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Information Technology in Small Businesses: An Overlooked Opportunity?

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ABSTRACT

This paper examines the use of Information Technology (IT) by small businesses. We draw upon extant literature to propose and then test a model that examines the key motivational factors in the IT adoption decision. Survey data from a sample of small businesses in the Maritime Provinces of Canada are used in testing the model. The findings show that recognition of strategic opportunities for using IT builds incrementally as usage increases. The implications of the results and an agenda for further research are discussed.

INTRODUCTION

It is generally agreed that the use of information and communications technologies (ICTs) can greatly enhance the ability for organizations to respond quickly and cost-effectively to shifting market demands. Accordingly, governments in Canada and elsewhere are attempting to encourage the use of ICTs as a means of increasing economic growth and competitiveness (Statistics Canada 2001). However, the small business community has yet to fully embrace the use of ICTs in general and the Internet specifically (Canadian Federation of Independent Business 1999; Craig and Murray 2001). Understanding why small businesses are not adopting ICTs is important to examine considering their potential to enhance the success of small businesses.

Small business use of IT has received little academic attention (Thong, 1999). Research in the area of adoption tends to be concentrated in large organizations, primarily in manufacturing sector or in the information technology sector. This research has marginal generalizability. For example, Pollard and Hayne's (1998) empirical work – drawn from members of information technology (IT) professional associations, cannot be generalized to the broader small business community because it is industry specific.

As a basis for understanding the small business sector's general indifference to ICTs and the Internet, a necessary first step is to determine the scope and nature of IT adoption. Indeed, the use of the Internet is contingent upon having the basic technology infrastructure. The paper begins by drawing on the literature to develop a conceptual model of the adoption process centering on *efficiency*, *effectiveness*, and *expertise*. It then presents the research method used, the results, a discussion of the findings and our conclusion and implications.

TOWARDS A MODEL OF INFORMATION TECHNOLOGY ADOPTION BY SMALL BUSINESSES

Fundamentally, if IT is to be adopted by a small business – an owner-managed independent firm with less than 100 employees (Longnecker et al., 1997), there needs to be an impetus or motivation to do so. Research indicates that small businesses can be prompted by 'pushes' or negative aspects of the firm's present situation that cause it to consider adopting IT such as the need to replace existing systems with new and more reliable ones (Razi and Trail (2001) and/or 'pulls' or potential opportunities afforded by adoption such as an increased capacity to compete with large firms (Dandridge and Levenburg, 2000).

Conceptualized another way, small businesses hope to obtain either a measure of *efficiency* (more output from a given input); and/or a measure of *effectiveness* (ability to achieve a strategic goal or objective) through the adoption of IT. In other words, they aim to be efficient by saving money, saving time, or communicating better and/or to be effective by providing better products, creating new markets, or reacting strategically to competition. Within the IT literature, there are mixed results regarding these two factors, with some studies (Duan et al., 2001) finding efficiency to be the main reason for adoption while others (Pollard and Hayne, 1998) claim effectiveness is the primary motivator.

Insight into these seemingly contradictory findings can be gained by drawing on the small business literature. Typically, small businesses make multi-staged resource commitments (Stevenson et al., 1999). In doing so, the entrepreneur's aim is to maximize value creation by minimizing resources. Consequently, we propose that IT will be adopted in a similar fashion (see Figure 1). The literature indicates that most small firms first foray into using IT is to assist with operational and administrative duties (Fuller, 1996; Pugsley et al., 2000). Accordingly, since these operational tasks - accounting, budgeting, inventory control, word processing, and spreadsheet analysis (Nickell and Seado, 1986) are *efficiency* oriented, we hypothesis that:

> H_1 There will be a significant and positive relationship between a small business's focus on *efficiency* goals and their adoption of IT.

While many small businesses do not move beyond the first or efficiency stage (Kagan et al., 1990), we maintain that if IT is perceived to add value at this stage, there is a greater likelihood of subsequent commitment. Proceeding to the second or *effectiveness* stage would involve expanded use of IT whereby effectiveness goals become the focus. Indeed, recent findings suggest small businesses are beginning to recognize IT's strategic or effectiveness potential (Pollard and Hayne, 1998). Accordingly, we hypothesize that after efficiency effects have been accounted for, effectiveness will have a significant main effect on IT adoption within small businesses:

> H_2 There will be a significant and positive relationship between a small business's focus on *effectiveness* goals and the adoption of IT.

