and strategic IT management are positively and mutually related.

### 3.2 Strategic Information Technology Management

There have been various perspectives used to measure the contribution of information technology to organizations. Delone and McLean's (1992) taxonomy identifies four antecedent factors (information quality, system quality, user satisfaction and use) that are seen to have individual and organizational impacts. The study by Raymond, Park and Bergeron found IT usage to be significantly correlated to organizational performance, irrespective of organizational size, environmental uncertainty, human resources and formal structure.
As opposed to IT usage, IT management refers to the infrastructure put in place to organize the IS function (Olson and Chervany 1980) and to the managerial practices employed to plan and control the implementation and use of IT (Srinivasan and Kaiser 1987). Raymond, Paré and Bergeron concluded that IT management sophistication had a more contingent effect on performance. Given the amount of literature on the importance of strategic IT management from the research and practice point of view, its effect on organizational performance should be observable. This leads to the following hypothesis.

Hypothesis 3: Strategic IT management is positively related to business performance.

3.3 Strategy, IT and Business Performance

While strategy-technology contingencies are thought to have implications for performance (Vitale, Ives and Beath; 1986), there have been few empirical confirmations of this assumption. For strategic choices to make an impact on performance, they ought to be supported and facilitated by the appropriate information infrastructure. A firm that is more analytical, more proactive and more future-oriented in its outlook requires access to external networks, on-line databases and executive support systems (e.g., for strategic market analysis). Conversely, information technology choices shown to have the greatest bottom line impacts (famous cases in the airline, finance and distribution sectors) resulted in radical changes in the firm’s strategic orientation.

Among the few IS researchers that have used the concept of fit, Chan and Huff showed that perceived business performance was higher when the IS strategy was aligned on the business strategy. The most fruitful approach to alignment seems to be one of moderation or interaction. Indeed, Raymond, Paré and Bergeron used such an approach to demonstrate that organizations whose IT sophistication was aligned on structural sophistication performed better than those that were misaligned. Hence, the following hypothesis:

Hypothesis 4: The relationship between strategic IT management and business performance indicated by Hypothesis 3 is stronger among organizations that have a stronger strategic orientation.

4. METHODOLOGY

4.1 Sample and Data Collection

The target population for this cross-sectional survey consists of several thousand business firms listed in Dun & Bradstreet’s (1993) Canadian Key Business Directory. All these organizations have more than 249 employees and spend $50,000 or more on their annual IS budget. In order to obtain a precise and representative sample, 1,000 organizations were selected using a systematic sampling technique (an organization taken at random from the first $k$ units and every $k$th organization thereafter), following Cochran’s recommendation (1963). The questionnaire used for data collection was pretested with five CEOs and CIOs through on-site interviews. A two-part questionnaire was addressed to the chief executive officer. He/she was asked to complete the first part concerning the organization’s strategic orientation and performance. He/she was also asked to have the chief information officer complete the second part pertaining to the firm’s strategic IT management. Both respondents mailed their questionnaire separately to secure confidentiality and independence. One week after the mailing, a follow-up card was sent out to all organizations reminding them of the importance of their participation in the study. There were 126 pairs (from both the CEO and CIO) of usable questionnaires returned for a response rate of 12.6%. Note that the somewhat lower response rate was to be expected given the fact that the questionnaire was initially addressed to the CEO. The time constraints of these individuals are here a more plausible explanation for non-response than the nature of the question under study or a faulty questionnaire design or administration procedure (Assael and Keon 1982). The results, however, must be interpreted with this limitation in mind.

The firms came from a variety of sectors as follows: manufacturing (27.7%), finance/insurance/real estate (13.4%), services (11.8%), transport/communications (8.4%), retail (6.7%), agriculture/forestry/fishing (4.2%), wholesale/distribution (3.4%), mining (1.7%), construction (1.7%) and others (21%). Their annual sales, $313 million on average, were distributed as follows: < $50MS (28%); $50MS to 100MS (20%); 101MS - 500MS (40%); 501MS to 1,000MS (6%); > 1,000MS (6%). They had 1,774 employees on average and a mean IS budget of $4.2 million.

