Journal of Small Business Management 2008 46(2), pp. 203–218

*Fueling Innovation through Information Technology in SMEs**

by Clay Dibrell, Peter S. Davis, and Justin Craig

This paper describes a study that investigates the mediating effects of information technology (IT) on the relationships among product and process innovations and firm performance (measured in multiple profitability and growth rate metrics). Using structural equation modeling on a sample of 397 small and medium-sized enterprises (SMEs), we find evidence that (1) increases on the strategic emphasis placed on innovation, both product and process, positively impact the prominence managers place on IT; (2) the impact of innovation (both product and process) on performance (both profitability and growth) is primarily indirect, felt via the mechanism of the importance managers place on IT; and (3) an increased emphasis on IT abets managers' perception of their firms' performance, as compared with that observed among peer firms (other SMEs).

A commitment to innovation has long been considered to be important to the success of entrepreneurial ventures and small firms (Fiol 1996). Research has shown that innovation stimulates ventures' growth (e.g., Wolff and Pett 2006; Motwani et al. 1999; Hax and Majluf 1991) and also provides a key source of competitive advantage in the absence of scale economies (Lewis et al. 2002). Considered from the resource-based view of the firm (Barney 1991), successful innovation may be dependent on the presence of other organization-

*The authors wish to thank Don Neubaum and the anonymous reviewers for their helpful comments and direction. Financial support was provided by the Austin Family Business Program in the College of Business at Oregon State University.

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specific skills and capabilities. For example, substantial evidence has begun to accumulate that suggests that appropriate strategic employment of information technology (IT) may be essential in translating strategies (e.g., innovation) into enhanced firm performance (e.g., Ray, Muhanna, and Barney 2005; Sakaguchi, Nicovich, and Dibrell 2004). A direct linkage between IT and firm performance was established by Powell and Dent-Micallef (1997). Bharadwaj (2000) found that high IT-capable firms (those that invest heavily in IT) outperform competitors that do not invest to the same extent (also see, Sambamurthy, Bharadwaj, and Grover 2003). These results suggest IT offers firms a competitive competency, which aids firms in differentiating themselves in the marketplace, such as through innovation.

Despite their prominence as key constructs in the literature, possible relationships among innovation, IT, and performance have not been the subject of extensive investigation (Aral and Weill 2007; Oh and Pinsonneault 2007; Dewett and Jones 2001). It is generally acknowledged that the effective application of IT should enable firms to respond more appropriately to their environment (Das, Zahra, and Warkentin 1991) and to receive and process information more efficiently (Hanson 1999; Perrow 1967), thereby facilitating competitive advantage (Ray, Muhanna, and Barney 2005; Barney 1991; Porter and Millar 1985). Consequently, firms often invest substantial resources in IT assets (e.g., computer hardware, computer software, and personnel) (Krishnan and Sriram 2000). Over time, firms that invest more than their competitors in IT tend to realize greater returns from the marketplace (Bharadwaj 2000). However, there is not a substantial body of theory-driven empirical studies that demonstrate how innovation interacts with IT resources to enhance firm performance (for exceptions, see King and Burgess 2006; Huang and Liu 2005; Croteau and Raymond 2004; Johannessen, Olaisen, and Olsen 1999). The purpose of the present study is to contribute to the closure of this gap. We achieve this by investigating further the potential benefits of IT, here presented as investments by the firm in both tangible and intangible assets, for innovation pursuant to enhanced firm performance.

Although prior studies have established evidence of beneficial performance and productivity impacts of IT investments (see, e.g., Huang and Liu 2005; Bharadwaj, Bharadwaj, and Konsynski 1999; Bonk 1996), there is also considerable skepticism to the benefits of IT and, consistent with what has become known as the "productivity paradox" (Trott and Hoecht 2004), IT investments do not meet performance objectives (e.g., Clegg et al. 1997), or that there is little or no relationship between IT investment and firm performance (e.g., Powell and Dent-Micallef 1997). Various arguments have been put forward as to why there is a lack of consensus in the value of IT investment. For example, Powell and Dent-Micallef (1997) suggest that IT is now so readily available and, as such, does not offer competitive performance. Others point to mismeasurement problems related to inputs and outputs (Wilcock and Lester 1997), confusion related to generalization of studies due to issues related to the level of analysis, and the role of time lag effects between investment in technology and its payoff (Sangho and Kim 2006).

