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# An information technology trilogy: business strategy, technological deployment and organizational performance

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**Abstract**

The objective of this empirical study is to identify various profiles of technological deployment specific to various types of business strategy that best support organizational performance. Top managers from 223 organizations completed two questionnaizres analyzed using a Partial Least Squares tool (PLS graph). Profiles of technological deployment based on the strategic impact of the information system department, the technological architecture, the information system performance evaluation and technological scanning were identified. Using Miles and Snow's typology to characterize business strategy, an outward technological profile contributes directly to organizational performance for the analyzer strategic activities, while an inward profile of technological deployment contributes indirectly to organizational performance for the prospector strategic activities.


*Keywords*: Strategic alignment; Profile of technological deployment; Business strategy; Information technology; Organizational performance; Miles and Snow's typology

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## 1. Introduction

Information technology plays a significant strategic role within organizations (Bergeron and Raymond, 1995; Henderson and Venkatraman, 1999; Porter and Millar, 1985; McFarlan et al., 1983). Strategic information systems (IS) can support or even shape business strategy. Furthermore, some conventional information systems become strategic when used in innovative ways (Wiseman, 1988). Since the early 1990s, improving the information system planning process has been one of the top 10 concerns of senior IS executives (Janz et al., 1996). In order to carry out this planning process successfully, it is important to align the IS plan with the organization's business plan (Busch, 1999; Luftman, 1998; Saviano, 1997). GartnerGroup's 1999 annual survey reports that aligning information technology with business goals is still among the Chief Information Officer's top 10 issues in management of technology (Raphaelian and Broadbent, 1999).

Some studies have successfully observed the effect of the alignment of information technology with organizational variables on organizational performance. These variables are the strategic management of IS, the organizational structure or the business strategy (Bergeron and Raymond, 1995; Raymond et al., 1995; Chan et al., 1997).

The importance of strategic alignment of information technology is being acknowledged; however, some issues still need to be addressed. For example, how organizations really deploy their information technology with respect to their business strategy. None of those studies mention any particular types of technological deployment belonging to a specific business strategy.

The original contribution of this study is the identification of the profiles of technological deployment associated with various types of business strategy. This article will also further the understanding of the impact of IS on organizational performance as recommended by DeLone and McLean (1992) as well as the interaction between business strategy and other organizational components such as the deployment of information technology (Miller, 1996). Using a contingency approach, this article looks at the different profiles of technological deployment associated to different types of business strategy.

## 2. Literature review

The literature review is organized according to the three basic constructs of the research: business strategy, technological deployment, and organizational performance.

### *2.1. Business strategy*

Business strategy is the outcome of decisions made to guide an organization with respect to the environment, structure and processes that influence its organizational performance. Approaches to identifying business strategies are textual, multivariate or typological (Hambrick, 1980). The typological approach to identifying business strategy is recognized as creating a better understanding of the strategic reality of an organization, since all types of business strategy are viewed as having particular characteristics. There are several typologies (Ansoff and Stewart, 1967; Freeman, 1974; Porter, 1980; Miles and Snow, 1978). According to Zahra and Pearce (1990) and Smith et al. (1989), the most popular typology is Miles and Snow's. Indeed, a search of the literature revealed that it has been quoted more than 650 times (Social Sciences Quotation Index, 1989–2000).

One of the principal strengths of Miles and Snow's typology is the simultaneous consideration of the structure and processes necessary for the realization of a given type of business strategy. Miles and Snow's typology reflects a complex view of organizational and environmental processes, as well as the attributes of product, market, technology, organizational structure and management characteristics (Smith et al., 1989).

Miles and Snow's typology consists of four types of business strategy defined as prospector, analyzer, defender and reactor. Firms choose one type over another according to the perception they have of their environment. The first three types are expected to enhance organizational performance and share the same continuum where the prospector strategy is at one end of it, the defender at the other, and the analyzer strategy stands in the middle. The reactor strategy is expected to impede organizational performance and is excluded from the continuum.

Organizations supporting the prospector strategy wish to have access to the largest possible market. They are characterized by their repeated efforts to innovate and bring changes in their industry. Organizations favoring the defender strategy have a restricted market and stress production efficiency. They emphasize the excellence of their products, the quality of their services, and their lower prices. Organizations implementing the analyzer strategy share both prospector and defender characteristics, but in moderation. They seek to be first to introduce some new products, but are satisfied to remain in second place with certain products that offer a good quality/price ratio. Finally, organizations supporting the reactor strategy ignore new opportunities, and cannot maintain markets already acquired or take true risks.

Ample research has been conducted on the relationship between business strategy and organizational performance with the premise that the strategic orientation of a firm could be a crucial aspect in determining bottom line results. In a study on strategic management, Miller (1987) found a positive association between business strategy and organizational performance under various conditions. Venkatraman (1989b), Zahra and Covin (1993), and Parnell et al. (1996) also found various dimensions of business strategy to be positively related to organizational performance. A specific stream of research employed Miles and Snow's typology (Snow and Hrebiniak, 1980; Hambrick, 1983; Conant et al., 1989; Namiki, 1989; Smith et al., 1989; Tavakolian, 1989; Shortell and Zajac, 1990; Thomas et al., 1991; Parry and Parry, 1992; Abernethy and Guthrie, 1994; Julien et al., 1996; Karimi et al., 1996). Organizational performance has been regularly used in evaluating the impact of business strategy based on this typology. The most common observation is that the prospector, analyzer and defender strategies usually contribute to organizational performance while the reactor strategy contributes negatively to it (Conant et al., 1989; Namiki, 1989; Snow and Hrebiniak, 1980).