4.2 Definition, Measurement and Validity of Variables

Strategic Orientation. The firm’s strategic orientation lies in the operationalization of the strategies tracing its course of action. This concept was measured with Venkatraman’s instrument. It is based on the measurement of six underlying traits or dimensions: aggressiveness (allocation of resources for improving market positions at a faster rate than competitors), analysis (tendency to search deeper for the root causes of problems and to generate the best solution), defensiveness (preservation of one’s own products, markets and technology through cost reduction and efficiency increase), futurity (emphasis on longer-term effectiveness), proactiveness (continuous search for new market opportunities and preemptive actions) and riskiness (organizational risk-taking in product, market and resource allocation choices).

The instrument is composed of 29 items rated by the respondents on seven-point scales (varying from 1= very weak to 7= very strong). The number of items forming each dimension along with
Cronbach alpha were as follows: aggressiveness (4, 0.81), analysis (6, 0.83), defensiveness (3, 0.77, one item eliminated), futurity (5, 0.67), proactivity (5, 0.60) and riskiness (5, 0.45). This reveals acceptable levels of reliability for all dimensions, except for riskiness which was judged to be somewhat unreliable (Nunnally and Durham 1975).

Strategic Information Technology Management. The instrument developed to measure the strategic information technology management construct (STITM) was based on the list of most critical issues facing information systems executives as extracted by Niederman, Brancheau and Wetherbe (1992). The STITM construct was operationalized by evaluating to what extent these issues constitute a strength or a weakness for the organization, relative to its competitors. The measure is strategic in that it positions each organization on a series of important IT management traits, relative to the competition. A principal components factor analysis (Table 1) identified five underlying factors: information systems positioning (the role and contribution of IS to organizational objectives); strategic use of IS (applications to gain competitive advantage); new IT applications (adoption of new technologies such as EDI and CASE); architecture planning (the existence of data, technology and systems architectures); and data security (data security, integrity and recovery).

The instrument is composed of 20 items rated by the respondents on a seven-point scale (ranging from 1= major weakness to 7= major strength) (see the appendix). Out of the original 20 items, 19 items were elected to form the factors. One item (#18) was eliminated because it did not load sufficiently on any one factor. The final number of items in each factor with the corresponding Cronbach alpha were as follows: information systems positioning (5, .79), strategic IS use (4 .77), new IT applications (4, .74); architecture planning (4, .78); security (2, .64). These levels of reliability were considered acceptable.

Business Performance. Business performance was measured along two dimensions: growth and profitability, and return on assets. The first dimension was measured with an instrument developed by Venkatraman. It consists of a subjective evaluation based on eight items rated by the respondents on a seven-point scale (1= very weak to 7= very strong). Its internal validity was found to be .89.

The second dimension, ROA, was assessed with an objective financial measure. There are various ways to calculate the ROA, most of which produce equivalent results when used for businesses comparison purposes (Dawson, Neupert and Stickney 1980). The exact measure used in this study is equal to: \( \text{net income plus income taxes plus interest expense, divided by total asset,} \) as used for instance by Yap and Walshman.

The ROA of each firm was first calculated with the above formula, and positioned on a 7 point equal interval scale (where 1= lower fractile, 4= median fractile and 7= upper fractile) following the recommended procedure (Gagnon and Khoury 1988; Deakin 1976; McDonald 1984). The position of each firm on the scale was determined by a careful analysis of its ROA relative to a group of organizations in the same industrial sector, as indicated by the four-digit SIC code. Financial data were extracted from the CanCorp database.

A subset of the sample of 126 firms was used to test the model relative to the return on assets measure of business performance. Out of the seventy-one business having their financial statements reported in the CanCorp database, twenty-three were eliminated for various reasons: fourteen with financial statements which were too old, three with too few comparable businesses in the same industrial sector, and three being too large or too small in terms of assets to suffer comparison. A study of statistical residuals eliminated three more organizations identified as outliers.

