

Factors Impacting the Adoption of the Internet among SMEs

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ABSTRACT. The Internet can extend market reach and operational efficiency of small and medium enterprises (SMEs) and enhance their contributions to the U.S. economy. This paper reports an empirical study conducted to identify the factors that impact SMEs' involvement with the Internet. Internal and external variables such as firm size, self-efficacy, prior technology use, etc. are used to predict the level of Internet involvement. This involvement is examined in terms of ownership of a web site (adoption) and use of the Internet for selling purposes (routinization). Logistic regression is used to examine the relationships between internal and external factors and SMEs' involvement with the Internet. The results suggest that specific factors contribute to the SMEs' involvement with the Internet – prior technology use and the customer service subscale of perceived competitive pressure influence both stages of Internet adoption. Moreover, the relative importance of some of these predictor variables decreases as the level of Internet involvement increases. Past media use does not explain SME behavior – in terms of adoption or routinization. These findings can be used to develop strategies to build SME involvement with the Internet.

1. Introduction

Small and medium sized enterprises (SMEs)¹ play a significant role in the U.S. economy. SMEs comprise 99.7% of the enterprises in the U.S., accounting for 48% of the gross national product (GDP) and 53.7% of the total employment

(OECD, 1997, p. 17). Similarly, about 96% of the U.S. firms that export are small businesses (Dickerson 1999).

The Internet can be a critical factor in enhancing a firm's market reach and operational efficiency (Porter, 2001). Internet based technologies provide small firms the opportunity to overcome the limitations of size and compete more effectively and/or in larger markets with bigger sized establishments. There is some evidence to suggest that the Internet has increased international opportunities for SMEs (Hamill and Gregory, 1997; Lituchy and Rail, 2000). According to Williams (1999, p. 20), Internet technologies:

1. Increase ability of small firms to compete with other companies both locally and nationally (promotional tool);
2. Create the possibility and opportunity for more diverse people to start a business;
3. Offer convenient and easy way of doing business transactions (not restricted to certain hours of operation, virtually open 24 hours a day, seven days a week);
4. Offer an inexpensive way (compared to postage, fax, telephone and travel prior to Internet) for small business to compete with larger companies and for U.S. companies to sell in distant markets.

Surveys by various consulting and industry groups suggest that small firms recognize the advantages of e-commerce. For instance, a survey of small and mid-sized businesses by Arthur Andersen's Enterprise Group and National Small Business United (2000) cites the following reasons for using a Web site:

- sending and receiving business email (78%);
- researching goods and services (60%);

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- sending and receiving personal email (48%);
- conducting research (41%);
- purchasing goods and services (40%).

Despite these advantages, actual adoption of the Internet for e-commerce applications is limited. Moving into e-commerce requires a major change in the models that businesses use as well as the adoption of specific communication and information technologies. Not surprisingly, many small businesses are waiting to see if these new innovative ways are viable and whether the return on the investment will exceed the costs of adopting the new technologies.

In this paper, we first review the status of Internet adoption by SMEs and the factors that contribute to the adoption behaviors. We then describe an empirical study designed to examine the contribution of specific factors to the phased adoption behaviors of SMEs. We conclude with implications for SMEs' future behaviors as well as suggestions for further research.

2. Factors influencing adoption and utilization of technologies by SMEs

Almost 25 years ago, Ein-Dor and Segev (1978) found that smaller organizations are less likely to succeed in computerization than large enterprises. Although access and know-how related disadvantages still persist for SMEs, the gap between SMEs and large enterprises can be expected to decrease mainly because of two related factors – costs and specialized applications. In the past 20 years, costs have plummeted. For instance, computing power per dollar invested has risen by a factor of 10,000 and the cost of voice transmission has fallen by a factor of 10,000 because of fiber optics and low-cost electronics (The World Bank, 1999). Second, availability of user-friendly small business applications have made SMEs' computerization feasible (Foong, 1999). It is not surprising, therefore, that the sheer size of the small business market has started to attract the attention of Internet vendors who estimate that small and medium-sized companies will generate \$120 billion in annual online trade in 2001 (King, 2000).