The third stage of our adoption model involves the development of internal IT *expertise*. Cragg and King (1993) identified IT knowledge and skill as a key resource deficiency that has inhibited the adoption of IT in small businesses. Indeed, Statistics Canada (1998) reports that small businesses have limited technical and financial resources available to implement and maintain IT. As IT expertise in the organization is shown to be important for IT adoption (Montazemi, 1988; Raymond, 1985), we hypothesize, that after efficiency and effectiveness have been accounted for, having internal IT expertise will lead to increased IT adoption.

H_3: There will be a significant and positive relationship between a small business being able to drawn upon internal *expertise* and the adoption of IT.

We believe that internal expertise plays more than just an additive role in the adoption of IT. We hypothesize that at this final stage, internal expertise interacts with a firm's focus on efficiency and/ or effectiveness goals to generate even higher adoption of IT. Thus, we hypothesize that:

H_4: Technical expertise will play a moderating role with efficiency and effectiveness and positively and significantly influence the level of IT adoption in a small business.

While the model focuses specifically on three factors - *efficiency, effectiveness and expertise* - that we predict will individually and collectively have a significant effect on adoption, it is not purported to be exhaustive. Indeed, the adoption of IT is a complex issue that is influenced by a number of other factors, not the least of which is having the financial resources to do so.

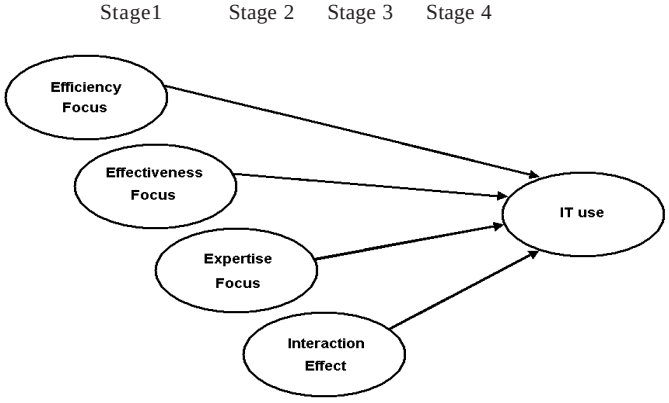
METHOD

Sample and Data Collection

The study is based on a sample of small businesses from the Maritime Provinces in Canada. These firms were drawn from the *2001 Atlantic Provinces Business to Business Marketing Directory*, which includes over 85,000 total businesses. This enabled us to sample a broad range of firms from various sectors including: retail, market services, manufacturing, construction, agriculture, and the trade sector.

In May of 2001, questionnaires were mailed out to the owner-managers of a random sample of 900 firms drawn from this directory (84 were returned as undeliverable). Of the 816 surveys delivered, 177 were completed and returned to yield a response rate of 22%. This is comparable to that obtained in other studies on the use of IT among small businesses (c.f. Pollard and Hayne 1998; Thong 1999). Eighteen of these surveys were later dropped because they did not meet the sampling criteria. This resulted in 159 usable questionnaires.

Figure 1: IT Adoption Process



Measures

To measure a variety of organizational demographic variables, questions were designed to determine: the number of full-time employees (firm size), years the organization has been in operation (age), the legal form of the business, and the sector the business operates within. Firm size and age of the business were used as control variables in the analysis as they have been found to affect intensity of adoption (Kagan et al., 1990).

Total Use: IT usage was determined by a question that focused on the number of areas that a firm used IT in each of the past three consecutive years. Respondents were asked to indicate if IT was used regularly in completing the tasks / activities associated with a particular aspect of business including: inventory management, accounting, advertising, planning and research and six other areas (one space was provided to specify additional aspects). A maximum score of 33 could be achieved on this scale, with actual scores ranging between 3 and 30.