### *2.2. Technological deployment*

Technological deployment corresponds to the way companies plan and manage information technology to benefit from its potential and effectiveness. The concept of technological deployment arises from five recognized conceptual frameworks addressing the strategic aspect of IS (McFarlan et al., 1983; Porter and Millar, 1985; Das et al., 1991; Henderson and Venkatraman, 1999; Bergeron and Raymond, 1995).

The first conceptual framework, proposed by McFarlan et al. (1983), stresses the importance of the strategic value of IS and the portfolio evaluation of current and future applications. A second conceptual framework from Porter and Millar (1985) highlights the contribution of IT in enhancing the competitive position of an organization. A third conceptual framework suggested by Das et al. (1991) proposes four principal dimensions related to the deployment of information technology: distinct competencies, the role of IT, design and development of IS, as well as technological, organizational and administrative infrastructures. Henderson and Venkatraman (1999) indicated that to realize a successful strategic alignment of IT with the business strategy, companies should address components such as business strategy, IT strategy, organizational infrastructure and technological infrastructure. Finally, the model of strategic management of IT from Bergeron and Raymond (1995) includes five major concerns of the CIOs related to the management of IS: the positioning and role of IS, the strategic use of IS, new technological applications, the planning of architecture, and the security. The expression 'technological deployment' emerges from those five conceptual models.

Overall, seven components emerge from these frameworks. First, the *strategic use of information technology* refers to the IT applications used to help the organization gain a competitive advantage, reduce competitive disadvantage, or meet other strategic enterprise objectives (Bergeron and Raymond, 1995; Bergeron et al., 1991). Second, the *management of information technology* looks at the activities of the IT department such as the usage of current and new technologies, the development of specific IT applications and the degree of IT usage practiced by the employees (Bergeron and Raymond, 1995; Parry and Parry, 1992; Das et al., 1991). Third, the *role of the IS department* concerns the organizational importance of IT planning, the quality of the IT alignment with organizational structure, the effectiveness of software development, and the management of communication networks (Bergeron and Raymond, 1995). Fourth, the *technological infrastructure* addresses the IT architecture and the formalized procedures used to guide and control the firm's IT resources (Das et al., 1991; Bergeron and Raymond, 1995). Fifth, the *organizational infrastructure* refers to the internal functioning of the IS department such as formal structure, processes, reporting relationships, support groups, and skills (Das et al., 1991; Henderson and Venkatraman, 1999). Sixth, the *administrative infrastructure* deals with the managerial policies and actions that influence and guide the work of employees involved with the IS department (Das et al., 1991). Finally, *technological scanning* refers to the managed acquisition, analysis, and diffusion of IT information by members of the IS department to increase the competitiveness of the company (Julien et al., 1996; Sutcliffe; 1994). This component was not directly mentioned within the frameworks as a distinct component but it is presented here given its importance in any competitive IT environment.

As explained by Henderson and Venkatraman (1999), it is important that IT be aligned with business strategy. Therefore, firms could adopt different types of technological deployment depending on their various business strategies. According to Das et al. (1991), the IT activities of organizations of the prospector type would be characterized by: a more intensive use of IT, better management of IT, a more important role of the IS department, more decentralized and flexible technological, organizational and administrative infrastructures, and more intensive technological scanning than the ones associated with the defender type. Research has been done supporting some of these perspectives (Bergeron and Raymond, 1995; Julien et al., 1996; Parry and Parry, 1992).

Little research has shown the existence of a direct link between IT management and organizational performance. However, using contingential approaches, Bergeron and Raymond (1995), Chan et al. (1997), and Sabherwal and Kirs (1994) have been able to identify indirect links between these variables. The impact of IT on organizational performance is therefore an interesting concept to study further.

### *2.3. Organizational performance*

Following their literature review on the impact of IS in organizations, DeLone and McLean (1992) noted that future efforts should focus on the impact of IS on organizational performance. Despite the difficulties in explaining the contribution of information technology to organizational performance, a few studies have concluded on the importance of the alignment among business strategy, information technology and organizational performance (Bergeron and Raymond, 1995; Chan et al., 1997).

However, measuring organizational performance can also be a problem since there is no universally recognized measure of this concept. Organizational performance can be assessed using either objective or subjective data (Dess and Robinson, 1984). The objective approach refers to the financial data provided by the organization, whereas the subjective measurement calls upon the perception of the respondent. The results obtained from their study indicate that neither approach is preferable to the other, each producing similar results. In a study on organizational performance, Bergeron and Raymond (1995) used both an objective (return on assets) and a subjective measurement (instrument of Venkatraman, 1989b); in each case, the results obtained were comparable and significant.

## 3. Research model

The research model shown in Fig. 1 has been developed to answer the following question: *Given a type of business strategy, what profile of technological deployment best help firms enhance their performance?*

A contingency approach was used to test the model to get a better understanding of the impact of IS on performance (Weill and Olson, 1989; Raymond et al., 1995; Bergeron et

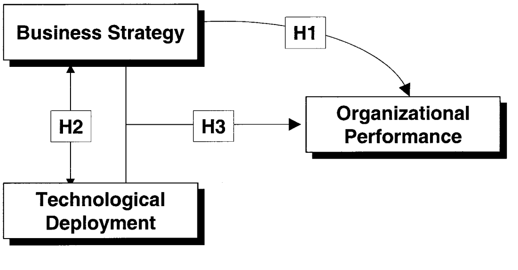


Fig. 1. Research model.

al., 1998). This approach consists of examining simultaneously the links between several variables, such as business strategy, technological deployment, and organizational performance. These links can be assessed by using the notion of fit. Among the several definitions of fit, the notion of fit as a mediator was used (Venkatraman, 1989a). A mediating variable intervenes between independent variables and a dependent variable (in this case, performance). In turn, business strategy and technological deployment can be mediating variables. For example, technological deployment is the independent variable that influences business strategy (mediating variable), which in turn influences organizational performance (dependent variable). The reverse is also possible: business strategy is the independent variable that influences technological deployment (mediating variable), which in turn influences organizational performance (dependent variable). The mediating approach illustrates the two strategic possibilities of information technology as a primary source of influence of strategy, i.e. the impact approach, or as being influenced by the business strategy, i.e. the alignment approach (Vitale et al., 1986; Bergeron et al., 1991). A two-ways path between business strategy and technological deployment illustrates this mediating approach. This double arrow also indicates that, statistically speaking, there is no difference if the arrow goes from the business strategy toward technological deployment or vice versa.