5. RESULTS AND DISCUSSION

The hypotheses were tested by computing zero-order and partial product-moment correlation coefficients for the global research constructs and for each of their dimensions (Figure 1). Additional analyses were made by forming sub-samples based on the median (high-low) strategic orientation (STRO) and strategic IT management (STITM), comparing correlations and means with Z and t tests. With methodological triangularization in mind, all tests were performed using both the perceptual (growth and profitability) and objective (ROA) measures of performance. The descriptive statistics of the research variables are presented in Table 2. Note that the correlation between these two dependent variables was 0.51 (p<0.001), in line with previous results linking both types of performance measures (Dess and Robinson 1984; Miller 1987)

5.1 Hypothesis 1

The results presented in Table 3 provide empirical support for the first hypothesis, linking strategy to performance. Looking at the first column from the left, the correlations confirm that the more an organizational posture or stance is strategically oriented overall, the better the performance in terms of profitability and ROA. In particular, the proactiveness, futurity and defensiveness dimensions are seen to contribute the most to both aspects of performance. Analysis has a positive effect on growth and profitability but not on ROA. Similarly to Venkatraman’s study, the negative results pertaining to the riskiness dimension could be attributed to its lack of reliability (alpha = 0.45).

Added support for Hypothesis 1 lies in the fact that the strength of the strategy-performance relationships remains the same, when one takes IT management into account by calculating partial correlations as shown in the second column. This would indicate that STITM has no mediating effect (STRO → STITM → Performance) on strategic orientation. However, when one looks at the strategy-performance relationships within the two sub-samples consisting
Table 1. Rotated Factor Matrix of Strategic IT Management (n = 126)

<table>
<thead>
<tr>
<th>Scale*</th>
<th>IS Position</th>
<th>Strategic IS Use</th>
<th>New IT Application</th>
<th>Architecture Planning</th>
<th>Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.77</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.62</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>.55</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>.48</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
<td>.65</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
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<tr>
<td>7</td>
<td>.72</td>
<td>-</td>
<td>-</td>
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<td>8</td>
<td>-</td>
<td>.65</td>
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<td>-</td>
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<tr>
<td>9</td>
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<td>.69</td>
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<tr>
<td>12</td>
<td>-</td>
<td>-</td>
<td>.60</td>
<td>-</td>
<td>-</td>
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<tr>
<td>13</td>
<td>-</td>
<td>-</td>
<td>.77</td>
<td>-</td>
<td>-</td>
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<td>14</td>
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<tr>
<td>15</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.52</td>
<td>-</td>
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<tr>
<td>16</td>
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<td>.69</td>
<td>-</td>
<td>-</td>
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<tr>
<td>17</td>
<td>-</td>
<td>.71</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>18</td>
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<tr>
<td>19</td>
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<td>.77</td>
</tr>
<tr>
<td>20</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.79</td>
</tr>
</tbody>
</table>

% variance: 37.7, 7.9, 6.4, 6.0, 5.1
Eigenvalue: 7.5, 1.6, 1.3, 1.2, 1.0

*The Strategic IT Management scales are presented in the Appendix.

Table 2. Descriptive Statistics of the Research Variables (n = 126)

