International Journal of Information Management 34 (2014) 672–681

Contents lists available at ScienceDirect

International Journal of Information Management

journal homepage: www.elsevier.com/locate/ijinfomgt

# Information management for the internationalization of SMEs: An exploratory study based on a strategic alignment perspective

Vincent Dutot[a,*], François Bergeron[b], Louis Raymond[c]

[a] ESG Management School, 25, rue St-Ambroise, 75011 Paris, France
[b] Université du Québec, 455, rue du Parvis, Québec, QC, Canada G1K 9H6
[c] Université du Québec à Trois-Rivières, 3351, boul. des Forges, Trois-Rivières, QC, Canada G9A 5H7

ARTICLE INFO

*Article history:*

*Keywords:*
Information management
Strategic alignment
Internationalization mode
International performance

ABSTRACT

The ability to internationalize has become a competitive necessity for many SMEs, enabling their survival and access to larger markets. From an IS research perspective, one important issue is the strategic role played by the firm's IT capabilities in responding to greater environmental uncertainty and correspondingly greater information requirements, and in enabling the firm's internationalization performance. Given that such a major aspect of the influence of IT on the performance of SMEs has so far been ignored, the following research question is posed: to what extent does the match between the IT capabilities and information requirements of SMEs contribute to their internationalization performance? Our research model and hypotheses are based on Tushman and Nadler's information processing model. In revisiting this model, the aim was to show its continued relevancy and extend its domain of applicability. In order to answer the research question, we conduct a survey-based empirical study of 174 Canadian SMEs that have internationalized their activities. Our results show that a better match between IT capabilities and information requirements does indeed exert a positive influence on internationalization performance. We also find that the SMEs' IT capabilities are influenced externally by the environmental uncertainty and internally by their internationalization mode.



## 1. Introduction

There has been an agreement for some time in the IS literature that it is not appropriate to automatically generalize to small and medium-sized enterprises (SMEs) from the results of empirical studies done mostly in large, resource, and competencies-abundant organizations (Thong, Yap, & Raman, 1996). Given the specificities and especially the "organic" nature of SMEs in terms of strategy and structure, the advent of globalization and the concomitant reshaping of organizational processes and systems with information technology ("e-business") has had an effect on these firms that cannot be extrapolated, predicted, explained, or understood simply in light of what has been already found in large enterprises (Raymond & Bergeron, 2008). Now, there has been growing evidence of the internationalization of SMEs within the last two decades, and the ability to internationalize has become a competitive necessity for many of these firms, enabling their survival and growth as observed by an access to larger markets and achieving economies of scale (Raymond & St-Pierre, 2013).

Internationalization obviously brings about greater uncertainty and complexity in the environmental and strategic context of SMEs (Westhead, Wright, & Ucbasaran, 2004). Looking at this issue through the lens of information processing theory, such a strategic choice – or obligation – would require these organizations to develop a greater information processing capacity (Galbraith, 1973). In other words, international SMEs are social systems that "must develop information mechanisms capable of dealing with both external and internal sources of uncertainty" (Tushman & Nadler, 1978, p. 614). Furthermore, in developing their information processing model, Tushman and Nadler (1978) used a contingency theoretical argument to describe "congruence", "match" or "fit", as the degree to which an organization's information processing capacity is consistent with its information processing requirements, and to link this congruence with organizational performance.

IT alignment or "fit" is a notion deemed crucial by IS researchers to understand how SMEs can translate their deployment of information technology into actual increases in performance (Chan & Reich, 2007). In particular, these firms may leverage their IT

* Corresponding author. Tel.: +33 01 53 36 44 41.
*E-mail address:* vdutot@esg.fr (V. Dutot).

http://dx.doi.org/10.1016/j.ijinfomgt.2014.06.006
0268-4012/

capabilities to enable their internationalization process and thus build a competitive advantage (Mohr & Spekman, 1994). As strategy is the force that mediates between the firm and its environment, it is in practical terms the basic alignment mechanism, and the firm's IT resources and competencies must be well suited to it if a significant competitive advantage is to be created (Bergeron, Raymond, & Rivard, 2001; Duhan, 2007). SMEs whose internationalization strategy and IT are aligned should be less vulnerable to external changes and internal inefficiencies, and should thus perform better.

From an IS research point of view and with globalization as a backdrop, a major issue yet to be addressed with regard to SMEs is the strategic role played by their IT capabilities in responding to greater environmental uncertainty and correspondingly increased information requirements, and in enabling the internationalization performance of these organizations. Hence, there is reason to believe that a major aspect of the effect of IT on the performance of SMEs has been ignored so far. In addressing this research gap, we wish to revisit information processing theory with a "matching" perspective of the strategic alignment of IT, doing so in order to answer the following research question: does the match between the IT capabilities and information requirements of SMEs contribute to their internationalization performance?

## 2. Theoretical and empirical context

This study mobilizes and combines two theoretical approaches, namely information processing theory and the strategic alignment of IT.

### 2.1. Information processing theory

Information processing theory helps understand the way organizations handle information to increase their performance. While this theory was initially viewed as an integrating concept in organizational design, it is a useful tool to study information in organizations (Galbraith, 1973). Information processing theory is based on three main concepts: information processing requirements, information processing capabilities and the match between the two to attain greater organizational performance. As Galbraith (1973, p. 4) puts it: "The greater the uncertainty of the task, the greater the amount of information that has to be processed between decision makers during its execution [...] in order to achieve a given level of performance". Based on Galbraith's theory, Tushman and Nadler (1978) identified task characteristics and the interdependence of business units as important sources of uncertainty determining the information requirements. The information requirements, when they are fulfilled through adequate information processing capacities, help attain organizational performance. In an information systems context, two specific propositions outlined by Tushman and Nadler (1978) are still worth specific investigation. The first is related to the link between uncertainty and information requirements: "As work related uncertainty increases, so does the need for increased amounts of information, and thus the need for information processing capacity". The second relates to contingency theory: "Organizations will be more effective when there is a match between information requirements facing the organization and information processing capacity of the organization's structure".

Following Tushman and Nadler's seminal work, a number of researchers have applied information processing theory and their findings have supported this theory for the most part. For instance, Flynn and Flynn (1999) examined a variety of information processing approaches in the manufacturing context and found environmental uncertainty to negatively influence organizational performance, whereas IT investments had no significant influence. In an ERP context, Gattiker (2007) found interdependence among the firm's subunits to be a source of uncertainty, this author stating that "the greater the interdependence between marketing and operations the greater the benefit of a highly integrative coordination mechanism such as ERP" (p. 2911). More recently Cegielski, Jones-Farmer, Wu, and Hazen (2012) used information processing theory to assess how a firm's information processing requirements and capabilities combine to affect the intention to adopt cloud computing as an enabler of supply chain management systems. Their analyses (both quantitative and qualitative) and results support the assertion that information processing requirements and information processing capability affect this intention.