Efficiency: The following three 7-point items (1=no influence; 7= strong influence) were used to measure the extent to which IT was adopted for efficiency reasons: (1) "it saves us time"; (2) "it saves us money"; (3)"it allows us to collect information both faster and cheaper." An index of efficiency was created by averaging the scores on these three items (Chronbach alpha =.74). In this index, a high score indicates that efficiency was a strong motivating factor for adoption.

Effectiveness: Effectiveness as a motivating factor, was measured using four 7-point items (1 =no influence; 7 =strong influence): "Computers, computer systems or software were acquired because... (1) it allows us to offer a better product and/or service; (2) we felt we could supply and/or create new markets by adopting IT; (3) our competitors had it and we did not want to lose customers to them; and (4) we felt we could offer new products / services by adopting IT." An effectiveness index was created by averaging the scores on these four items (Chronbach alpha =.77). A high score indicates that effectiveness had considerable influence on the acquisition of IT for the organization.

Expertise: Three items measured this factor. The first two used a 7-point scale (1 = no influence; 7=strong influence): "Computers, computer systems or software were acquired because… (1) we have the technical expertise to use IT; (2) our internal expert(s) advise us to adopt."; while the third used a 5-point LIKERT scale (1= unimportant; 5= very important) "When you are seeking advice on computers/computer systems, how important are the following sources of information to you? (3) company employees". These three items were used to create an index of expertise (Chronbach alpha = .65). A high score indicates that having internal IT expertise was a motivating factor in the decision to adopt IT.

Analysis

Hierarchical multiple regression analysis (Nunnally and Berstein, 1994) was used to test our hypotheses. Two control variables 'size of the firm' and 'age of the firm' were entered first, followed in turn by measures of 'efficiency', 'effectiveness', and internal 'expertise'. Both changes in R^2 and the level of significance in regression equations were used to determine the strength of the hypothesized model. To determine the interactive effect of expertise, the joint effects or cross products of their scores were entered (efficiency X expertise and effectiveness X expertise) in the fifth step. A significant difference in R^2 between the fourth and fifth equations indicates that the regression line indeed varies depending on the level of the moderator variable (Nunnally and Berstein, 1994). To lessen the effects of multicollinearity when testing for interaction effects, all items were centred around their means (Aiken and West, 1991).

RESULTS

Descriptive statistics and intercorrelations for all variables are presented in Table 1. On average, each small business had been operating for 20 years, with 22 full-time and 17 part-time employees.

Table 2 presents the results of the regression analyses. The first hypothesis that an efficiency focus would have a positive and significant effect on IT adoption was supported (R^2 change = .08; p.< .01). The path from 'efficiency' to 'IT use' was also significant (t. = 3.73; p. < .01). The second hypothesis was also supported as an effectiveness focus also resulted in an increased adoption of IT (R^2 change = .10; p. < .01). The path from 'effectiveness' to 'IT use' was also significant (t. = 4.33; p. < .01). However, the third hypothesis was not supported although it did realize a measure of significance (R^2 change = .01; p. < .10). The path from 'expertise' to 'IT use' was also not significant (t. = 1.31; ns).

The fourth hypothesis was not supported (R^2 change = .03; p.< .10) although it did account for a modest increase in variance explained. The path from variable 'efficiency X expertise' to 'IT use' was not found to be significant (t. = 1.92; p. < .10) but the path from variable 'effectiveness X expertise' to 'IT use' was significant, although contrary to the expected direction (t. = -2.16; p. < .05).

DISCUSSION

This study has contributed to the IT literature by investigating the effect motivational factors have on IT adoption among a broad sample of small businesses. We found that two motivational factors - efficiency and effectiveness – were additively associated with more intensive use of IT. The other motivational factor – expertise – while showing modest support (as a main effect) did not have a significant effect on adoption. At this time it would appear that internal expertise has yet to make a sizeable breakthrough in sparking the adoption of IT.