### *3.1. Hypotheses*

This research model is tested across three hypotheses. Several studies have already shown that there is a positive link between organizational performance and the prospector, analyzer and defender business strategy (Parry and Parry, 1992; Conant et al., 1989; Smith et al., 1989; Snow and Hrebiniak, 1980) and a negative link in the case of the fourth business strategy (reactor) (Zahra and Pearce, 1990). Since this link has already been tested in previous research, the first hypothesis is included to validate the research model.

> H1: The more specific the type of business strategy adopted by an organization, the better the organizational performance (a negative link is expected for the reactor type).

The second hypothesis concerns the identification of specific profiles of technological deployment associated to different types of business strategy. Technological deployment is based on various aspects of information technology management considered essential to organizational performance. This includes components such as the strategic use of information technology, management of information technology, the role of the IS department, technological infrastructure, the organizational infrastructure, the administrative infrastructure, and technological scanning (Bergeron and Raymond, 1995; Das et al., 1991).

> H2: There is a profile of technological deployment specific to each type of business strategy.

The third hypothesis concerns the link between a profile of technological deployment for a given type of business strategy and organizational performance. It is expected that each organization favors a specific strategic type of business strategy. For each type of business strategy, there should exist a profile of technological deployment that will optimize performance. Indeed, the importance of a strategic alignment of information technology has been reported in the literature (Boar, 1994; Chan et al., 1997). Recent research observed the existence of significant relationships among firms' strategic orientation and facets of strategic information technology management (Bergeron and Raymond, 1995; Bergeron et al.,1998, 2001).

H3: For each type of business strategy, the more specific the profile of technological deployment, the better the organizational performance.

### *3.2. Variables and measurements*

Business strategy is defined as actions taken by an organization to reach its objectives. In this study, only business strategy that has been realized, not one which is merely intended, is measured (as recommended by Mintzberg, 1979). As Venkatraman (1989b) suggested, business strategy is studied at the business level to discover how firms compete effectively in their product-market segments. Four types of business strategy (prospector, analyzer, defender and reactor) are examined, using the 23 items of Segev's instrument (1987) rated on a Likert-type scale varying from 1 to 7 (highly disagree to highly agree). Although Miles and Snow's typology was used, organizations could not be clearly classified as one type or another based on the data set. Thus, it is the level of *strategic activities* pertaining to each type that was used to test the hypotheses. This means that for each organization, four levels of strategic activities were calculated, one for each possible type. To be sure that the business strategy is seen as a series of activities, the terms 'prospector, analyzer, defender and reactor *strategic activities*' is used thereafter.

Technological deployment corresponds to the way companies plan and manage information technology to benefit from its potential and effectiveness. The *initial* scale of technological deployment consists of seven components: strategic use of IT, IT management, role of the IS deployment, technological infrastructure, organizational infrastructure, administrative infrastructure, and technological scanning. The instrument uses 53 items extracted mainly from Das et al.'s (1991), Bergeron and Raymond's (1995) and Janz et al.'s (1996) works, while the items concerning technological scanning were designed by the authors. The items were also rated on a Likert-type scale varying from 1 to 7 (highly disagree to highly agree). A more 'specific' profile means that the profile of technological deployment incorporates many desirable elements or qualities, and translates to a high score on the scale.

Finally, organizational performance reflects the user's perception of organizational sales growth and profitability. Items addressing the level of the respondent's satisfaction with regard to sales growth, market share gains and financial liquidity position are comprised of this scale (Venkatraman, 1989b). The eight items were rated on a Likert-type scale varying from 1 to 7 (very dissatisfied to very satisfied).

## 4. Methodology

### *4.1. Sample and data collection*

Following in-depth interviews used to pre-test the research instrument, paired questionnaires were sent to a sample 1949 Canadian firms listed in Dun and Bradstreet's directory. The first questionnaire, concerning business strategy, was addressed to the Chief Executive Officer, while the second, pertaining to technological deployment was addressed to the Chief Information Officer. The selection criteria were to have more than 250 employees (to have a minimum of technological deployment) and to come from various branches of industry. Two hundred and forty-three companies returned both questionnaires. Twenty companies had to be withdrawn from the sample since they did not meet the criteria or the information supplied was insufficient. The final response rate was 11.4%. Half of the respondents had held their current title for five years or less, but had worked for the company for more than 15 years. Half the sampled firms reported that they had more than 750 employees, their IS department employed more than ten employees and had a budget allocation of over two million dollars. The sampled firms were principally from the manufacturing, service and finance industries.

### 4.2. Data analysis

Descriptive statistics for all variables are presented in Table 1. To test the research model and hypotheses, partial least squares (PLS) analysis was used. PLS is a regression-based technique, with roots in path analysis that can estimate and test the relationships among constructs. It produces loadings between items and constructs and estimates standardized regression coefficients (i.e. beta coefficients) for the paths between constructs.