We acknowledge that although relationships among IT and strategic foci, such as innovation, and firm performance are the focus of considerable conjecture in various literatures (Sambamurthy, Bharadwaj, and Grover 2003; Johannessen, Olaisen, and Olsen 1999), further and ongoing investigation of these relationships in the context of small and medium-sized enterprises (SMEs) is warranted given the dramatic advancement of IT that has shifted SMEs to more advantageous positions in organizational flexibility and efficiency terms (Tanabe and Watanbe 2005; Izushi 2003; Larsen and Lomi 2002; Xiang and Lan 2001). In particular, Cooper (1998) highlights that due to advances in computer technology, the declining cost of systems and improved software and technological sophistication of the workforce, no longer are adaptations reserved for the technologically elite, which results in opportunities for innovation in the small firm. Further support for our examination of IT and innovation relationships is drawn from Dewett and Jones (2001, p. 326) who stress that, "because IT moderates many aspects of the process of bringing new problem-solving ideas into use given that it determines the way information is stored, transmitted, communicated, processed and acted upon, IT is an important but neglected means of facilitating the innovation process."

Our study provides distinguishing contributions to the extant literature in the following ways. First, whereas previous studies often collapsed product and process innovations into a single variable, we separate product innovation from process innovation in our analyses to be consistent with indications in the literature that each form of innovation would have differing impacts on performance outcomes (cf. Wolff and Pett 2006; Olson, Slater, and Hult 2005; Vermeulen 2005). A second distinguishing contribution of the current study from prior studies is that we broaden the measurement of firm performance to include multiple profitability and growth rate metrics. Third, a compelling characteristic of the study is its context. Although some studies have investigated the impact of IT or innovation on performance, to date, there have been relatively few empirical studies that have demonstrated this association among the vast population of SMEs (Huang and Liu 2005).

The paper is organized into four sections. The first section draws upon strategic management and management information systems literatures to describe the critical components of innovation and IT and presents theory-driven links among IT, innovation, and firm performance. From this, we distill our hypotheses and present our conceptual framework. The second and third sections consist of methods and results, respectively. Lastly, the discussion and conclusion section elaborates on the findings of this study.

Literature Review

Innovation

Innovations vary in complexity and can range from minor changes to existing products, processes, or services to breakthrough products, and processes or services that introduce first-time features or exceptional performance. Process definition of innovation proponents concern themselves mainly with how the interplay between events and people at each stage of the process influences events in subsequent stages, determining whether the adoption process will continue (Cooper 1998). Issues of interest for these scholars include the role of communication in facilitating successful innovation, best practices in terms of sequencing the stages of innovation, the characteristics of individuals and teams in successful and unsuccessful processes, and the nature of the relationships between parties involved in the innovation process (Frishammar and Hörte 2005). In contrast, those who see innovation as a discrete event suggest that implementation of innovation occurs when there is actual acceptance of risk and the commitment of resources occurs. A growing number of practitioners and researchers define innovation as any idea, practice, or object that the adopting individual or organization regards as new (e.g., Bhaskaran 2006; Damanpour 1991). From this perspective, the newness attached to an innovation remains a matter of perception. Innovation has further been defined as "the willingness to place strong emphasis on research and development, new products, new services, improved product lines, and general technological improvement in the industry" (Slevin and Covin 1990, p. 43). Regardless of definitional debates, success in innovation typically requires strong managerial support and resource commitment (Fujita 1997). Even then, only 4 percent of all new product innovations beat the expected return on investment (Nussbaum, Berner, and Brady 2005).

Examinations of innovation have been divided into two major research streams (Brown and Eisenhardt 1998). The first stream examines issues related to the diffusion of innovations across nations, industries, and organizations (e.g., O'Neill, Pouder, and Buchholtz 1998). In this stream, an innovation is defined as a technology, strategy, or management practice that a firm is using for the first time, whether other organizations or users have previously adopted it, or as a significant restructuring or improvement in a process (O'Neill, Pouder, and Buchholtz 1998). The second stream examines the influence of organizational structures, strategic processes, and people on the development and marketing of new products (e.g., Dibrell and Craig 2006; Zahra 1993). Within this second research stream, an innovation refers to a new product that an organization has created for the market and represents the commercialization of an invention, where invention is an act of insight (Damanpour 1991). New products may take different forms, such as upgrades, modifications, and extensions of existing products.