#### 2.1.1. Information requirements

The information requirements of an organization depend upon its level of uncertainty relative to various internal and external factors. These requirements are defined as the gap between the information that is necessary and the one that is available to the organization (Cegielski et al., 2012; Premkumar, Ramamurthy, & Saunders, 2005). Tushman and Nadler's (1978) model indicated that the uncertainty facing organizational subunits comes from three basic sources: task environment, task complexity, and interunit interdependence. These sources of uncertainty also vary along three dimensions, namely, the dynamism, the munificence, and the complexity of the business environment (Liu, Shah, & Babakus, 2012). Enterprises need inputs from their external as well as internal environments and therefore require information to reduce the uncertainties that emanate from these environments (Christopher & Lee, 2004).

The level of environmental uncertainty translates into information requirements relative to control, communication, and collaboration in organizations. These information requirements can be fulfilled with appropriate information systems and technologies. In an information technology (IT) context, various information requirements can be satisfied with IT-based control to enhance the operational performance of organizations (Corbett, 2004). Information technology also responds to communication requirements. As such, it exerts a positive influence on the performance of organizations in national and international contexts (Gurbaxani & Whang, 1991). Further, IT is useful in the conduct of international business strategy and in knowledge management among business partners (Shi, Kunnathur, & Ragunathan, 2005). Moreover, IT-supported inter-organizational collaboration has been found to stimulate the performance of organizations (Sanders & Premus, 2005). Finally, IT can improve internal and external collaboration by providing better-quality information, and influence decision-making effectiveness (Bharadwaj, Bharadwaj, & Konsynski, 1999).

#### 2.1.2. Information processing capacity

Following Tushman and Nadler (1978), the organization's information processing capacity is put in place to fulfill its information requirements. In this research, we define information processing capability as an organization's capacity to utilize and structure information in a meaningful fashion that supports decision making (Tushman & Nadler, 1978). Previous research suggests that IT is a key aspect of an organization's information processing capability (Cegielski et al., 2012; Gattiker, 2007; Melville & Ramirez, 2008; Premkumar et al., 2005). Tushman and Nadler (1978) assert that, within organizations, formalized information systems, and particularly ones that are IT-based, are the most complex but provide the highest capacity for organizational information processing. Based upon this assumption, we focus on IT capabilities as a most important aspect of information processing capabilities.

Each organization has specific resources to exploit, develop, and share in order to create value. These resources can be defined as the capabilities of an organization (Barney, 1991). Relative to

technological capabilities specifically, IT can be classified as technologies for handling, storing and communicating information (Zhang et al., 2007). IT capabilities can be divided in two groups: management capabilities and technical capabilities (Root, 1994). A more complete definition of IT capabilities is the "firm's ability to acquire, deploy, and leverage its IT-related resources in combination with other resources and capabilities in order to achieve business objectives" (Bharadwaj et al., 1999). In this case, the IT capabilities concept contains six sub-dimensions: IT business partnerships, external IT Linkages, IT business strategic thinking, IT business process integration, IT management, and IT infrastructure (Bharadwaj et al., 1999). These IT capabilities aim to satisfy the firm's information requirements.

The growing literature on International New Ventures (INVs) also establishes the importance of the SME's resources and capabilities for its internationalization performance (Zhou, Wu, & Barnes, 2012). In this regard, the firm's marketing capabilities, in particular, are leveraged by its capacity to integrate Internet technology (Prasad, Ramamurthy, & Naidu, 2001). Furthermore, the development of e-business capabilities such as e-collaboration, in conjunction with its strategic orientation, was found to positively influence the SME's internationalization performance (Raymond & Bergeron, 2008).

The link between IT capabilities and performance has been highlighted previously in the literature (Raymond & St-Pierre, 2013). For example, IT support and development of key competences (both technological and managerial) can improve performance (Ravichandran & Lertwongsatien, 2005). IT and complementary resources within the organization can also affect the efficiency of business processes. As a collaboration tool between employees, technology can enhance business performance (Sanders & Premus, 2005). More recently, the relationship between IT capabilities and performance in Chinese SMEs has been studied (Zhang, Sarker, & Sarker, 2008), showing that specific components of IT capabilities (IT business partnerships and IT management) have a positive effect on the organizational performance of these firms.

### 2.2. Strategic alignment of IT

The idea that there is no best way to manage an organization has been the underlying assumption of a great number of research models in several areas of study (Burns & Stalker, 1961). Contingency models, which hypothesize that there is no best way to organize, have also been proposed and tested in IS studies. Contingency models have been used to study the relationship between business strategy, structure, IT strategy and IT structure (Bergeron et al., 2001; Chen, Sun, Helms, & Jih, 2008), to define strategies for information requirements determination (Davis, 1982), to identify individual impacts of IT (Pinsonneault & Rivard, 1998), impacts of IT on learning (Leidner & Jarvenpaa, 1995), impacts of IT problem solving tools on task performance (Vessey & Galletta, 1991) and impacts of IT on organizational performance (Bergeron, Raymond, & Rivard, 2004). Moreover, following Tushman and Nadler's (1978) information processing model, the alignment between information requirements and information processing capacity has been an objective pursued by a number of researchers (Engelen, Brettel, & Heinemann, 2010; Kearns & Lederer, 2004; Premkumar et al., 2005), and particularly in the present global business context (Turkulainen, Kujala, Artto, & Levitt, 2013).

IT alignment has been studied in various research settings and research designs. There is however one specific type of IT alignment targeted toward the alignment of IT with business strategy. Most research conducted on this topic concluded in the importance of a "strategic alignment" of IT (e.g. Bergeron et al., 2001; Chan & Reich, 2007; Pollalis, 2003). The strategic alignment of IT can be viewed as complementary to the basic "fit" between information requirements and information capacities proposed by information processing theory. Used to determine specific IT capacities, the strategic alignment of IT could even be considered as a concurrent theory. In this regard, Venkatraman (1989) proposed a classificatory framework for the concept of alignment wherein six different perspectives of alignment are defined: moderation, mediation, matching, covariation, profile deviation, and gestalts. Building on this work, Bergeron et al. (2001) performed a comparative analysis of the six perspectives to conclude in the paramount importance of specifying the alignment type in the research design. This specification provides definitional and methodological rigor needed to build and support alignment theory.

### 2.3. Alignment research context

#### 2.3.1. Small and medium-sized enterprises

Most research on alignment has been conducted in large businesses. Since Galbraith has not specified that his theory of information was solely applicable to large organizations, there is no reason to believe that it could not apply to SMEs. However, given the "specificities" of SMEs (Welsh & White, 1981), it seems appropriate to conduct a study on this particular group of enterprises. The differences between SMEs and large businesses are many: (1) SMEs have highly centralized structures and typically employ generalists rather than specialists (Thong, 1999); (2) SMEs often lack in-depth IT/IS knowledge and technical skills within the organization leading to a lower level of awareness of the benefits of IT (DeLone, 1988); (3) SMEs have limited funds to develop and maintain sophisticated IT infrastructures (Thong et al., 1996); and (4) SMEs have much less access to the necessary management and financial resources to correct situations arising from an unwise or unsuccessful IT investment (Zhang et al., 2007).