When using PLS, the data do not have to be normally distributed, scales may be ordinal

Table 1
Descriptive statistics

| | Mean[a] | Median | Standard deviation | Min | Max |
|---|---|---|---|---|---|
| *Strategic activities* | | | | | |
| Prospector | 5.04 | 5.07 | 1.09 | 1.63 | 7.00 |
| Analyzer | 5.78 | 6.00 | 0.79 | 2.50 | 7.00 |
| Defender | 4.32 | 4.47 | 1.09 | 1.00 | 6.84 |
| Reactor | 3.14 | 3.03 | 0.98 | 1.00 | 6.69 |
| *Technological deployment (final scale)* | | | | | |
| Strategic impact of IS department | 5.44 | 5.64 | 1.01 | 1.65 | 7.00 |
| Management style of teams | 5.77 | 6.00 | 1.08 | 1.00 | 7.00 |
| Technological architecture | 5.53 | 5.73 | 0.95 | 1.72 | 7.00 |
| Technological scanning | 5.53 | 5.76 | 0.97 | 2.50 | 7.00 |
| Source of IS development | 4.35 | 4.50 | 1.91 | 1.00 | 7.00 |
| IS performance evaluation | 4.46 | 4.50 | 1.47 | 1.00 | 7.00 |
| *Organizational performance* | | | | | |
| Sales growth | 4.72 | 4.69 | 1.24 | 1.00 | 7.00 |
| Profitability | 4.76 | 4.84 | 1.25 | 1.15 | 7.00 |

[a] Likert-type scale varying from 1 to 7.

and the sample can be small as long as it is ten times larger than the number of items contained in the most substantial construct (Chin et al, 1996). PLS analysis involves two stages: (1) assessment of the measurement model, including the item reliability, convergent validity, and discriminant validity, and (2) assessment of the structural model. Together, the measurement and structural models form a network of constructs and measures. The item weights and loadings indicate the strength of measures, while the estimated path coefficients indicate the strength and the sign of the theoretical relationships (Hulland, 1999; Igbaria et al., 1995; Thompson et al., 1991).

#### *4.2.1. Assessment of the measurement model*

*Item reliability* (or construct unidimensionality) indicates whether the indicators measure this construct only. Guidelines provided by Hair (1992) were used in determining the relative importance and significance of the factor loading of each item. Following their suggestions, only items with loadings equal to 0.50 or greater were kept for inclusion in the scales. The initial and final number of items for each construct is presented in Table 2.

Table 2
Construct reliability

| | Initial # of items | Final # of items | Rho[a] |
|---|---|---|---|
| *Technological deployment (initial scale)* | | | |
| Strategic use of IT | 6 | 6 | 0.85 |
| IT management | 6 | 6 | 0.88 |
| Role of the IS department | 5 | 5 | 0.86 |
| Technological infrastructure | 14 | 8 | 0.90 |
| Organizational infrastructure | 7 | 4 | 0.78 |
| Administrative infrastructure | 6 | 2 | 0.70 |
| Technological scanning | 9 | 9 | 0.88 |
| *Technological deployment (final scale)*[b] | | | |
| Strategic impact of IS department | – | 6 | 0.88 |
| Management style of teams | – | 2 | 0.88 |
| Technological architecture | – | 7 | 0.90 |
| Technological scanning | – | 4 | 0.87 |
| Source of IS development | – | 2 | 0.96 |
| IS performance evaluation | – | 2 | 0.94 |
| *Strategic activities* | | | |
| Prospector | 7 | 5 | 0.86 |
| Analyzer | 4 | 2 | 0.78 |
| Defender | 9 | 6 | 0.80 |
| Reactor | 3 | 3 | 0.77 |
| *Organizational performance* | | | |
| Sales growth | 3 | 3 | 0.91 |
| Profitability | 5 | 5 | 0.90 |

[a] $\rho = (\sum_{i=1}^{n} \lambda_i)^2/((\sum_{i=1}^{n} \lambda_i)^2 + \sum_{i=1}^{n} \mathrm{Var}(\xi_i))$, where $\mathrm{Var}(\xi_i) = 1 - \lambda_i^2$.
[b] the initial number of items forming each construct is unspecified since this scale was intended for an exploratory factor analysis.

Table 3
Discriminant validity of technological deployment (initial), (diagonals represent the AVE, while the other matrix entries represent the shared variance; underlined data are variances shared between two constructs higher than the AVE)

| | Use | Management | Role | Technology | Organization | Administration | Scanning |
|---|---|---|---|---|---|---|---|
| Strategic use of IT | *,48* | | | | | | |
| IT management | ,38 | *,46* | | | | | |
| IS role | ,49 | ,31 | *,55* | | | | |
| Technological infrastructure | ,45 | ,38 | ,53 | *,54* | | | |
| Organizational infrastructure | ,26 | ,20 | ,26 | ,28 | *,48* | | |
| Administrative infrastructure | ,04 | ,01 | ,04 | ,05 | ,06 | *,79* | |
| Technological scanning | ,41 | ,26 | *,56* | *,53* | ,26 | ,10 | *,45* |

*Convergent validity* indicates at which point a construct is representative of the 'true' value. It is measured by using the *rho* value. This is a coefficient somewhat similar to the Cronbach alpha, but with the distinction that its value is weighted by the respective loading of items and not by the number of items per construct. The criterion established by Nunnally (1978) concerning the reliability of construct, which also applies to PLS (Hulland, 1999), is that any constructs having a rho value equal or greater to 0.70 should be kept. This was the case for each construct since the rho values varied between 0.70 and 0.96 (see Table 2).

*Discriminant validity* is a measurement that verifies whether each construct is unique. The first requirement is to make sure that the loading value of an item allotted to a specific construct is higher than the loading value of the same item for another construct. The second requirement is that the average variance extracted (AVE) calculated for each construct is higher than all the variances shared between two constructs (Fornell and Larcker, 1981). The average of the extracted variance is obtained by the sum of loadings squared, divided by the number of items in the construct, whereas the variance shared between two constructs corresponds to the square of the coefficient of correlation between the latter. The discriminant validity of the strategic activities and organizational performance was verified successfully (see Table 4).