<table>
<thead>
<tr>
<th>Variable (range)</th>
<th>mean</th>
<th>alpha</th>
<th>s.d.</th>
<th>min.</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic Orientation (1-7)</td>
<td>4.88</td>
<td>.81</td>
<td>.60</td>
<td>2.83</td>
<td>6.48</td>
</tr>
<tr>
<td>aggressiveness</td>
<td>3.44</td>
<td>.81</td>
<td>1.30</td>
<td>1.00</td>
<td>6.50</td>
</tr>
<tr>
<td>analysis</td>
<td>5.59</td>
<td>.83</td>
<td>.90</td>
<td>2.67</td>
<td>7.00</td>
</tr>
<tr>
<td>defensiveness</td>
<td>5.16</td>
<td>.77</td>
<td>1.14</td>
<td>1.67</td>
<td>7.00</td>
</tr>
<tr>
<td>futurity</td>
<td>5.28</td>
<td>.67</td>
<td>.89</td>
<td>2.60</td>
<td>7.00</td>
</tr>
<tr>
<td>proactiveness</td>
<td>4.59</td>
<td>.60</td>
<td>.88</td>
<td>2.60</td>
<td>7.00</td>
</tr>
<tr>
<td>riskiness</td>
<td>4.55</td>
<td>.45</td>
<td>.85</td>
<td>2.00</td>
<td>7.00</td>
</tr>
<tr>
<td>IS positioning</td>
<td>4.88</td>
<td>.79</td>
<td>1.06</td>
<td>1.00</td>
<td>7.00</td>
</tr>
<tr>
<td>strategic use of IS</td>
<td>4.31</td>
<td>.77</td>
<td>1.11</td>
<td>1.00</td>
<td>6.75</td>
</tr>
<tr>
<td>new IT applications</td>
<td>3.99</td>
<td>.74</td>
<td>1.09</td>
<td>1.00</td>
<td>6.75</td>
</tr>
<tr>
<td>architecture planning</td>
<td>4.60</td>
<td>.78</td>
<td>1.11</td>
<td>1.50</td>
<td>7.00</td>
</tr>
<tr>
<td>security</td>
<td>4.94</td>
<td>.64</td>
<td>1.25</td>
<td>2.00</td>
<td>7.00</td>
</tr>
<tr>
<td>growth and profitability</td>
<td>4.40</td>
<td>.89</td>
<td>1.17</td>
<td>1.63</td>
<td>6.63</td>
</tr>
<tr>
<td>return on assets*</td>
<td>4.94</td>
<td>.33</td>
<td>1.34</td>
<td>2.00</td>
<td>7.00</td>
</tr>
</tbody>
</table>

*(n = 48)
of organizations who do manage IT strategically (high SITM) and those who do not (low SITM), a significant moderating effect occurs, i.e., (SITM -> [STRO -> Performance]). The positive impact of strategy becomes much stronger overall in the former group, whereas it becomes non significant in the latter.

Differences between the two sets of correlations notably occur along the analysis and defensiveness dimensions, as demonstrated by significant Z values. The exception is the proactiveness dimension whose correlation with performance remains equally strong in both high and low-SITM groups. The strategic key to performance would thus lie in searching for new business opportunities, in introducing innovative new products or services to stay ahead of the competition, and in acting on rather than reacting to changing environmental trends. From a validity standpoint, these results are seen to be in line with Venkatraman’s (1989) study that showed proactiveness to be dominant in regard to growth and profitability, and both aggressiveness and riskiness to have no positive effect.

### 5.2 Hypothesis 2

Shown in Table 4 are the correlation coefficients related to the second hypothesis, linking strategy and information technology. These results confirm that the more strategically oriented the organization, the more it tends to manage IT strategically. This is
true for all dimensions of SITM with the exception of security. Here, one could surmise that systems security has now become a primary concern for all organizations, irrespective of their strategic posture.

Also, the effect of strategic orientation on IT management originates mostly from the analysis and futurity dimensions. The former trait refers to the rationality and comprehensiveness of organizational decision-making, whereas the latter refers to the organizational time frame (short versus long term). A more analytic, future-oriented organization uses planning, coordinating, forecasting and tracking systems more extensively. This would require management to support these systems by aligning its IT planning, organizing and control activities more strategically, and by providing the needed data, applications and technological infrastructure. Correspondingly, a well articulated architecture planning and the support of strategic IS applications might be considered as conditions for a strategic orientation to take form.

### 5.3 Hypothesis 3

Directly linking IT management to performance, the third hypothesis cannot be confirmed. Looking at the first column from the left in Table 5, the only significant correlation is between the IS positioning dimension and ROA. Again, one can see why previous researchers have had difficulty in linking IT investment or sophistication by itself to organizational performance. These results lose even more significance when one controls for strategic orientation, by calculating partial correlations, as shown in the second column. This would indicate that STRO has no mediating effect (SITM → STRO → Performance).

The preceding results are in line with Raymond, Paré and Bergeron's finding that IT management sophistication does not by itself affect business performance, that is, irrespective of structure (or strategy in this case). These authors state that to better understand the effect of IT management, one should rather look to a joint effect ("alignment" or "fit") with strategy and structure. This is done in the following section.