#### 2.3.2. Internationalization of SMEs

The internationalization of a firm is the outward movement of its operations and the process of mobilization, accumulation, and development of a specific set of resources in order to achieve greater performance. The internationalization of a firm is also defined as the process by which it increases its involvement in international markets. This process can vary if focused on R&D, innovation, network, technology, or human resources (Raymond & St-Pierre, 2013). The concept of internationalization refers to the geographical expansion of economic activities beyond national borders. It is closely linked to globalization and growth (Ruzzier, Hisrich, & Antoncic, 2006). While definitions of internationalization are numerous, they usually refer to this concept as the mobilization of human, material, technological, and organizational resources for international markets (Spowart & Wickramasekera, 2012).

There exist various forms of internationalization strategies for SMEs (Kotabe & Helsen, 2010). Six basic forms of partnership can be identified: exportation, subcontracting, outsourcing, offshoring, strategic alliance, and joint venture. Root (1994) explains that these strategies could be classified into three categories: the first one is called export entry mode (i.e., exportation only). The second is the contractual entry mode (i.e., transfer of technological or human skills, strategic alliances, subcontracting). The third is the investment entry mode (i.e., joint-venture, sole venture or foreign direct investment which includes wholly owned subsidiary). Other researchers have focused on binary or multinomial choices (Wei, Liu, & Liu, 2004), such as acquisition vs. greenfield (Harzing, 2001), wholly owned subsidiary vs. equity-based cooperative venture or non-equity-based cooperative venture (Agarwal & Ramaswami, 1992; Hill, Hwang, & Kim, 1990; Kim & Hwang, 1992). The organization chooses the strategy based on its requirements, its resources, the complexity of the operation and its profitability (Ruzzier & Konečnik, 2006). The international activities of SMEs may thus have

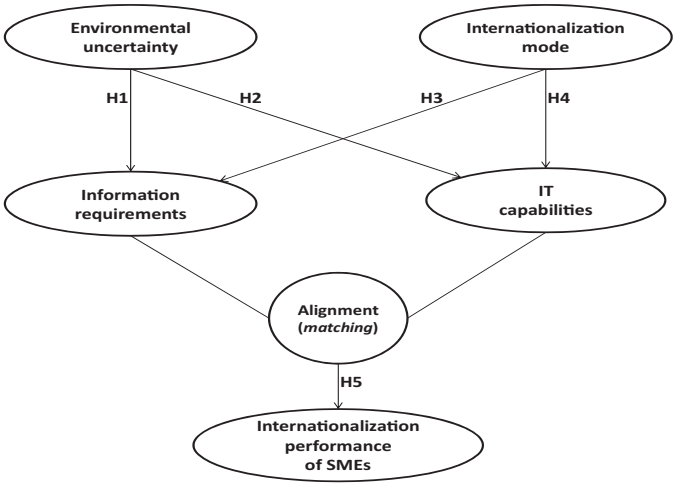


**Fig. 1.** Research model.

different levels of complexity. At one end, the exporting form of strategy generally asks for a relatively less detailed contract and follow-up plan. At the other end, considerable time and energy must be put forth by SMEs, with their generally limited resources and expertise, in order to create a successful alliance with foreign partners, as entering into strategic alliance arrangements requires comprehensive planning (Elmuti & Kathawala, 2001).

## 3. Research model and hypotheses

The research model underlying the present study is shown in Fig. 1.

Information theory assumes that the environmental uncertainty of an organization influences its information requirements (Galbraith, 1973). Among other sources, the level of environmental uncertainty is formed from environmental complexity, task complexity, and inter-unit task interdependence (Liu et al., 2012; Tushman & Nadler, 1978). Tushman and Nadler (1978) proposed that as work related uncertainty increases, so does the need for increased amounts of information. A more uncertain environment can be observed by strong competition in product quality over the market, several differences in product standards, and the need to adapt products for overseas markets (Zhang et al., 2007). A high level of environmental uncertainty is, thus, expected to be related to high information requirements. Based on the Kearns and Lederer's (2004) work on business dependence on IT, it is also expected that environmental uncertainty influences the alignment of IT capabilities. Environmental uncertainty leads a company to develop technological capabilities (Kearns & Lederer, 2004), including the development of IT skills (Zhang et al., 2007). The two following research hypotheses follow from the above:

**H1.** A more uncertain environment generates greater information requirements for international SMEs.

**H2.** A more uncertain environment requires greater IT capabilities of international SMEs.

Business strategy is a determinant of IT strategy and of the development of IT operational components (Bergeron et al., 2004). The SME's mode of internationalization can be viewed as forms of business strategy, which carry a specific level of task complexity (Rivkin, 2000), and, in turn, influence the firm's information requirements. As a business strategy per se, the internationalization mode should also directly influence the SME's IT capabilities (Ross, Beath, & Goodhue, 1996). Thus, the following research hypotheses:

**H3.** A more complex internationalization mode generates greater information requirements for international SMEs.

**H4.** A more complex internationalization mode requires greater IT capabilities of international SMEs.

The performance of an organization depends on its ability to develop information systems in relation with the level of uncertainty it faces (Kearns & Lederer, 2004; Zhang et al., 2007). Tushman and Nadler (1978) propose that organizations are more effective when there is a match between information requirements facing the organization and information processing capacity. An organization should respond to increased information requirements brought about by internationalization, by implementing appropriate IT capabilities. From a strategic alignment perspective, the right match between information requirements and IT capabilities in the face of greater uncertainty should then be related to the firm's internationalization performance. Thus, the following research hypothesis:

**H5.** SMEs have a greater internationalization performance when there is a greater match between their information requirements and their IT capabilities.

The "matching" perspective of fit is adopted as it is the most relevant to the theoretical foundations of this study. Here, fit is a theoretically defined match between two variables "without reference to a third criterion variable, although, subsequently, its effect on a set of criterion variables could be examined" (Venkatraman, 1989, p. 430). Adopting this perspective in an information processing theoretical context, one would state that fit exists when the firm's IT capabilities match its information requirements. Whether the match improves internationalization performance can then be tested. One analytical scheme for supporting the matching perspective is deviation score analysis, using the absolute difference between the standardized scores of the variables that measure the two constructs (Venkatraman, 1989).

## 4. Methodology

### 4.1. Data collection

A survey instrument targeting Canadian SMEs was designed for this research. The identified firms have less than 250 employees – this being the size criterion set by the European Union and often used by researchers (Kalantaridis, 2004) – and their annual sales do not exceed 50 million Canadian dollars. An additional sampling criterion was that the SME should be engaged internationally in one form or another (e.g., exporting, offshoring). We targeted key informant owner-managers or CEOs as potential respondents because they have the most knowledge of their firm's business environment, strategy, organizational capabilities, and performance (Bergeron et al., 2001). This survey was administered online using the Web-based platform SurveyMonkey. A direct link (in French or English) to the questionnaire was emailed to the identified respondent. Using various business repertories of Canadian manufacturing and service firms, a population of 885 international SMEs was established, of which 174 usable answers were obtained, thus a 19.6% response rate was achieved, which is typical for small business survey research (Karimabady & Brunn, 1991).