However the discrimant validity of the *initial* scale of technological deployment was low (see Table 3). Indeed, five out of the 21 variances shared between two constructs did not meet the criterion (see Table 3). Since it was a newly developed scale, an exploratory factor analysis was then performed. The *final* scale of technological deployment consisted of six components: strategic impact of IS department, management style of project teams, technological architecture, technological scanning, source of IS development and IS performance evaluation. The strategic impact of the IS department means that its members participate in organizational strategic meetings, design and implement applications that allow the firm to differentiate itself from competitors and reduce its operation costs, and contribute to business growth. Management style of project teams, authoritative or participating, refers to the organization of work and ways of communicating among the team members, recognition of their individual needs and level of authority of the project director. Technological architecture refers to the IS department playing an important role in setting guidelines for applications development, integrating multi-vendor open systems technologies, managing communication networks effectively and providing a proper level of data access, security and control to the organization. The source of IS development indicates the preferences established by top management with regards to the decisions of having new IS applications developed in-house or by external consulting firms. Information systems performance evaluation refers to the effectiveness and the productivity attributed to the implemented IS.

The assessment of the *final* scale of technological deployment was repeated. The convergent validity of the *final* scale was again adequate (Table 2) and therefore, the discriminant validity of the *final* scale met the AVE criterion (Table 4). The final list of items for each construct is presented in Tables 5–7.

#### 4.2.2. Assessment of the structural model

The structural model and hypotheses are evaluated by looking at the path coefficients.

Table 4
Discriminant validity of constructs (final), (diagonals represent the AVE, while the other matrix entries represent the shared variance)

| | Impact | Style | Architecture | Scanning | Source | Evaluation | Prospector | Analyzer | Defender | Reactor | Sales growth | Profitability |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Impact | *0.56* | | | | | | | | | | | |
| Style | 0.02 | *0.79* | | | | | | | | | | |
| Architecture | 0.36 | 0.04 | *0.57* | | | | | | | | | |
| Scanning | 0.22 | 0.10 | 0.32 | *0.64* | | | | | | | | |
| Source | 0.05 | 0.00 | 0.01 | 0.01 | *0.92* | | | | | | | |
| Evaluation | 0.22 | 0.03 | 0.27 | 0.16 | 0.02 | *0.88* | | | | | | |
| Prospector | | | | | | | *0.57* | | | | | |
| Analyzer | | | | | | | 0.10 | *0.64* | | | | |
| Defender | | | | | | | 0.01 | 0.00 | *0.41* | | | |
| Reactor | | | | | | | 0.26 | 0.07 | 0.01 | *0.53* | | |
| Sales growth | | | | | | | | | | | *0.78* | |
| Profitability | | | | | | | | | | | 0.26 | *0.66* |

Table 5
Measure of technological deployment

| | |
|---|---|
| *Strategic impact of the IS department* | |
| | IS department has a strategic impact on our firm |
| | IS department contributes to business growth |
| | IS department employees design and implement applications that allow the firm to differentiate itself from competitors |
| | Information systems (IS) are used for competitive advantage by our firm |
| | IS department employees participate in organizational meetings |
| | IS department employees design and implement applications that reduce organizational operations costs |
| *Management style of teams* | |
| | Authoritative style in the IS project team is preferred |
| | Participating style in the IS project team is preferred |
| *Technological architecture* | |
| | IS department integrates multi-vendor open systems technologies |
| | IS department designs and implements an information architecture that guides applications development |
| | IS department contributes to the effective use of the data resource |
| | IS department plans and manages for effective and flexible communication networks |
| | Technological architecture is designed to respond to our business needs |
| | IS department improves information security and control |
| *Technological scanning* | |
| | IS department employees learn continuously about new technologies and technological applications |
| | IS department employees read technological journals on a regular basis |
| | IS department employees attend information systems associations meetings |
| | Continuous learning about ways to integrate new technologies is encouraged by our firm |
| *Source of IS development* | |
| | IS are primarily developed in-house |
| | IS are primarily developed by external resources |
| *IS performance evaluation* | |
| | IS effectiveness is measured |
| | IS productivity is measured |

For each of the six components of the technological deployment construct, a mean value of the reliable items was taken in order to create a second order construct that was used in the path analysis. The same procedure was performed for the two components of organizational performance. Each type of strategic activities was tested using the reliable items only, creating a first order construct. Each construct was then defined by reflective indicators measured by those respective averages for technological deployment and organizational performance, and by the reliable items pertaining to each type of strategic activities. Reflective indicators are believed to indicate the underlying construct and they contribute to the construct explanation since they covary simultaneously.

For each type of strategic activities, a test was carried out using the PLS Graph software package (Chin and Fee, 1995) to evaluate the links between business strategy, technological deployment and organizational performance. Statistical significance levels of the estimated path coefficients were determined using a jackknife procedure. The *t*-value with

Table 6
Measure of strategic activities

| |
|---|
| *Prospector* |
| Our firm leads in innovations in its industry |
| Our firm believes that being 'first-in' in the industry is attained through the development of new products/services |
| Our firm responds rapidly to early signals of opportunities in the environment |
| Our firm's actions often lead to a new round of competitive activity in the industry |
| Our firm adopts quickly promising innovations in our industry |
| *Analyzer* |
| The innovations which are chosen by our firm are carefully examined |
| Our firm carefully monitors competitors' actions in our industry |
| *Defender* |
| Our firm tries to locate a safe niche in a relatively stable products/services domain |
| Our firm tries to maintain a safe niche in a relatively stable products/services domain |
| Our firm tends to offer a narrower set of products/services than its principal competitors |
| Our firm concentrates on trying to achieve the best performance in a relatively narrow product-market domain |
| Our firm tries to maintain a limited line of products/services |
| Our firm tries to maintain a stable line of products/services |
| *Reactor* |
| Compared to its competitors in the industry, our firm is aggressive in maintaining its products/services domain. (*reverse*) |
| Our firm takes many risks. (*reverse*) |
| Our firm responds to areas in which its environment puts pressure on it |

$n-1$ degrees of freedom, where n is the number of subsamples used in the jackknife procedure, is the jackknife estimate of the path coefficient divided by the standard error (Barclay et al., 1995).