### 5.4 Hypothesis 4

The last research hypothesis stated that the effect of strategic IT management on performance would be greater in organizations having a more strategic orientation. This is globally confirmed by the two sets of correlations presented in Table 5, using the median value to break down the sample into two groups (high and low STRO). Z tests indicate that the relationship between IT management and performance is stronger in the high STRO group, indicating strategy's moderating effect (STRO → [SITM → Performance]). This is also evidence of a possible reverse causality between IT and business strategy (Powell 1992), given their mutually moderating effect in relation to performance.

In regard to growth and profitability, managing IT strategically would in fact have a dysfunctional effect in firms that are not strategically oriented, as shown by significant but negative correlations. Conversely, IT management has a positive effect on ROA only in firms that show a strong strategic orientation. These results are also in line with the general argument that IT management does not by itself impact performance, but only to the extent that it is aligned with the organization's strategy or structure (Livari 1992).

### 5.5 Further Analyses

Given the need for a more encompassing perspective on strategic fit (Van de Ven and Drazin 1985), other types of joint effects can
of organizations who do manage IT strategically (high SITM) and those who do not (low SITM), a significant *moderating* effect occurs, i.e., (SITM → (STRO → Performance)). The positive impact of strategy becomes much stronger overall in the former group, whereas it becomes non significant in the latter.

Differences between the two sets of correlations notably occur along the analysis and defensive dimensions, as demonstrated by significant *Z* values. The exception is the proactiveness dimension whose correlation with performance remains equally strong in both high and low-SITM groups. The strategic key to performance would thus lie in searching for new business opportunities, in introducing innovative new products or services to stay ahead of the competition, and in acting on rather than reacting to changing environmental trends. From a validity standpoint, these results are seen to be in line with Venkatraman’s (1989) study that showed proactivity to be dominant in regard to growth and profitability, and both aggressiveness and riskiness to have no positive effect.

### 5.2 Hypothesis 2

Shown in Table 4 are the correlation coefficients related to the second hypothesis, linking strategy and information technology. These results confirm that the more strategically oriented the organization, the more it tends to manage IT strategically. This is

<table>
<thead>
<tr>
<th>Table 3. Correlations of Strategic Orientation with Organizational Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>with Growth and Profitability</strong></td>
</tr>
<tr>
<td><strong>Strategic Orientation</strong></td>
</tr>
<tr>
<td><strong>aggressiveness</strong></td>
</tr>
<tr>
<td><strong>analysis</strong></td>
</tr>
<tr>
<td><strong>defensiveness</strong></td>
</tr>
<tr>
<td><strong>futurity</strong></td>
</tr>
<tr>
<td><strong>proactiveness</strong></td>
</tr>
<tr>
<td><strong>riskiness</strong></td>
</tr>
<tr>
<td><strong>with Return on Assets</strong></td>
</tr>
<tr>
<td><strong>Strategic Orientation</strong></td>
</tr>
<tr>
<td><strong>aggressiveness</strong></td>
</tr>
<tr>
<td><strong>analysis</strong></td>
</tr>
<tr>
<td><strong>defensiveness</strong></td>
</tr>
<tr>
<td><strong>futurity</strong></td>
</tr>
<tr>
<td><strong>proactiveness</strong></td>
</tr>
<tr>
<td><strong>riskiness</strong></td>
</tr>
</tbody>
</table>

*Partial correlation, controlling for Strategic IT Management (SITM).*  
*High/Low: based on median Strategic IT Management score.*  
*A positive Z score indicates that the correlation between Strategic Orientation and Organizational Performance is greater in the high-SITM firms than in the low-SITM firms (Guilford and Fruchter 1973, pp. 166-167).*  
*p < 0.05  **p < 0.01  ***p < 0.001*
true for all dimensions of SITM with the exception of security. Here, one could surmise that systems security has now become a primary concern for all organizations, irrespective of their strategic posture.

Also, the effect of strategic orientation on IT management originates mostly from the analysis and futurity dimensions. The former trait refers to the rationality and comprehensiveness of organizational decision-making, whereas the latter refers to the organizational time frame (short versus long term). A more analytic, future-oriented organization uses planning, coordinating, forecasting and tracking systems more extensively. This would require management to support these systems by aligning its IT planning, organizing and control activities more strategically, and by providing the needed data, applications and technological infrastructure. Correspondingly, a well articulated architecture planning and the support of strategic IS applications might be considered as conditions for a strategic orientation to take form.