### 4.2. Measures

Measures used in the survey were based on the extant literature, being selected for their previously confirmed reliability and validity and their relevance to the research model. The number of items composing each scale is presented in Figs. 2 and 3. Environmental uncertainty was defined in terms of technological uncertainty

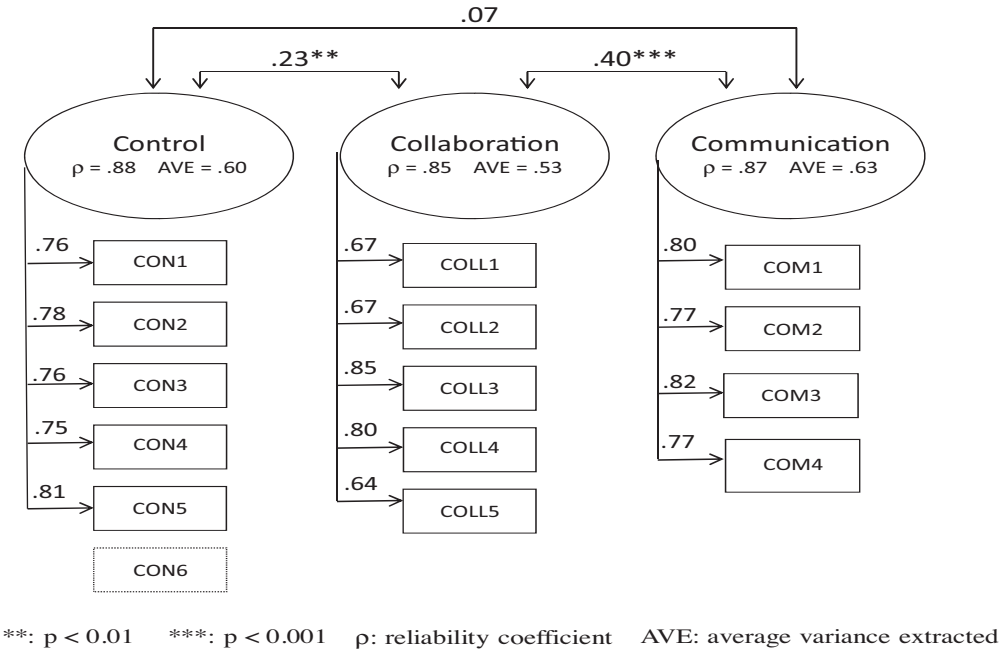


**Fig. 2.** CFA of information requirements.

and environmental turbulence, using Zhang et al. (2007) scales. The measure of the firms' internationalization mode was based on Kotabe and Helsen's (2010) classification. Six internationalization modes were regrouped in three groups based on their increasing level of complexity, that is, exportation (M1), subcontracting, and/or outsourcing abroad (M2), and offshoring, strategic alliance, and/or joint venture with foreign partners (M3). IT capabilities were measured using the scale developed in Bharadwaj et al. (1999) and Zhang et al. (2008). It addresses six dimensions as follows: IT business partnership, external IT linkages, business IT strategic thinking, IT business process integration, IT management, and IT infrastructure. Information requirements were measured across three dimensions: communication (Mohr & Spekman, 1994), collaboration (Han, Lee, & Seo, 2008), and control (Corbett, 2004;

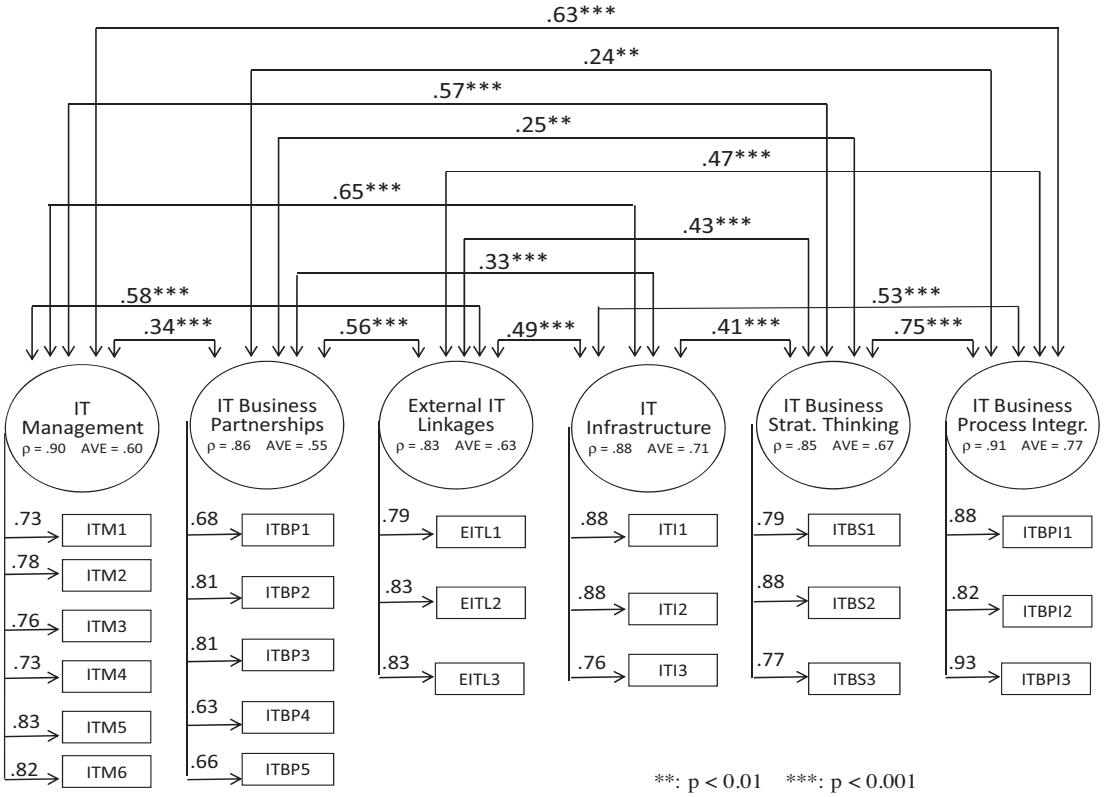


**Fig. 3.** CFA of IT capabilities.

Dekker, 2004). Internationalization performance was measured by using an export performance instrument developed and validated by Zou, Taylor, and Osland (1998). This scale measures the extent that the firm's international activities have been profitable, generated a high volume of sales, achieved rapid growth, strengthened the firm's strategic position, increased its global market share, and improved its global competitiveness. Save for internationalization mode, which is a categorical measure, all items were measured on Likert-type scales varying from 1 (strongly disagree) to 5 (strongly agree).

The "matching" perspective of strategic alignment is adopted, being the most appropriate to the theoretical context of this study. Following Venkatraman (1989, p. 430), alignment or fit is seen here to be a theoretically defined match between two variables "without reference to a third criterion variable, although, subsequently, its effect on a set of criterion variables could be examined". From this perspective, fit exists when the SME's IT capabilities match its information requirements. The next step it to test whether this match improves internationalization performance. The analytical scheme supporting the matching perspective is deviation score analysis, using the absolute difference between the scores of the information requirements and IT capabilities variables, for each pair of variables (Bergeron et al., 2001).