Indicators with loadings equal to 0.5 or greater determined the specific profile of technological deployment. These indicators are the components of a specific profile of technological deployment associated to a specific type of strategic activities.

Table 7
Measure of organizational performance

| |
|---|
| *Sales growth* |
| The sales growth position relative to our principal competitors |
| My satisfaction with sales growth rate |
| The market share gains relative to our principal competitors |
| *Profitability* |
| The return on corporate investment position relative to our principal competitors |
| My satisfaction with return on corporate investment is |
| My satisfaction with return on sales is |
| The net profit position relative to our principal competitors is |
| The financial liquidity position relative to our principal competitors is |

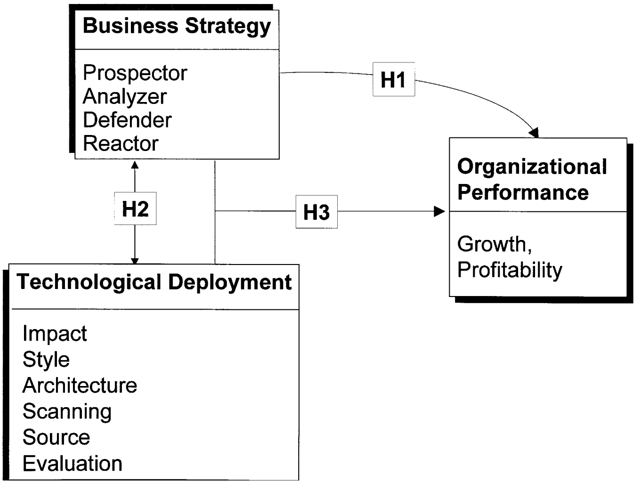


Fig. 2. Detailed research model.

## 5. Results

The detailed research model is presented in Fig. 2 and the test results are presented in Figs. 3–6. Hypothesis 1 tested the relationship between each type of strategic activities and organizational performance. A positive and significant relationship was observed between prospector strategic activities and organizational performance (path = 0.37; $P < 0.001$), while a negative and significant relationship was found between reactor strategic activities and organizational performance (path = −0.32; $P < 0.001$). Other relationships tested for hypothesis 1 (analyzer and defender) were not significant. Therefore, prospector strategic activities enhance organizational performance, while reactor strategic activities impede organizational performance.

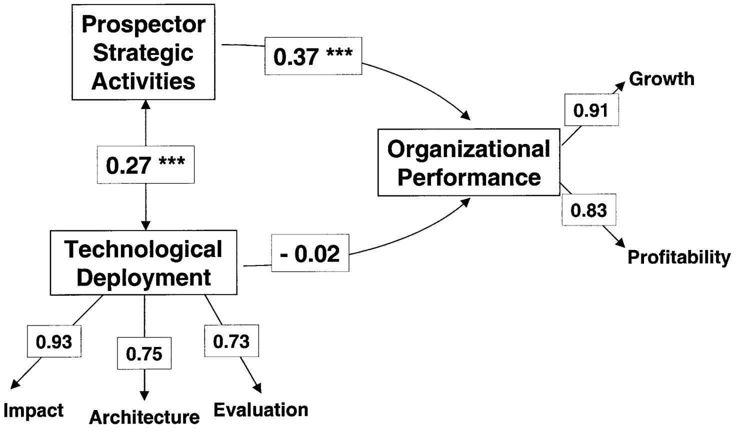


Fig. 3. Prospector path coefficients.

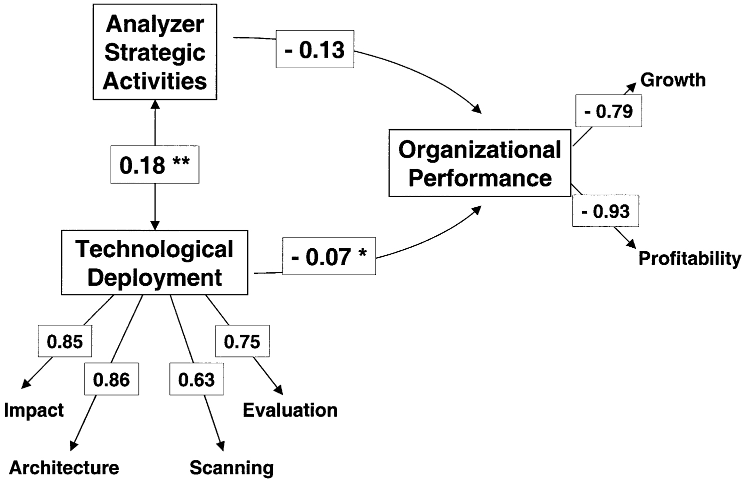


Fig. 4. Analyzer path coefficients.