The most prominent innovation dimensions within these research streams are radical, incremental, product, process, administrative, and technological (Camison-Zomoza Lapiedra-Alcamí and Boronat-Navarro 2004). The two most common of these innovation dimensions are product innovation and process innovation (Daft 2001). Broadly, product innovation reflects change in the end product or service offered by the organization, whereas process innovation represents changes in the way firms produce end products or services (Camison-Zomoza, Lapiedra-Alcamí, and Boronat-Navarro 2004). Both product and process innovation have been shown to be potentially significant sources of strategic advantage. Process innovation historically seems to favor large firms operating in mature markets with high organizational slack, is efficiency focused and, as such, is centered on lowering a firm's average cost of production (Garcia and Calantone 2002). Process innovation, in this research, refers to the changes made in the processes or technologies used by the organization to deliver products or services, while product innovations are defined in this research as new products or services introduced to meet an external user or market need (Walker 2005).

IT Investment

With IT's increasing sophistication and usage, managers now consider the use of IT as a competitive tool used for the implementation of strategic plans and the support of firm core competencies (e.g., Aral and Weill 2007; Oh and Pinsonneault 2007; Dibrell and Miller 2002). As a consequence, investment in IT by firms has dramatically escalated in recent times (Devaraj and Kohli 2003). IT can be used to influence a firm's ability to gain a competitive advantage (e.g., Ravichandran and Lertwongsatien 2005; Kohli and Devaraj 2003) through the linkage of IT with a firm's strategy and industry. Das, Zahra, and Warkentin (1991) suggest that linking strategy to IT allows firms to compete more effectively. A study by Powell and Dent-Micallef (1997) confirmed a direct link between

IT and firm performance. Ravichandran and Lertwongsatien (2005) also found a direct relationship between investments in IT capabilities and firm financial performance. However, since prior studies focused on the population of large, often diversified companies, questions remain as to whether these results are generalizable to SMEs. Supposedly, the more flexible managerial capabilities of SMEs dictate the extent of success of IT adoption and the resulting positive effects on financial performance (Khazanchi 2005). In this event, smaller firms should be able to more effectively utilize IT to exploit newer technologies than their larger, less agile competitors (Xiang and Lan 2001; Bonk 1996).

IT Investment, Innovation, and Firm Performance

Firm performance is enhanced when there are synergies among the elements of a system. Complementary factors of a system of mutually enhancing elements operate in such a way that doing more of one thing increases the returns of doing more of another (Huang and Liu 2005). As such, investment in IT does not stimulate productivity and growth (i.e., firm performance) without a number of complementary developments, and, even then, resource commitment in IT may detract from short-run profitability (Johannessen, Olaisen, and Olsen 1999). Innovation also exists with the same characteristic, that is, focusing on innovation is likely to influence organizational structures and systems (Craig, Cassar, and Moores 2006). For example, as innovation entails considerable risk-taking (Blumentritt and Danis 2006), successful implementation requires making significant systemic changes in a firm to promote risk. A strategy that focuses on innovation will also likely require some degree of flexibility in its organizational structure (Blumentritt and Danis 2006). Open channels of communication, decentralization and informal decision-making, loosely coupled decision linkages and loosely identified job descriptions, and flexibility in processes and procedures are all associated with innovative activity (Mintzberg 1979). For an organization to develop the capacity for sustained innovation, as well as incorporating innovation as a meaningful component of strategy, it must make resources available for new products and provide collaborative structures and processes to solve problems creatively and connect innovations with existing businesses (Bhaskaran 2006). IT is seen as vital to building this capacity (King and Burgess 2006). Firm performance is enhanced, therefore, when innovative activity is complemented by IT initiatives that result in the systematic introduction of new processes and products that fit with existing processes, promoting increased customer loyalty, and stimulating demand for other products (Frishammar and Hörte 2005).