As a result of these changes in the technological environment, Internet adoption rate among

SMEs is rising rapidly in the United States. A survey of small businesses in the U.S. by Dun and Bradstreet in 2000 found that about 70% of small businesses have Net access and 38% have built Web pages (Business2.0, 2000). A more recent research by Kelsey Group found that about 25% of small businesses in the U.S. are using the Internet to provide customer service and support and 10 percent are using email marketing to promote their services (Nua Internet Suveys, 2001). The progress in Internet penetration and use among SMEs raises two important questions: What factors predict SMEs' adoption decision and degree and type of Internet use? Is the relative importance of a given factor the same at different levels of involvement with the Internet?

Past studies

There is little direct evidence to answer the above questions. Past studies have examined technologies in general and have found a number of factors impacting the adoption decision of information and communications technologies (ICTs) in organizations. These factors can be classified into two types: internal factors and external factors (Lefebvre and Lefebvre, 1996).

Internal factors. Several internal factors have been identified that impact the adoption decision of ICTs in organizations. Factors internal to the firm include firm's characteristics, firm's past experience with and attitude towards technology, and firm's pursued strategy.

- *Firm Characteristics: (including size, type of business, length of time in a community):* Past research has found that firm size is an important determinant of a firm's involvement and decision process in acquiring ICT (Dholakia et al., 1993). Larger organizations tend to have the resources and the competitive imperative to initiate deployment of new information technologies (Clemons and McFarlan, 1986). Size, as measured by the number of employees, is particularly important for e-mail benefits and mobile communications (Dholakia, 1995). Sectoral differences were observed in the acquisition of telecom products and services (Dholakia et al., 1991). Kean et al. (1998)

found store tenure to be an important influence on the strategy selection of rural retail businesses. Size of a firm was also a major influence on the selection of a competitive strategy (Ibrahim, 1993).

- *Attitudes and Past Experiences:* Hill, Smith and Mann (1987) found that self-efficacy, the belief in one's ability to perform a particular behavior, influences the adoption of a technology. In a study of technology adoption in hospitals, Herbert and Benbasat (1994) found that 77% of the variance in the intent to use a technology was explained by three attitude related variables and one normative variable. Past experiences in protecting their local customer base or in reaching out to distant customers have helped smaller retail businesses compete against larger stores and stores with direct selling methods (Kean et al., 1998). Similarly, Fink (1998) found that internal factors such as perceived ICT benefits, organizational culture and in-house ICT expertise and resources influence ICT adoption.

External factors. External factors exist at three levels: industry, macroeconomic, and national policy level (Lefebvre and Lefebvre, 1996). These external factors affect the general and competitive environment within which a particular firm has to operate.

- *Infrastructure and business related factors:* Electronic and telecommunications environment as well as the business environment in which a specific firm operates influence the level of involvement of the firm in the Internet. Businesses fortunate enough to be located in new and high-bandwidth telecommunication regions can expect to obtain better technological services to support e-commerce applications. Such access is generally better in urban than in rural areas (NTIA, 1999). A business environment where other firms invest in technologies, share their experiences offer greater support for a specific firm to actively or passively pursue a specific strategy.
- *Competition related factors:* Competitive environments have a strongly influence on the adoption of a technology (see, for example,

Dasgupta et al., 1999). Ghosh (1998) provides several examples of companies in the U.S. that adopted the Internet mainly because of competitive pressures. Increasing numbers of SMEs from developing countries are adopting electronic technology as a means of communication and distribution under competitive pressure from suppliers and customers from developed countries. More than five years ago a study found that some of the organizations from developed countries accepted new suppliers only if they can demonstrate an EDI capability (Schware and Kimberley, 1995). The study points out that "there are cases of companies, particularly traditional, small, older firms, who have gone out of business because of inability, or unwillingness to comply or disbelief in the need to comply. This has been particularly true of some middlemen companies" (Schware and Kimberley, 1995, p. 19).

3. Technology adoption: A phased involvement

While several internal and external factors contribute to ICT adoption, several studies suggest that the adoption behavior may be described as a *phased* involvement. In examining ICT implementation, Cooper and Zmud (1990) use a stage model to examine technology diffusion. Kwon and Zmud (1987) have proposed a phased model of ICT implementation consisting of six stages:

- initiation (organizations find the *match* between ICT solutions and its application in organization);
- adoption (decision is reached to *invest* resources);
- adaptation (ICT applications are *available* for use);
- acceptance (ICT applications are *employed* in organizational use);
- routinization (organization's *governance systems are adjusted* to account for the ICT application);
- infusion (ICT applications are used within the organization to its *fullest potential*).