### 4.3. Descriptive statistics

Respondents were distributed as follows: CEO (62%), marketing and sales manager (24%), CIO (7%), and others (7%). The SMEs reported annual revenues varying as follows: below $1M (20%), $1–5M (38%), $5–20M (22%) and above $20M (20%). The number of employees was distributed as follows: less than 10 (3%), between 11 and 50 (48%), between 51 and 100 (12%), and between 101 and 300 (25%). The respondent firms operated in various industries: manufacturing (42%), scientific and technical services (17%), food (13%), wholesale (12%), construction (6%), transportation (3%), retailing (2%), and various others (5%). Regarding the internationalization strategies, 12.5% of the sampled SMEs practice sub-contracting, 20.6% import, 66.7% export, 9.7% offshore, 40.8% strategic alliances, and 11.5% in international joint-ventures.

Non-response bias was tested by comparing the annual revenue, the number of employees, and the number of years of existence of the 174 responding SMEs to the 711 SMEs that did not respond. No significant difference was observed using an ANOVA test.

## 5. Results

Structural equation modelling (SEM) was used to assess the research model. The component-based PLS method was deemed more appropriate than covariance-based SEM methods such as LISREL, given the relatively high number of variables relative to sample size and the presence of a formative construct in the research model (Pavlou & El Sawy, 2006).

### 5.1. Assessment of construct validity

Using the PLSGraph 3.0 software with the data from the 174 organizations sampled, confirmatory factor analyses (CFA) were first used to assess the construct validity of the three and six dimensions that respectively make-up the two 2nd orders constructs in the research model, that is, Information requirements (Fig. 2) and IT capabilities (Fig. 3).

As a result, the measurement model was re-specified by deleting an item that did not load sufficiently ($\lambda < 0.5$) on its associated dimension, that is, 1 item out of 6 for the control dimension of the information requirements construct. The primary aim here was to confirm the reliability ($\rho > 0.7$) and convergent validity (AVE > 0.5) (Fornell & Larcker, 1981) of these two constructs' dimensions so that each of these dimensions could then be treated as a single value when testing the research model. However in further analyzing the Information requirements construct, one must bear in mind that its Communication dimension did not correlate significantly with its Control dimension, thus casting initial doubt on the unidimensionality of this construct.

**Table 1**
Discriminant validity of constructs.

| Construct | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Environmental uncertainty. | .71 | | | | | |
| 2. Internationalization mode | .17 | – | | | | |
| 3. Information requirements | .16 | −.02 | .79 | | | |
| 4. IT capabilities | .29 | .26 | .41 | .78 | | |
| 5. Misalignment | −.23 | −.18 | −.13 | −.61 | .69 | |
| 6. Internationalization performance | .01 | .22 | .22 | .48 | −.36 | .85 |

*Note*. Diagonal: (average variance extracted)$^{1/2} = (\sum \lambda_i^2/n)^{1/2}$. Sub-diagonals: correlation = (shared variance)$^{1/2}$.

### 5.2. Assessment of the measurement model

The PLS method simultaneously assesses the theoretical propositions and the properties of the underlying measurement model. Internal consistency of measures; i.e., their unidimensionality and their reliability must be verified first. The observable variables measuring a reflective construct must be unidimensional to be considered unique values. Unidimensionality is usually satisfied by retaining variables whose loadings ($\lambda$) are above 0.5, indicating that they share sufficient variance with their related construct. As presented in Fig. 4, two variables that did not load sufficiently on their associated construct were removed from the measurement model: the communication dimension for the information requirements construct and the IT business partnerships dimension for the IT capabilities construct. In considering the further analysis, bear in mind that these two dimensions are not constitutive elements of the match between the two constructs. The reliability of the four reflective constructs was confirmed by $\rho$ values above the 0.7 threshold. Convergent validity was also confirmed for three out of the four reflective constructs; the (mis)alignment construct showing an AVE value of 0.47, just below the 0.5 threshold.

The fourth property to be verified is discriminant validity, which shows the extent to which each construct in the research model is unique and different from the others. The shared variance between a construct and other constructs must be less than the average variance. This was the case for all five constructs, as shown in Table 1.

Returning to Fig. 4, the internationalization mode construct is modeled here to be "formative" rather than "reflective", given its categorical nature (Roberts & Thatcher, 2009). This construct is composed of dichotomous indicators (dummy variables) that each captures a different category. The usual reliability and validity criteria do not apply to formative constructs as it is necessary to first verify that there is no multicollinearity among the indicators that form such a construct (Petter, Straub, & Rai, 2007). This was verified with the variance-inflation-factor (VIF), the guideline being that this statistic should not be greater than 3.3 for any formative indicator (Diamantopoulos & Siguaw, 2006). Here, a VIF value of 1.14 for both indicators satisfies this criterion. Formative indicator validity is then confirmed by a weight ($\gamma$) that is significant, in the appropriate causal direction, and not less than 0.10. Again this was true for both formative indicators with weight values for the M2 and M3 categories of 0.96 ($p < 0.001$) and 0.78 ($p < 0.001$) respectively (with M1 constant as the baseline category).