Hypotheses

SMEs that can demonstrate timely responsiveness and rapid and flexible product innovation, coupled with the management capability to effectively coordinate and redeploy internal and external competences, can potentially build a competitive advantage (Zahra, Neubaum, and Larrañeta 2007; Tanabe and Watanbe 2005). Such efforts largely overlook what has rapidly become a fundamental and crucial firm operation, IT. Dewett and Jones (2001) have extended the IT to performance proposition by stressing the need to incorporate firm-level strategy into this body of research. Through their theoretical examination, the authors argue that IT directly influences the strategy to firm performance relationship. Moreover, Lee and Runge (2001), in their study of SMEs, found that firms that are innovative are more likely to employ IT successfully. These innovative firms are also more likely to realize greater value from IT than firms that are less innovative. Based on this logic, we propose the following hypothesis:

H1: An emphasis on innovation will be positively associated with an emphasis on IT in small and medium-sized firms.

Despite the fact that the majority of innovations come from the small business sector (SBA 2004), empirical innovation research has tended to focus on large publicly held organizations (Verhees and Meulenberg 2004; Gudmundson, Tower, and Hartman 2003). SMEs are increasingly being recognized for their innovativeness through new product and process developments (Freel 2003). Innovation in small firms is different from large firms (Audretsch 2001; Eden, Levitas, and Martinez 1997), and these firms are able to respond to changes in demand through their organizational flexibility. Further, due to their close relationships to customers, small firms can detect market niches more efficiently and effectively than larger firms. Brown and Blackmon (2005) suggest that smaller firms can combine the flexibility of production organization with product specialization, creating a way out of the constraints of mass production. Comparably, Ojha (2004) argues that larger long-stable organizations are especially challenged by changes in technology. These previous studies lead to our second hypothesis:

H2: An emphasis on innovation will be positively associated with financial performance in small and medium-sized firms.

Prior works, for the most part, ignore the processes involved in the use of IT as a means of generating greater profitability (Dewett and Jones 2001; Bharadwaj 2000) and only investigate the direct linkage of IT to firm performance (for exceptions, see Huang and Liu 2005; Verbees and Meulenberg 2004). This point is especially poignant when considering SMEs. In reviewing the SME IT research, Khazanchi (2005) emphasizes the necessity to study additional organizational variables when considering the role of IT on firm performance. Likewise, he indicates that IT should have a demonstrable and positive effect on firm performance when other organizational constructs are considered. Consequently, when a firm actively engages in an innovation strategy, we hypothesize that IT will have a positive relationship to firm performance:

H3: In the presence of a firm strategy of innovation, an emphasis on IT will be positively associated with financial performance in small and medium-sized firms.

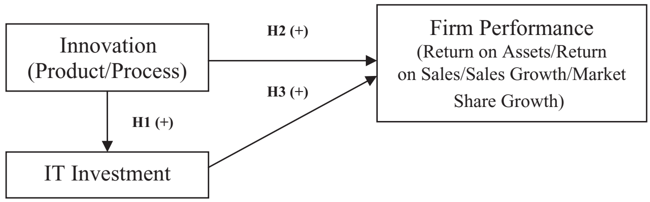
The conceptual model presented in Figure 1 provides a summary of the relationships that are under investigation in this research.

Methodology

Sample

Following Salant and Dillman's (1994) recommendation for conducting survey studies, 2,200 potential respondents were selected from a Dun & Bradstreet mail list of the population of firms residing in a state within the United States that met our criteria of being for-profit SMEs (6–499 employees) with the key respondent (owner, chief executive officer [CEO], director) in a knowledgeable management position (Floyd and Wooldridge 1994). A total of 351 respondents asked to be removed from our mailing list resulting in an effective sample pool of 1,849, which produced our final sample size of 375 and a response rate of 20.3 percent. This response rate compares more favorably than other studies that have targeted top-

Figure 1
Conceptual Model



management team members (Hambrick, Gelekanycz, and Fredrickson 1993).