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The preceding results are in line with Raymond, Paré and Bergeron’s finding that IT management sophistication does not by itself affect business performance, that is, irrespective of structure (or strategy in this case). These authors state that to better understand the effect of IT management, one should rather look to a joint effect (“alignment” or “fit”) with strategy and structure. This is done in the following section.

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### 5.5 Further Analyses

Given the need for a more encompassing perspective on strategic fit (Van de Ven and Drazin 1985), other types of joint effects can
Table 5. Correlations of Strategic IT Management with Organizational Performance

<table>
<thead>
<tr>
<th></th>
<th>with Growth and Profitability</th>
<th></th>
<th></th>
<th></th>
<th>Z*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All firms (n = 126)</td>
<td>High* SITM (n = 62)</td>
<td>Low SITM (n = 64)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>part.*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic IT Management</td>
<td>.01</td>
<td>-.11</td>
<td>.11</td>
<td>-.25*</td>
<td>1.99*</td>
</tr>
<tr>
<td>IS positioning</td>
<td>-.02</td>
<td>-.10</td>
<td>.13</td>
<td>-.27*</td>
<td>2.23*</td>
</tr>
<tr>
<td>strategic use of IS</td>
<td>.04</td>
<td>-.08</td>
<td>.17</td>
<td>-.22*</td>
<td>2.16*</td>
</tr>
<tr>
<td>new IT applications</td>
<td>-.03</td>
<td>-.13</td>
<td>-.11</td>
<td>-.11</td>
<td>0.00</td>
</tr>
<tr>
<td>architecture planning</td>
<td>.06</td>
<td>-.05</td>
<td>.15</td>
<td>-.20*</td>
<td>1.93*</td>
</tr>
<tr>
<td>security</td>
<td>-.03</td>
<td>-.05</td>
<td>.02</td>
<td>-.16</td>
<td>0.99</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>with Return on Assets</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All firms (n = 48)</td>
<td>High* SITM (n = 25)</td>
<td>Low SITM (n = 23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>part.*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic IT Management</td>
<td>.18</td>
<td>.06</td>
<td>.36*</td>
<td>-.07</td>
<td>1.45</td>
</tr>
<tr>
<td>IS positioning</td>
<td>.24*</td>
<td>.16</td>
<td>.25</td>
<td>.16</td>
<td>1.35</td>
</tr>
<tr>
<td>strategic use of IS</td>
<td>.19</td>
<td>.06</td>
<td>.44*</td>
<td>-.09</td>
<td>1.82*</td>
</tr>
<tr>
<td>new IT applications</td>
<td>.07</td>
<td>-.04</td>
<td>.29</td>
<td>-.18</td>
<td>1.56</td>
</tr>
<tr>
<td>architecture planning</td>
<td>.15</td>
<td>.03</td>
<td>.33*</td>
<td>-.10</td>
<td>1.43</td>
</tr>
<tr>
<td>security</td>
<td>-.05</td>
<td>-.08</td>
<td>-.13</td>
<td>-.03</td>
<td>-.32</td>
</tr>
</tbody>
</table>

*Partial correlation, controlling for Strategic Orientation (STRO)

*High/Low: based on median Strategic Orientation score

*A positive Z score indicates that the correlation between Strategic IT Management and Organizational Performance is greater in the high-STRO firms than in the low-STRO firms (Guilford and Fruchter 1973, pp. 166-167).

*p < 0.05

be analyzed. In line with the last hypothesis, one can also test for an interaction effect between strategic orientation and IT management ([STRO x SITM] -> Performance). The correlations presented in Table 6, linking the product of the two independent variables and their respective dimensions to performance, confirm the presence of such an effect on profitability, and especially on ROA. The dominant dimensions in this regard are proactive and defensiveness for STRO, joined with strategic IS use and IS positioning for SITM. The strongest combination would thus be a firm that seeks new product and market opportunities, and more efficiency to preserve its existing markets. This strategy should be aligned with an IT management that has an equally strong strategic vision and promotes the use of information systems in supporting strategic decision-making (e.g., DSS, EIS) and in attaining a competitive advantage (e.g., through operations support applications) (Bergeron, Buteau and Raymond 1991).