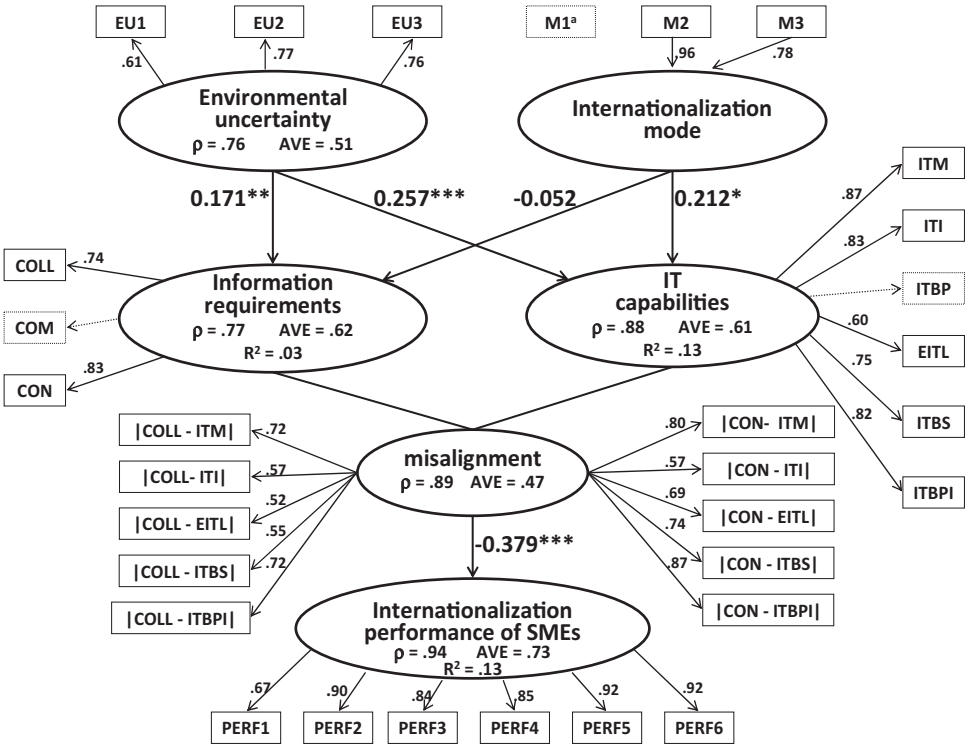


**Fig. 4.** Test of the research model.

**Table 2**
Summary of hypotheses testing.

| Hypothesized relationship | $\beta$ | Result |
|---|---|---|
| H1: Environmental uncertainty → information requirements | 0.171** | Accepted |
| H2: Environmental uncertainty → IT capabilities | 0.257*** | Accepted |
| H3: Internationalization mode → information requirements | −0.052 | Rejected |
| H4: Internationalization mode → IT capabilities | 0.212* | Accepted |
| H5: Alignment → internationalization performance | 0.379*** | Accepted |

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

### 5.3. Assessment of the structural model

The research hypotheses were tested by assessing the direction, strength and level of significance of the path coefficients (betas) estimated by PLS, as shown in Fig. 4. The alignment or "match" between international SMEs' information requirements and their IT capabilities, as defined in the research model, explains a significant amount of variance in their internationalization performance (13%); thus, providing overall support for the research model and the information processing theoretical perspective that it embodies. Furthermore, the test of the research model shows that all but one of the hypotheses (H3) are accepted, as summarized in Table 2.

## 6. Discussion and implications

### 6.1. Environmental uncertainty, IT capabilities and information requirements

Environmental uncertainty was positively related to IT capabilities and information requirements, in line with Galbraith's information processing theory (1973) and Tushman and Nadler's (1978) proposition, which says "As work related uncertainty increases, so does the need for increased amounts of information, and thus the need for information processing capacity". The international SMEs respond to levels of internal and external uncertainty by implementing communication and control mechanisms and adequate IT capabilities. Since SMEs are particularly dependent upon their environment, the threats related to environmental uncertainty can be countered with appropriate communication systems providing timely, accurate, complete and credible information. The implementation of adequate IT capabilities represents another significant challenge. While some SMEs may be helped by their partners, this is not always the case. Cooperation with partners is not an easy task given that SMEs generally have limited access to financial, managerial, technological and human resources. Overall, we conclude that these two significant relationships are not limited to large international organizations. They extend to international SMEs as well, confirming the applicability of information processing theory to this type of enterprise.

### 6.2. Internationalization mode, IT capabilities and information requirements

The internationalization mode of an SME is positively related to its IT capabilities. The internationalization mode varies from lower to higher forms of complexity. While no direct relationship was observed between the internationalization mode and information requirements, it is observed that SMEs adopting a more complex form of internationalization have more developed IT capabilities. Indeed, results show that the internationalization mode influences five of the six IT capabilities: IT management, external IT linkages, IT infrastructure, IT business strategic thinking, and IT business process integration.

Again in line with Galbraith (1973), and Tushman and Nadler's (1978) proposition relative to uncertainty, this relationship does not only confirm the relationship for SMEs specifically but it refines the type of uncertainty by specifying that more complex inter-unit

activities such as offshoring, strategic alliances and joint ventures, are related to more developed IT capabilities. The less complex inter-unit activities, such as exportation, are related to less developed IT capabilities. This supports the applicability of Tushman and Nadler's (1978) proposition to international SMEs. The SME's internationalization mode has therefore a determining role in the choice of IT capabilities that are to be deployed locally and internationally. SME managers who plan to expand or modify their international approach would gain insight by including this fact into their scenario assessment. The non-significant relationship between the internationalization mode and information requirements might indicate that the need for control and communication varies among the SMEs. It is conceivable that this need is dependent upon the type of industry in which the SME operates. Indeed, firms operating in industries characterized by a more uncertain environment, such as software programming and outsourcing, might have greater information requirements than firms in industries such as food or textile. In such a context, the internationalization mode's effect upon information might be mediated by the type of industry. Following Chiasson and Davidson (2005), it would thus be necessary to account for industry effects in future research of international SMEs' information management. With this limitation in mind, it can be concluded that the information processing theory applies again for SMEs, as it does for larger organizaations.

### 6.3. Alignment and internationalization performance

A greater alignment between the international SME's information requirements and its IT capabilities is related to a greater internationalization performance. This observation is in line with Tushman and Nadler's (1978) proposition that "organizations will be more effective when there is a match between information requirements facing the organization and information processing capacity of the organization's structure". International SMEs that fulfilled their information requirements by implementing the appropriate IT capabilities performed better than those that did not work on this alignment. More specifically, the international SME perform better when IT business integration, IT management, IT infrastructure, external IT linkages, and business-IT strategic thinking match (fit) control and collaboration information requirements. An international SME with moderate control and collaboration requirements that adopts moderate IT capabilities to match its requirement types and level, will be more performing than the one that has a mismatch (such as moderate-high, or high-moderate) between the two. This underscores the importance of considering international SMEs as "real" enterprises facing real information challenges. The alignment of their information requirements with their IT capabilities can help them sustain international competition. Revisiting information processing theory was fruitful as we can conclude that this theory generally applies to international SMEs. For practitioners, information processing theory provides a useful framework to plan the international activities of SMEs. Still, the main hurdle for these organizations is to have access to sufficient and appropriate financial, human, and technological resources to succeed in their international endeavor.

## 7. Limitations and conclusion

This investigation also has limitations that must be mentioned. Common to survey studies, the nature of the sample and perceptual nature of most measures impose care in generalizing the results of the study. Adding objective measures of internationalization performance would also reinforce research findings. Secondly, measuring all variables through a self-administered questionnaire may pose a risk of common method variance (CMV) and lead to an overestimation of the relationships between the research constructs (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), entailing that basic precautions must be taken to minimize this risk (Chang, van Witteloostuijn, & Eden, 2010). Thus, the questionnaire was designed to be anonymous, giving the respondents all the latitude needed to express their true perceptions. Robust measurement scales were used, with the independent and dependent variables being placed in different sections of the questionnaire. In addition, the unmeasured latent method construct (ULMC) approach recommended by Podsakoff et al. (2003, p. 894) to test for CMV post hoc was employed. Hence, a confirmatory factor analysis (CFA) was done in which a ULMC was added to the measurement model, allowing the measures to load on this construct as well as on their theoretical construct. The CFA provided a breakdown of the measures' variance into theoretical, method, and random error components (Williams, Cote, & Buckley, 1989). The results of this analysis were that 59% of the average variance of the measures was explained by their associated construct and only 9% by the ULMC, the remaining 32% being explained by random errors, thus suggesting that CMV is not a major problem.