The industry sample breakdown is as follows: Agriculture, Forestry, Hunting, Fishing ($n = 47$); Manufacturing ($n = 95$); Finance, Insurance, Real Estate ($n = 14$); Health, Education, Social Services ($n = 23$); Mining, Construction ($n = 72$); Transportation, Communication, Utilities ($n = 26$); Retail, Hotel, Restaurant ($n = 45$); Business Services ($n = 58$); and Consumer Services ($n = 17$). The age of the firms ranged from 1 to greater than 40 years with the median range of the sampled firms from 20 to 29 years. The median size of the firms was in the 20–49 employee category with a small minority of firms larger than 100 employees ($n = 18$). We tested for potentially confounding effects associated with cross-industrial surveys and found no statistically significant differences on the demographics of industry life cycle and firm age. Although our response rate was high, nonresponse bias could still obfuscate our findings. As suggested by Armstrong and Overton (1977), a t-test on the studied constructs between early versus late respondents was conducted, and no statistical differences were revealed.

Given the potential rural location specific bias associated with some of the natural resource-based industries in our sample (e.g., mining, agriculture), we tested for potential confounding effects associated with a location-specific bias by classifying locations as rural that had less than 50,000 residents and urban greater than 50,000 residents. These results suggest that there are no differences between rural and urban on the studied dimensions. This finding extends the generalizability of our findings to include SMEs not only in rural areas but also urban areas. Likewise, these findings further strengthen support for our earlier finding concerning nonresponse bias, as firms regardless of geographical location, demographics, and industry classification answered comparably.

Similarly, we were concerned about the potential effects associated with common method bias. To check for the effects associated with common method bias, we conducted a principal component analysis of all the items employed in the study (Podsakoff and Organ 1986; Harman 1967). Four factors emerged with eigenvalues greater than 1, with the first factor accounting for only 34 percent of the explained variance indicating that common method bias should not influence the results.

To test for effects of multicollinearity, which may be a result of common method variance, we conducted a multiple regression analysis with the three criterion variables (product innovation, process innovation, and IT investment) regressed on the dependent variable of firm performance. The variance inflation factor (VIF) scores for the three measures were below 1.5, which is much lower than the VIF cutoff of 10 (Chatterjee and Price 1991).

Innovation. As product and process innovations have different performance impacts (Olson, Slater, and Hult 2005), we employed separate scales to examine product innovation and process innovation.

Product Innovation. To tap product innovation, we used a three-item scale developed by Miller and Friesen (1982), which has been used extensively in the literature. The three items captured the extent of product innovation within a firm. Respondents were asked to compare their firm to other firms in their respective industries. The items were (1) "there exists a very strong emphasis on marketing of tried and true product/services" compared to "there exists a very strong emphasis on R&D, technological leadership, and innovations"; (2) "no new lines of products, services, or programs were introduced during the past three years" versus "more than half of our product lines or services were introduced during the past three years"; and (3) "changes in product lines have been minor over the last three years" opposed to "changes in product lines have been major over the last three years."

Process Innovation. To assess a firm's emphasis on process innovation, we adapted items assessing process innovation from Dess and Davis (1984), and Davis, Dibrell, and Janz (2002). Respondents were asked to answer four questions with the anchors 1 = not at all to 5 = great extent in relation to the emphasis that their firm places on specific process-related innovation activities. The four items were (1) innovation in production processes; (2) investing in new R&D facilities to gain a competitive advantage; (3) producing specialty products; and (4) higher production efficiency than competitors.

IT Asset Investment. Management information systems scholars (e.g., Sakaguchi and Dibrell 1998; Mahmood and Mann 1993) suggest that an appropriate way to gauge a firm's emphasis on IT is to look at their investments in IT assets (e.g., hardware, software, and personnel) relative to other competitors within the same industry. Drawing upon a scale developed and validated by Sakaguchi and Dibrell (1998), we modified their scale to a four-item scale that included respondents being asked to report their (1) total dollar value of IT assets; (2) total IT investment; (3) number of IT employees; and (4) number of personal computers and terminals per employee.

Firm Performance. The firms participating in this study were SMEs that were not publicly traded. Like many of the study's constructs, measuring performance required data that were unavailable from suitable secondary data sources. Hence, we used subjective measures of performance provided by the respondent managers to capture firms' relative profitability and growth as compared with that of their peer competitors (other SMEs). Following Dess and Robinson (1984), and Davis, Dibrell, and Janz (2002), managers were asked to report their primary business unit's return on assets, return on sales, sales growth, and market share growth.

Analyses

Structural equation modeling using LISREL 8.52 was employed for validation of the scales through confirmatory factor analysis and for hypothesis testing. This statistical analysis was chosen as both the measurement and structural models are estimated simultaneously (e.g., Jöreskog 1978).