To better visualize this effect, a breakdown of the sample into four groups was performed, based on the median value for strategic orientation and IT management (low/low, low/high, high/low and high/high). Comparing the performance means for each group, t-test results shown in Table 7 indicate, as expected, that the high STRO/high SITM group had a significantly better performance than the three other groups, concuring with Chan and Huff’s findings. There was however no significant difference in performance among the latter, even though the low/high and high/low groups should have had better performances than the low/low group. However, strategic orientation had more of an effect on

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growth and profitability (low versus high STRO groups), whereas strategic IT management had more of an effect on ROA (low versus high SITM). A tentative interpretation of this last result could take into account the time-frame difference between the two performance measures (Kaplan 1982). Strategic IT management would show its effects sooner, in the form of greater returns on assets, whereas strategic orientation would pay off later, (i.e., in long-term increases in sales and profitability).

A final analysis involves a difference or matching approach to alignment ([STRO-SITM]² → Performance). Given the preceding justification for the research model, and for Hypothesis 4 in particular, this last approach seems to be a priori less plausible. For instance, contrary to the preceding interaction approach, it would entail that a low STRO/low SITM combination would be as effective as a high/high combination. Nonetheless, it was tested for comparison purposes. In contrast to the interaction approach (Table 6), the matching approach was much less successful in explaining performance.

6. FUTURE RESEARCH

While providing new and interesting empirical results on the contribution of information technology to organizational performance, this study should be followed by others. A "systems" rather than a bivariate approach to alignment (Van de Ven and Drazin 1985) could be used to analyze the joint effects of strategic orientation and IT management, given the multidimensional nature of these constructs. Further data analyses that are to be carried out by the researchers will thus include multivariate techniques such as cluster analysis and structural equation modeling, in order to more fully understand the internal coherence, patterns and covariations among the various strategic dimensions. In the same vein, while a fair amount of knowledge has now been gained by IS researchers and organization theorists on the strategy-IT, structure-IT and strategy-structure alignments, one should now look at combined strategy-IT-structure effects on business performance for greater explanatory power.
Table 7. Breakdown of Organizational Performance by Strategic Orientation (STRO) and Strategic IT Management (SITM)

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low STRO</td>
<td>low STRO</td>
<td>high STRO</td>
<td>high STRO</td>
</tr>
<tr>
<td></td>
<td>low SITM</td>
<td>high SITM</td>
<td>low SITM</td>
<td>high SITM</td>
</tr>
<tr>
<td>Growth and profitability</td>
<td>(n = 37)</td>
<td>(n = 27)</td>
<td>(n = 26)</td>
<td>(n = 36)</td>
</tr>
<tr>
<td>(F = 6.0*** mean (1-7))</td>
<td>4.3</td>
<td>3.9</td>
<td>4.3</td>
<td>5.1</td>
</tr>
<tr>
<td>s.d.</td>
<td>1.1</td>
<td>1.1</td>
<td>1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Contrasts (t value)*</td>
<td>-</td>
<td>-1.2</td>
<td>0.0</td>
<td>3.0**</td>
</tr>
<tr>
<td>Group 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td>-</td>
<td>1.2</td>
<td>4.0***</td>
</tr>
<tr>
<td>Group 3</td>
<td></td>
<td></td>
<td>-</td>
<td>2.7**</td>
</tr>
<tr>
<td>Group 4</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Return on assets</td>
<td>(n = 14)</td>
<td>(n = 9)</td>
<td>(n = 10)</td>
<td>(n = 15)</td>
</tr>
<tr>
<td>(F = 3.1*) mean (1-7)</td>
<td>4.5</td>
<td>5.1</td>
<td>4.3</td>
<td>5.7</td>
</tr>
<tr>
<td>s.d.</td>
<td>1.2</td>
<td>1.4</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Contrasts (t value)*</td>
<td>-</td>
<td>1.1</td>
<td>-0.4</td>
<td>2.5*</td>
</tr>
<tr>
<td>Group 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td>-</td>
<td>-1.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Group 3</td>
<td></td>
<td></td>
<td>-</td>
<td>2.7**</td>
</tr>
<tr>
<td>Group 4</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