It is recognized that SMEs are highly flexible and adaptable to change, be it environmental, operational, or technological. Some of these have become international or are in the process of doing so, already possess highly developed information systems, and, in a more complex business environment, must implement practices such as supply chain management (SCM), quick-response (QR), and customer-relationship management (CRM) to improve their competitive position. Investments in IT cannot insure greater international performance for these firms unless they are coherent with the information requirements brought about by their competitive environment and their strategic objectives. To this end, these enterprises must increase their IT management capability, and, thus, seek increased support from researchers and practitioners. Also, it should be kept in mind that due to the diversity of SMEs (in terms of size, sector, technological sophistication of the production process, market experience, level of dependence to larger companies for their business activities) the generalization of these results to all types of SMEs must be made with caution. Overall, the applicability of information processing theory to international SMEs has been confirmed.

Future research should seek a deeper understanding of how SMEs develop their IT capabilities based on different internationalization strategies. Adding their business partners' perspective could also be important in better understanding the internationalization strategies of SMEs. Finally, focusing on the interorganizational governance of IT in international SMEs by specifying appropriate structures, control mechanisms and relationships should also be an important research contribution.

## References

Agarwal, S., & Ramaswami, S. (1992). Choice of foreign entry mode: Impact of ownership, location and internalisation factors. *Journal of International Business Studies*, *23*(1), 1–16.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*, 99–120.

Bergeron, F., Raymond, L., & Rivard, S. (2001). Fit in strategic information technology management research: An empirical comparison of perspectives. *Omega*, *29*, 125–142.

Bergeron, F., Raymond, L., & Rivard, S. (2004). Ideal patterns of strategic alignment and business performance. *Information & Management*, *41*(8), 1003–1020.

Bharadwaj, A. S., Bharadwaj, S. G., & Konsynski, B. R. (1999). Information technology effects on firm performance as measured by Tobin's Q. *Management Science*, *45*(7), 1008–1024.

Burns, T. E., & Stalker, G. M. (1961). *The management of innovation*. Historical Research Reference in Entrepreneurship, University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership. Available at http://ssrn.com/abstract=1496187

Cegielski, C. G., Jones-Farmer, L. A., Wu, Y., & Hazen, B. (2012). Adoption of cloud computing technologies in supply chains: An organizational information