Results

As seen in Table 1, the coefficient alphas ranged from a low of 0.69 for a process innovation strategy to a high of 0.88 for IT asset investment and firm financial performance. The correlation matrix indicated that multicollinearity did not seem to be present in the sample.

For construct validation, a two-phase confirmatory factor analysis approach was conducted, as suggested by Anderson and Gerbing (1988). First, the reflective measures were tested. The standardized factors loadings were above 0.50 and were statistically significant ($p < .05$). Second, a series of sequential chi-square models were compared, specifically, the null one-factor model, the constrained four-factor model (the latent constructs were not allowed to correlate), and the unconstrained four-factor model (the latent constructs were allowed to correlate). The unconstrained factor model demonstrated the best fit among the three models with the following results ($\chi^2 = 264.69$; $df = 84$, $p < .05$; comparative fit index (CFI; Bentler 1990) = 0.95; Delta2 (Bollen 1989) = 0.95; relative noncentrality index (RNI; McDonald and Marsh 1990) = 0.95; the root mean square error of approximation (RMSEA; Steiger and Lind 1980) = 0.083; and the goodness of fit index (GFI) = 0.90. These results indicate that the constructs in the measurement model demonstrate convergent and discriminant validities.

With the scales validated, we proceeded to test the hypothesized model. The model fits the data strongly ($\chi^2 = 123.40$, $df = 81$, $p < .05$; CFI = 0.99; Delta2 = 0.99; RNI = 0.99; RMSEA = 0.04; and GFI = 0.95), as shown in Table 2. Both product ($\beta = 0.27$; $p < 0.05$) and process innovations ($\beta = 0.20$; $p < .05$) had positive associations with IT asset investment, resulting in H1 being supported. The squared multiple correlation (comparable to R^2 in regression analysis) for this equation was 0.11, suggesting that 11 percent of the variation associated with IT can be explained through product and process innovations. For H2, product innovation to (a) performance ($\beta = 0.02$; $p > .05$) and process innovation to (b) performance ($\beta = 0.04$; $p > .05$) were rejected. In H3, IT did have a positive path to firm performance ($\beta = 0.59$; $p < .05$), resulting in support for this hypothesis. Further, 37 percent of firm performance variation (the squared multiple correlation for performance)

Table 1
Descriptives, Coefficient Alphas, and Correlation Matrix

Latent Construct	Mean[a]	S.D.[b]	Coefficient Alpha	1	2	3
1. Product Innovation	2.90	0.97	0.78			
2. Process Innovation	2.70	0.89	0.69	0.31**		
3. IT Investment	2.85	1.04	0.88	0.29**	0.22**	
4. Firm Performance	3.32	0.96	0.88	0.20**	0.19**	0.48**

[a]The measures were summated and then divided by the number of items for each respective measure.
[b]S.D., standard deviation.
$^{**}p < .01$ (2-tailed).

Table 2
Structural Model Parameter Estimates and Goodness-of-Fit Statistics for Hypothesized Model ($n = 311$)[a]

Estimates and Fit Statistics	Standardized Estimate	*t*-Value
Gamma Parameters		
Product Innovation → Information Technology	0.27*	4.18
Process Innovation → Information Technology	0.20*	2.96
Product Innovation → Performance	0.02	0.37
Process Innovation → Performance	0.04	0.62
Beta Parameter		
Information Technology → Performance	0.59*	7.20
Theta-Epsilon Parameters[b]		
Return on Assets ↔ Return on Sales	0.28*	4.65
Sales Growth ↔ Market Share Growth	0.15*	2.53
Value of IT Assets ↔ Total IT Investment	0.15*	3.59
Producing Specialty Products ↔ Invest in R&D	0.17*	3.11
Model Fit Statistics: $\chi^2 = 123.40$ ($df = 81$, $p < .05$); CFI = 0.99; Delta2 = 0.99; RNI = 0.99; RMSEA = 0.04; GFI = 0.95).		

[a]Total sample size was reduced, as we employed listwise deletion. CFI, comparative fit index; RNI, relative noncentrality index; RMSEA, root mean square error of approximation; GFI, goodness of fit index.
[b]The errors for these individual items were allowed to correlate to improve overall model fit.
*$p < .05$.

was explained mainly through information technology with a smaller percentage explained by product and process innovations.