Hypothesis 2 tested for the existence of profiles of technological deployment specific to each type of strategic activities. A positive and significant relationship was observed between prospector strategic activities and technological deployment (path = 0.27; $P < 0.001$). The latter is composed of three significant components which are the strategic impact of the information system department ($\lambda = 0.93$), the technological architecture ($\lambda = 0.75$) and the information system performance evaluation ($\lambda = 0.73$). Another positive and significant relationship was also observed between the analyzer strategic activities and technological deployment (path = 0.18; $P < 0.01$). The latter is composed of four significant components, which are the strategic impact of the information system

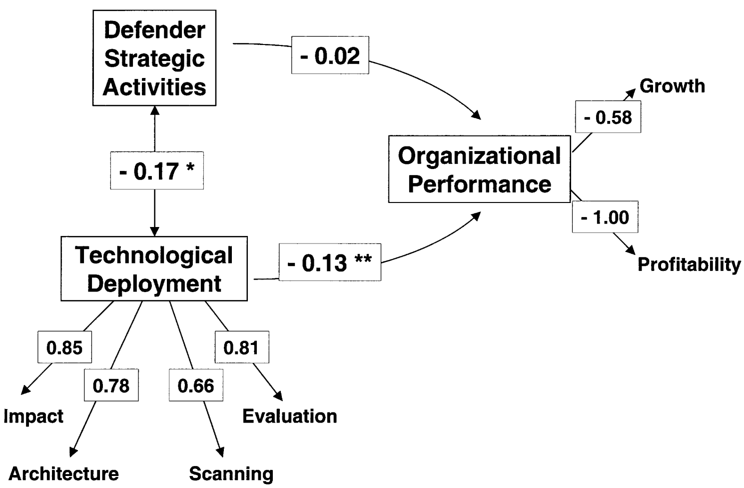


Fig. 5. Defender path coefficients.

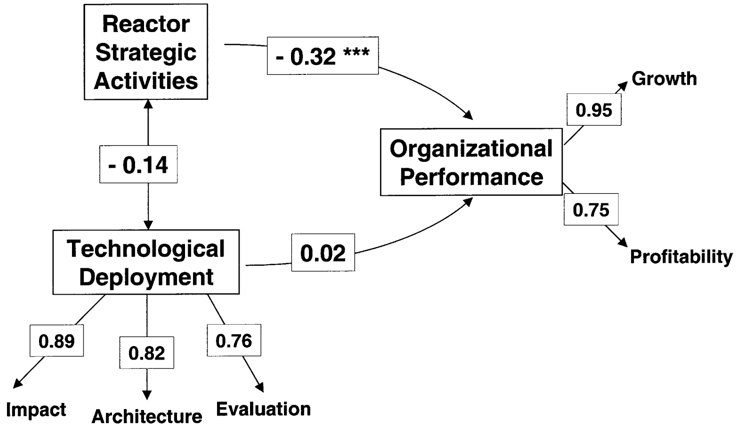


Fig. 6. Reactor path coefficients.

department ($\lambda = 0.85$), technological architecture ($\lambda = 0.86$), technological scanning ($\lambda = 0.63$), and information system performance evaluation ($\lambda = 0.75$). A significant, yet negative, relationship was observed between the defender strategic activities and technological deployment (path $- 0.17$; $P < 0.05$). The latter is composed of four significant components which are the strategic impact of the information system department ($\lambda = 0.85$), technological architecture ($\lambda = 0.78$), technological scanning ($\lambda = 0.66$), and information system performance evaluation ($\lambda = 0.81$). No significant relationship was found relative to the reactor strategic activities. Therefore, there exist two different profiles of technological deployment: one more outward oriented and includes technological scanning, and the other more inward oriented excluding it. The *outward* profile is positively linked to the analyzer strategic activities and negatively linked to the defender strategic activities while the *inward* profile is positively linked to prospector strategic activities.

Hypothesis 3 tested the relationship between the profiles of technological deployment and organizational performance for each of the strategic activities. The hypothesis was supported for the outward profiles of technological deployment. A positive and significant relationship was observed for the analyzer strategic activities between technological deployment and organizational performance (path $= -0.07$; $P < 0.05$). The relationship is positive since the sign of the path coefficient is negative such for the loadings of the organizational performance constructs ($\lambda = -0.79$ for sales growth; $\lambda = -0.93$ for profitability). Another positive and significant relationship was observed for the defender strategic activities between technological deployment and organizational performance (path $= -0.13$; $P < 0.01$). The relationship is positive since the sign of the path coefficient is negative such for the loadings of the organizational performance constructs ($\lambda = -0.58$ for sales growth; $\lambda = -1.00$ for profitability). Other relationships tested for hypothesis 3 (prospector and reactor) were not significant. Therefore, the profile of technological deployment previously defined for the analyzer strategic activities directly enhances organizational performance. However, since technological deployment is negatively linked to defender strategic activities, it does not contribute to the enhancement of organizational performance in this case, despite the link between technological deployment and organizational performance being positive.

## 6. Discussion

This section discusses the results obtained from the hypothesis testing by type of strategic activities and presents more information on the directions of the relationships, thereby explaining the role of the mediating variables and concludes with some limitations of the study.

### *6.1. Prospector strategic activities*

Organizations involved in prospector strategic activities tend to improve their organizational performance and deploy effectively their information technology (see Fig. 3). Such organizations are the first to react to signals of change in their branch of industry, and are the leading innovators in the development of new products or services. However, the technology is not the primary driver of organizational performance. This is understandable since these firms have more capabilities in finding new ideas, launching new products and are more open to taking risks than they have finding and applying information technology to gain a competitive advantage. It is their excellence in prospector strategic activities that makes them more effective and more performant, not their knowledge of technology. The profile of technological deployment observed in these firms is more inward than outward oriented. Firms involved in prospector strategic activities do not practice technological scanning on a regular basis. However, they recognize that it is important for members of the IS department to participate in strategic meetings. They ask their IS department to play the role of technological facilitator and to foster technological innovation. It is important for them that the technological architecture be flexible and open, and support the rapid changes required by a new project. Finally, new systems are assessed for their effectiveness and efficiency. The results indicate that prospector strategic activities are related to a higher organizational performance and are positively associated with an inward profile of technological deployment.