processing theory approach. *International Journal of Logistics Management*, *23*(2), 184–211.
Chan, Y. E., & Reich, B. H. (2007). IT alignment: What have we learned? *Journal of Information Technology*, *22*(4), 297–315.
Chang, S.-J., van Witteloostuijn, A., & Eden, L. (2010). From the Editors: Common method variance in international business research. *Journal of International Business Studies*, *41*, 178–184.
Chen, R.-S., Sun, C.-M., Helms, M. M., & Jih, W.-J. (2008). Aligning information technology and business strategy with a dynamic capabilities perspective: A longitudinal study of a Taiwanese Semiconductor Company. *International Journal of Information Management*, *28*(5), 366–378.
Chiasson, M., & Davidson, E. (2005). Taking industry seriously in information systems research. *MIS Quarterly*, *29*(4), 591–605.
Christopher, M., & Lee, H. (2004). Mitigating supply chain risk through improved confidence. *International Journal of Physical Distribution & Logistics Management*, *34*(5), 388–396.
Corbett, M. F. (2004). *The outsourcing revolution: Why it makes sense and how to do it right*. Dearborn Trade Publishing, Chicago, IL.
Davis, G. B. (1982). Strategies for information requirements determination. *IBM Systems Journal*, *21*(1), 4–30.
Dekker, H. C. (2004). Control of inter organizational relationship: Evidence on appropriation concerns and coordination requirements. *Accounting, Organization and Society*, *29*(1), 27–39.
DeLone, W. H. (1988). Determinants of success for computer usage in small business. *MIS Quarterly*, *12*(1), 51–61.
Diamantopoulos, A., & Siguaw, J. (2006). Formative vs. reflective indicators in organizational measure development: A comparison and empirical illustration. *British Journal of Management*, *17*, 263–282.
Duhan, S. (2007). A capabilities based toolkit for strategic information systems planning in SMEs. *International Journal of Information Management*, *27*(5), 352–367.
Elmuti, D., & Kathawala, Y. (2001). An overview of strategic alliances. *Management Decision*, *39*(3), 205–221.
Engelen, A., Brettel, M., & Heinemann, F. (2010). The antecedents and consequences of a market orientation: The moderating role of organisational life cycles. *Journal of Marketing Management*, *26*(5–6), 515–547.
Flynn, B. B., & Flynn, E. J. (1999). Information processing alternatives for coping with manufacturing environmental complexity. *Decision Science*, *30*(4), 1021–1052.
Fornell, P. H., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50.
Galbraith, J. R. (1973). *Designing complex organizations*. New York: Addison-Wesley.
Gattiker, T. F. (2007). Enterprise resource planning (ERP) systems and the manufacturing-marketing interface: An information-processing theory view. *International Journal of Production Research*, *45*(13), 2895–2917.
Gurbaxani, V., & Whang, S. (1991). The impact of information systems on organizations and markets. *Communications of the ACM*, *34*, 59–73.
Han, H. S., Lee, J. N., & Seo, Y. W. (2008). Analysing the impact of a firm's capability on outsourcing success: A process perspective. *Information & Management*, *41*(1), 31–42.
Harzing, A. W. (2001). Acquisitions versus greenfields, international strategy and management of entry modes. *Strategic Management Journal*, *23*, 211–227.
Hill, C. W. L., Hwang, P., & Kim, W. C. (1990). An eclectic theory of the choice of international entry mode. *Strategic Management Journal*, *11*(2), 117–128.
Kalantaridis, C. (2004). Internationalization, strategic behavior, and the small firm: A comparative investigation. *Journal of Small Business Management*, *42*(3), 245–262.
Karimabady, H., & Brunn, P. J. (1991). Postal surveys to small manufacturers. *Industrial Marketing Management*, *20*(4), 319–326.
Kearns, G. S., & Lederer, A. L. (2004). The impact of industry contextual factors on IT focus and the use of IT for competitive advantage. *Information & Management*, *41*(7), 899–919.
Kim, W. C., & Hwang, P. (1992). Global strategy and multinationals' entry mode choice. *Journal of International Business Studies*, *23*(1), 29–54.
Kotabe, M., & Helsen, K. (2010). *Global marketing management* (5th ed.). New York: Wiley.
Leidner, D., & Jarvenpaa, S. (1995). The use of information technology to enhance management school education: A theoretical view. *MIS Quarterly*, *19*(3), 265–291.
Liu, G., Shah, R., & Babakus, E. (2012). When to mass customize: The impact of environmental uncertainty. *Decision Sciences*, *45*(5), 851–887.
Melville, N., & Ramirez, R. (2008). Information technology innovation diffusion: An information requirements paradigm. *Information Systems Journal*, *18*(3), 247–273.
Mohr, J., & Spekman, R. (1994). Characteristics of partnership success: Partnership attribute, communication behavior, and conflict resolution techniques. *Strategic Management Journal*, *15*(2), 135–152.
Pavlou, P. A., & El Sawy, O. A. (2006). From IT leveraging competence to competitive advantage in turbulent environments. *Information Systems Research*, *17*(3), 198–227.
Petter, S., Straub, D. W., & Rai, A. (2007). Specifying formative constructs in information systems research. *MIS Quarterly*, *31*(4), 623–656.
Pinsonneault, A., & Rivard, S. (1998). Information and technology and managerial work: From the productivity paradox to the Icarus paradox? *MIS Quarterly*, *22*, 287–311.
Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903.
Pollalis, Y. A. (2003). Patterns of co-alignment in information-intensive organizations: Business performance through integration strategies. *International Journal of Information Management*, *23*(6), 469–490.
Prasad, V. K., Ramamurthy, K., & Naidu, G. M. (2001). The influence of Internet-marketing integration on marketing competencies and export performance. *Journal of International Marketing*, *9*, 82–110.
Premkumar, G., Ramamurthy, K., & Saunders, C. S. (2005). Information processing view of organizations: An exploratory examination of fit in the context of interorganizational relationships. *Journal of Management Information Systems*, *22*(1), 257–294.
Ravichandran, T., & Lertwongsatien, C. (2005). Effect of information systems resources and capabilities on firm performance: A resource-based perspective. *Journal of Management Information Systems*, *21*(4), 237–276.
Raymond, L., & Bergeron, F. (2008). Enabling the business strategy of SMEs through e-business capabilities: A strategic alignment perspective. *Industrial Management & Data Systems*, *108*(5), 577–595.
Raymond, L., & St-Pierre, J. (2013). Strategic capability configurations for the internationalization of SMEs: A study in equifinality. *International Small Business Journal*, *31*(1), 82–102.
Rivkin, J. W. (2000). Imitation of complex strategies. *Management Science*, *46*(6), 824–844.
Roberts, N., & Thatcher, J. B. (2009). Conceptualizing and testing formative constructs: Tutorial and annotated example. *Data Base for Advances in Information Systems*, *40*(3), 9–39.
Root, F. R. (1994). *Entry strategies for international markets*. New York: Lexington Books.
Ross, J. W., Beath, C. M., & Goodhue, D. L. (1996). Develop long-term competitiveness through IT assets. *Sloan Management Review*, *38*(1), 31–33.
Ruzzier, M., Hisrich, R. D., & Antoncic, B. (2006). SME internationalization research: Past, present, and future. *Journal of Small Business and Enterprise Development*, *13*(4), 476–497.
Ruzzier, M., & Konečnik, M. (2006). The internationalization strategies of SMEs: The case of the Slovenian hotel industry. *Journal of Contemporary Management Issues*, *11*(1), 17–35.
Sanders, N. R., & Premus, R. (2005). Modeling the relationship between firm IT Capability, collaboration and performance. *Journal of Business Logistics*, *26*(1), 1–23.
Shi, Z., Kunnathur, A. S., & Ragunathan, T. S. (2005). IS outsourcing management competence dimensions: Instrument development and relationship exploration. *Information & Management*, *42*, 901–919.
Spowart, M., & Wickramasekera, R. (2012). Explaining internationalisation of small to medium sized enterprises within the Queensland food and beverage industry. *International Journal of Business and Management*, *7*(6), 68–80.
Thong, J. Y. L. (1999). An integrated model of information systems adoption in small businesses. *Journal of Management Information Systems*, *15*(4), 187–214.
Thong, J. Y. L., Yap, C. S., & Raman, K. S. (1996). Top management support, external expertise and information systems implementation in small businesses. *Information Systems Research*, *7*(2), 248–267.
Turkulainen, V., Kujala, J., Artto, K., & Levitt, R. E. (2013). Organizing in the context of global-based firm: The case of sales-operation interface. *Industrial Marketing Management*, *42*, 223–233.
Tushman, M., & Nadler, D. A. (1978). Information processing as an integrating concept in organization design. *Academy of Management Review*, *3*(3), 613–624.
Venkatraman, N. (1989). The concept of fit in strategy research: Toward verbal and statistical correspondence. *Academy of Management Review*, *14*(3), 423–444.
Vessey, I., & Galletta, D. (1991). Cognitive fit: An empirical study of information acquisition. *Information Systems Research*, *2*(1), 63–64.
Wei, Y., Liu, B., & Liu, X. (2004). *Entry modes of foreign direct investment in China: A multinomial logit approach [working paper]*. Lancaster University Management School.
Welsh, J. A., & White, J. F. (1981). A small business is not a little big business. *Harvard Business Review*, *59*(4), 18–32.
Westhead, P., Wright, M., & Ucbasaran, D. (2004). Internationalization of private firms: Environmental turbulence and organizational strategies and resources. *Entrepreneurship & Regional Development*, *16*, 501–522.
Williams, L. J., Cote, J. A., & Buckley, M. R. (1989). Lack of method variance in self-reported affect and perceptions at work: Reality or artifact? *Journal of Applied Psychology*, *74*(3), 462–468.
Zhang, M., Sarker, S., & Sarker, S. (2007). Drivers and effects of IT capability in "born-global" firms: A cross-national study. In *Proceedings of the 28th international conference on information systems* Montreal.
Zhang, M., Sarker, S., & Sarker, S. (2008). Unpacking the effect of IT capability on the performance of export-focused SMEs: A report from China. *Information Systems Journal*, *18*, 357–380.
Zhou, L., Wu, A., & Barnes, B. R. (2012). The effects of early internationalization on performance outcomes in young international ventures: The mediating role of marketing capabilities. *Journal of International Marketing*, *20*(4), 882–905.
Zou, S. M., Taylor, C. R., & Osland, G. E. (1998). The EXPERF scale: A cross-national generalized export performance measure. *Journal of International Marketing*, *6*(3), 37–58.

**Vincent Dutot** is Associate Professor of information technology and electronic commerce at ESG Management School, Paris, France. He holds a Ph.D. from Laval University (Québec). His areas of research are in business and IT strategy, IT

management, strategic alignment of information technology, electronic commerce, social media and knowledge diffusion. He also worked as an IT consultant for SME, government and in private sector for almost 10 years.

**François Bergeron** is a full professor of IT Governance at TELUQ, Université du Québec, Canada. His areas of research and consulting are in governance of IT, IT strategic alignment, the contribution of IT to business performance, and SMEs. He published extensively in journals such as *MIS Quarterly, Journal of Strategic Information Systems, Journal of Management Information Systems, Information & Management, European Journal of Information Systems* and others. He holds a Ph.D. from the Anderson School of Management, UCLA.

**Louis Raymond**, Ph.D., is Professor Emeritus of information systems and researcher at the Institute for Research on SMEs, Université du Québec à Trois-Rivières. His research has been published in journals such as the *MIS Quarterly, Journal of Management Information Systems, Entrepreneurship Theory and Practice, Information Systems Journal* and *International Journal of Information Management*, as well as in international proceedings such as *ICIS*. Professor Raymond's research interests center on the nature and the determinants of performance for SMEs in the face of globalization, with a particular interest on the role of ICTs in this regard.