Discussion and Conclusion

The findings of this study extend the SME, IT, and innovation literatures and help build a foundation for further understanding the link between innovation and IT and performance outcomes. From the results, we are able to make multiple observations. First, the impact of innovation (both product and process) on performance (both profitability and growth) is primarily indirect and is instead fueled by IT. The initiatives of innovation and IT are complementary. In order to optimize investment in innovation activities, IT initiatives should be aligned with innovation. Second, SMEs that compete with larger firms are able to level the competitive playing field by utilizing IT. Further, SMEs should consider how they apply IT to other strategic initiatives, such as customer responsiveness, in order to enhance overall effectiveness of the strategy.

The extant literature on innovation reveals that through investment in product and process innovations, firms expand their core capabilities in the areas of products, knowledge, and skills. Because investing in capabilities like these yield competitive advantage, the resultant distribution of such capabilities will tend to give certain firms an advantage relative to others (Ray, Muhanna, and Barney 2005; Barney 1991). Our results support that the potential for developing innovative capabilities may not need to be closely related to particular products to yield benefits. The finding that process innovation abets performance, albeit indirectly, suggests that it may be in the firm's best interests to invest in innovative capabilities, even when the innovation is not directly tied to a specific product.

The development of a range of innovative capabilities, whether in the form of products or processes, may offer the firm a set of strategic choices that can be exercised if customers' expectations fail to materialize or should shift suddenly (Amram and Kulatilaka 1999; Bowman and Hurry 1993). In contrast, it appears that a failure by SMEs to invest in innovation makes them slower to acquire necessary innovative capabilities than other SMEs and thus less able to respond to changing technological and competitive market expectations and opportunities. Being an innovator in a fast-moving market may confer advantages associated with technological leadership and first-mover advantages (Christensen 1998). A failure to invest in one or the other form of innovation, either product or process, may cause an SME to be unable to respond effectively to competitors' introduction of new products or process enhancements. An SME that fails to continually invest in innovation places itself at greater risk of having products and services marginalized by technologically superior competitors.

With regards to IT, in many respects, our findings appear to support contentions by Ravichandran and Lertwongsatien (2005) that an SME that is able to understand the power of IT and to link this power to support the core competencies of the firm successfully can have a competitive advantage. From our results, it appears that managers who are able to integrate either a product or a process-oriented innovation strategy with investments in IT enhance their firms' relative performance along two essential dimensions: profitability and growth. In contrast, a failure to invest in IT can cause a firm to be unable to support its innovation initiatives. Perhaps, a lack of investment in IT over time may render the firm incapable of meeting customer requirements.

For performance, our study demonstrates that IT does have a positive and significant effect on current profitability and future growth. We posit that this is due to an increase in managerial sophistication of IT usage and the increased production capacity of IT. Likewise, managers have increased their knowledge and understanding of the most effective ways to implement their firm's strategies with IT. Our reasoning once again suggests that firms are able to create unique resources and capabilities through the use of IT that are not easily inimitable, which is consistent with the resource-based view.

As with any research, associated with our study are limitations that offer opportunities for future research. With only one key respondent per firm, respondents could have a skewed perspective of the different model components, which future researchers may wish to triangulate with other respondents from the same firm or from external observers. In addition, despite previous research showing a strong correlation between objective and perceptual measures (Jennings and Young 1990; Dess and Robinson 1984), future research may wish to examine alternative measures as well to address questions attendant to common method variance. Finally, our findings may extend beyond the relationship demonstrated between innovation and IT to other types of SME orientations and behaviors; such possibilities are certainly worthy of further investigations.

Finally, we note several managerial implications for SMEs. Recall the three key findings that emerged: (1) product and process innovations exhibited strong linkages with IT; (2) IT mediated the innovation to firm performance direct relationship; and (3) IT was positively related to performance. Based on these findings, managers should be more willing to invest in IT; however, managers must also be cognizant of the necessity to create systems and processes that most effectively optimize IT usage. Our study, in conjunction with past research, clearly demonstrates the need for a firm to invest in IT and to hire employees that are capable of utilizing IT to implement competitive business-level strategies successfully.

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