### *6.2. Analyzer strategic activities*

Organizations carrying out analyzer strategic activities tend to make effective use of their information technology (see Fig. 4), which in turn leads to higher performance. Analyzer strategic activities involve watching competitors' activities closely and carefully evaluating possible organizational innovations. Information technology is a valuable instrument to increase performance relative to the competition and one could argue that these organizations have facility in using technology to increase organizational performance. It might explain why results indicate a direct link between technological deployment and organizational performance. The outward orientation of the profile of technological deployment of these firms is another explanation. Technological scanning is an additional characteristic to the inward technological profile, typical of prospector strategic activities. The addition of the technological scanning component relates closely to the behavior of the analyzer strategic activities. Technological scanning includes scrutiny of the environment, constant acquisition of new knowledge with respect to information technology and technological applications, the reading of journals specific to information technology and the participation in professional associations. Companies that carry out analyzer strategic activities further encourage their personnel to train in the application of new information technologies.

### 6.3. Defender strategic activities

Defender strategic activities are not directly associated with a higher level of organizational performance. It was observed that technological deployment is antithetic to the defender type. Indeed, the less an organization acts as a defender, the more advanced is its technological deployment. In return, the technological deployment leads to a higher performance. Hence, the defender type is counter-productive in terms of organizational performance as it restrains technological development (see Fig. 5). Defender strategic activities aim to reduce costs and to maximize the efficiency and effectiveness of production while avoiding organizational change as much as possible. The results of the survey indicate that such companies do not react very quickly to changes imposed by the environment. In fact, it looks like the benefits normally associated with information technology are repressed by the defender strategic activities. This illustrates how difficult, but indispensable, it is for defender strategic activities to adjust to new technological changes. It is thus essential that these companies evaluate the costs and benefits of implementing new IS. They should reassess the positive impact that information technology could have on the bottom line.

### 6.4. Reactor strategic activities

A significant and negative link was observed between the reactor strategic activities and organizational performance (see Fig. 6). This suggests that reactor strategic activities impede organizational performance, or else, that organizations with a high level of profitability tend not to be of a reactor type. What more, organizations in a low profitability context tend to adopt a reactive strategy. No profile was identified for reactor activities since to be in reaction means that there are no specific orientations given to strategic activities. It is thus quite normal to lack any specific profile of technological deployment.

### 6.5. Directions of relationships

Not only does the profile of technological deployment vary with the type of strategic activities, the direction and magnitude of the relationship also vary. While technological deployment is positively related to strategic activities in the case of prospector and analyzer, a negative relationship was observed for defender strategic activities and no relationship was observed for the reactor types. In addition to these results, it is worthwhile to discuss the direct and indirect effect of strategic activities and technological deployment on organizational performance. The question to raise is: do both exogenous variables have an effect on organizational performance and if so, is it a direct or an indirect effect?

In the case of prospector strategic activities, this type has a direct effect on organizational performance while technological deployment has an indirect effect on performance through the prospector type. Information technology might help the firms involved in prospector strategic activities, but, by itself, it will not increase organizational performance. Thus, the main effect on organizational performance comes from the actions taken at the strategic activities level, supported by an adequate deployment of information technology. For firms involved in analyzer strategic activities, this choice of strategy has no direct effect on their organizational performance; it is through technological deployment that these strategic activities have an indirect effect. These firms gain in relying on a solid technological deployment.

Choosing the defender strategic activities does not improve organizational performance directly. It is again through technological deployment that such activities could influence organizational performance. However, as a note of caution, the characteristics of defender strategic activities tend to inhibit technological deployment, and in turn impede organizational performance. It is thus suggested that firms change strategic activities if they wish to improve their organizational performance. Finally, for firms applying reactor strategic activities, technology is of no help. It has no direct or indirect effect on organizational performance, while the reactor strategic activities themselves have a direct, but negative effect on organizational performance.

In sum, an inward profile of technological deployment helps firms deploying prospector strategic activities improve their organizational performance; companies involved in analyzer strategic activities should rely on an outward profile of technological deployment in order to increase their organizational performance; and firms applying defender and reactor strategic activities would be better off changing strategy if they wish to perform in the future.

### *6.6. Limitations*

This study has some limitations. First, in terms of reliability, the number of items supporting some dimensions of Miles and Snow's instrument could be increased. Second, the questionnaire approach is not entirely free from the subjectivity of the respondent. And third, due to the necessity of pairing questionnaires within organizations, the final response rate is somewhat lower that it would have been had only one questionnaire per organization been used.

## 7. Conclusions

In summary, the first hypothesis has supported the existence of a positive link between strategic activities and organizational performance for the activities of prospector, and a negative link for the activities of reactor. The second hypothesis, corresponding to the relationship between strategic activities and different profiles of technological deployment is accepted for the activities of prospector, analyzer, and defender. Finally, the third hypothesis, which concerns the existence of positive relationships between strategic activities, specific profiles of technological deployment and organizational performance, is accepted for the activities of prospector and analyzer. An inward profile of technological deployment contributes indirectly to organizational performance for the prospector strategic activities, while an outward technological profile contributes directly to organizational performance for the analyzer strategic activities. These results indicate that organizations could enhance their performance by supporting prospector or analyzer strategic activities, and deploying their information technology accordingly.

In terms of future research, this study could be resumed using other modes of operationalization of strategic activities such as those applied by Porter (1980), Wiseman (1988) and Venkatraman (1989b). The concept of fit could also be explored using other theoretical approaches such as covariation and gestalt (Bergeron et al., 2001). Finally, conducting the study among small and medium-sized firms would further advance the research.

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