One very interesting result of the study was the modest support for the interactive effect that expertise has with efficiency and effectiveness. Due to the statistical difficulties of detecting interaction effects in field research (McClelland and Judd, 1993), some researchers suggest using a more liberal criterion than the one used here. Barling and Kelloway (1996), drawing from Monte Carlo and other field research, advocate retaining a cross product term if it adds more than 1 percent to the variance explained. As the interaction model added 3 percent to the variance explained further research should more fully explore this effect.

Perhaps the most interesting finding, when looking at each interaction variable, was the negative effect on adoption that effectiveness and expertise yielded (t = -2.16; p. < .05). A possible explanation is that in adding important IT knowledge to the firm, this expertise ensures that fewer forays are made down inappropriate IT paths. Thus, instead of generating support for the addition of IT to the firm, expertise may actually limit IT adoption. As this is an 'interesting' finding (Davis, 1971) further research is warranted to more fully explore this effect.

No investigation is without limitations. The model presented here deals with a restricted domain of factors influencing IT adoption. By extending it, the impact of other factors (such as financial resources or personal characteristics of the owner-manager) and other stages could be investigated. Moreover, since the impact of IT on firm performance was not measured, this is an important consideration for future research.

Table 1: Descriptive Statistics and Intercorrelations

	Mean	S. D.	Size	Age	Efficiency	Effectiveness	Expertise
Size	22.30	23.72					
Age	19.80	20.22	-.039				
Efficiency	5.63	1.33	.153	-.069			
Effectiveness	3.34	1.59	.109	-.042	.463**		
Expertise	3.65	1.47	.139	.009	.194*	.398**	
Total use	15.91	7.33	.280**	-.045	.316**	.452**	.301**

***Correlation is significant at the 0.01 level (2-tailed).*
**. Correlation is significant at the 0.05 level (2-tailed).*

Table 2. Results of the Hierarchical Multiple Regression Analysis

Model Variables entered	Model Adjusted R^2	Changes in R^2	F	Parameters Beta	t
1. Control	.07		6.72***		
Size				.29	3.66***
Age				.01	0.13
2. Efficiency	.15	.08***	9.52***		
Efficiency				.29	3.73***
3. Effectiveness	.24	.10***	12.71***		
Effectiveness				.35	4.33***
4. Expertise	.24 [a]	.01	10.57***		
Expertise				.10	1.31
5. Interactive	.27	.03*	8.54***		
Efficiency X Expertise				.16	1.92*
Effectiveness X Expertise				-.18	-2.16**

[a] while it would appear that the R^2 is the same, due to rounding, there is a difference between the two equations
**significant at p. < .10 level*
*** significant at p. < .05 level*
**** significant at p. < .01 level*

CONCLUSION AND IMPLICATIONS

Within the literature, the merits of having a strategic IT focus have been exalted for some time. However, there has been little evidence until now explaining *how* small businesses come to adopt such a focus. In this regard, our findings are significant. In revealing the scope and nature of IT use among a broad range of firms, this research indicates that a strategic orientation toward the use of IT develops through a multi-staged process likely occurs.

Previous research indicates that it is only over the past decade that small businesses have begun investing in IT (Pugsley et al., 2000). Consequently, many would be still in the initial adoption stage, having only begun to acquire IT. For them, capitalizing on ICTs and Internet-driven opportunities would require a significant investment in software, hardware and/or expertise. While large businesses characteristically make substantial one-time resource commitments (Stevenson, 1999), small businesses are not similarly attuned. Therefore, it is not surprising that the adoption of ICTs is yet to be widespread among small businesses (Van Beveren and Thomson, 2002).

These findings have implications for government. They suggest that a single policy or program will not be effective in encouraging the use of ICTs. In aiming to stimulate economic growth through the use of ICTs, high intensity users and growth-oriented firms would be the primary targets. As high intensity use is associated with a focus on new products and new markets, these firms are well poised to provide an impetus for growth. Moreover, they would have much of the basic infrastructure needed to capitalize on the strategic opportunities the Internet provides. Efforts to promote ICTs among growth-oriented firms that are not extensively using IT in their business would require a different strategy. However, to develop effective initiatives, further research is needed to better understand the issues facing small businesses at each stage of adoption. In doing so, assistance can be differentiated to facilitate the movement of firms through the various stages of adoption.

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