*Comparing means for each pair of groups

*p < 0.05 **p < 0.01 ***p < 0.001

7. CONCLUSION

This study has important implications for IS research and management practice. It has provided empirical evidence for the strategic conditions under which information technology contributes to the bottom line. Peak performance, both in perceptual (growth and profitability) and objective (ROA) terms, was achieved by organizations that combine a strong strategic orientation to a strategically oriented IT management. In this regard, a moderation or interaction conceptualization of fit was seen to be most appropriate, as was the use of two different types of performance measure. Another contribution of this study is the instrument developed to measure IT management, designed to reflect the inherent nature of this construct as perceived by IS executives, rather than to parallel the business strategy measure.

IT investment by itself, be it transactional, managerial or strategic in nature, provides no assurance of bottom line improvements. In an increasingly complex, uncertain and global business environment, firms needing to maintain or increase performance levels must adopt a stronger strategic posture (i.e., must be more aggressive, proactive, analytical and future-oriented), and must ensure that IT management follows suit. This means aligning the strategic position and use of IS on organizational objectives and providing the required support in terms of data, applications and technology. In this regard, the SITM instrument can be used by management to pinpoint the organization's strengths and weaknesses and to size the extent to which the IS function may help the organization define its own strategic orientation. Hence, IT management will be more focused, leading to improved business performance.

8. ACKNOWLEDGMENTS

The authors wish to thank the anonymous reviewers for their constructive comments, Eric Benoit, Martin Tessier, and Emilio Boulianne, graduate students in MIS for their participation in this study, Professor Jean-Marie Gagnon, for his advice, and the Government of Québec (FCAR), for its financial support.
9. REFERENCES


Weill, P., and Olson, M. H. “Managing Investment in Information Technology: Mini Case Examples and Implications.” MIS Quarterly, Volume 13, Number 1, March 1989, pp. 3-18.


Appendix

STRENGTHS AND WEAKNESSES OF INFORMATION SYSTEMS

In comparing your organization with competition, indicate whether these aspects of your information systems constitute a strong or weak point of your organization. Refer to this scale to answer:

<table>
<thead>
<tr>
<th>very weak</th>
<th>moderately weak</th>
<th>slightly weak</th>
<th>neither strong nor weak</th>
<th>slightly strong</th>
<th>moderately strong</th>
<th>very strong</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>N/A</td>
</tr>
</tbody>
</table>

You must circle “N/A” for every question that is not applicable to your situation.

1. Implementation of an information architecture to guide applications development and facilitate the integration and sharing of data
2. Effective use of data resource (the Information Systems Department develops a climate in which data is considered a corporate asset)
3. Strategic planning of information systems in relation with the business objectives of the organization
4. Recruitment and development of human resources for information systems
5. Continuous learning in the organization about ways to better use and integrate new information technologies
6. Implementation of a responsive information technologies infrastructure
7. Appropriate position of the Information Systems Department according to the structure and needs of the organization (centralization/decentralization)
8. Development and use of information systems for competitive advantage
9. Quality and effectiveness of software development
10. Planning and implementation of a telecommunications infrastructure that is flexible and effective
11. Understanding the role and contribution of information systems
12. Use of electronic data interchange systems (EDI) with your customers, retailers and/or business partners
13. Development and management of distributed systems
14. Use of CASE technologies for software development
15. Planning and management of the applications portfolio
16. Measure of information systems effectiveness and productivity


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<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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11. Understanding the role and contribution of information systems
12. Use of electronic data interchange systems (EDI) with your customers, retailers and/or business partners
13. Development and management of distributed systems
14. Use of CASE technologies for software development
15. Planning and management of the applications portfolio
16. Measure of information systems effectiveness and productivity
17. Development and management of decision support systems and executive support systems | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A

18. Management and use of end-user computing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A

19. Information security and control | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A

20. Establishment of effective disaster recovery capabilities | 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A