According to the Yankee Group, there are three phases of e-commerce involvement: Connectivity; Customer connections; and Commerce (Worhach, 2000). Cahners Group has suggested a similar

phased approach starting from Brochure-ware (for product advertisements) leading to Pre-Commerce (enough information, including price, to create online point-of-sale transactions) and then Simple Commerce (accept orders and payments online but little in security or online payment processing) (U.S. Small Business Administration, 1999). IBM has developed a four-stage model of doing e-business – transform (an understanding that e-business priorities should be the same as normal business priorities), build (actual deployment of the e-business application), run (seeing how e-business handles workload volumes, security and management) and leverage (careful examination of the data collected by e-business application to gain better understanding of customers' wants) (Amaru, 1999). The phased involvement is consistent with the literature on the adoption of innovations whether seen as a cognitive process (knowledge-persuasion – decision; Rogers, 1983) or as a behavioral process (with dimensions such as depth and width) that influence purchase of additional, enhanced or complementary products (Gatignon and Robertson, 1991).

4. Research questions and hypotheses

Based on the literature review above, we can conclude that there are several internal and external factors which contribute to the phased adoption of ICTs. The following research questions, however, remain to be answered:

- Are the internal and external factors also applicable to SMEs' adoption of the Internet?
- What is the impact of other internal factors such as past media use behavior and past adoption of technologies that have not been considered by prior studies?
- Is the SMEs' Internet adoption also likely to be a phased involvement?
- Does the effect of a variable remain unchanged at different phases of the Internet involvement?

In order to address these questions, the following hypotheses were specifically examined in the study.

A. Internal factors

The following variables were included in the study to determine the role of internal factors on the adoption decision of SMEs.

- *Firm size.* Past research has found that the size of a firm is one of the major determinants of the strategy of chosen strategy (e.g., Dholakia, 1995; Ibrahim, 1993; Kean et al., 1998; Miller and Toulouse, 1986). Limited resources restrict SMEs' ability to compete (Coviello and Martin, 1999). Smaller firms are less able to manage the fixed and variable costs associated with the use of the Internet, given their limited resources and hence are less likely to adopt the Internet than large firms. We, therefore, hypothesize that:

H1: The level of involvement of a firm is positively related to its size.

- *Self-efficacy.* As discussed in the literature review above, self-efficacy is the belief in one's ability to perform a particular behavior and this has been shown to influence the adoption of a technology (e.g., Hill, Smith and Mann, 1987). In a survey conducted in Asia Pacific Economic Cooperation (APEC) region in 1999, a majority of SMEs responded that absence of national and international regulatory framework related to privacy and security was the main reasons for their not adopting the Internet for doing business (see Computer Dealer News, 1999). Thus, we hypothesize that:

H2: SMEs concerned about cost, privacy and security, management of online sales, etc. are less likely to adopt the Internet.

- *Past experience with related technologies.* Technologies already existing in an organization also influence the future adoption a new technology in a number of ways. For instance, the incremental cost and knowledge required to adopt the Internet will be much smaller if a firm already owns a computer and a telephone. Moreover, past studies have found that so called "innovators" of a new product are drawn from the heavy users of other products within the product category (Gatignon and Robertson, 1991). Thus, another hypothesis is that:

H3: The level of involvement in the Internet is positively related to the adoption of other ICT products, such as telephone, fax, and toll free numbers.

- *Past use of marketing media.* Use of the Internet for providing product and price information to customers, to sell products to customers, to respond to customer inquiries about availability and shipping implies that the Internet is used as marketing media – for purposes of communication, distribution, and customer support. As argued above, innovators of a product are drawn from the users within the product category or with high level of experience in similar product categories. We, thus, hypothesize that:

H4: Firms with a greater degree of use of existing marketing media such as tele-marketing, catalogs, television are more likely to adopt and use the Internet for marketing purposes.

B. External factor

Only one variable – the competitive environment – was included in the study to reflect the role of external factor.

- *Perceived competitive pressure.* Because the pressure of competition exerts a positive influence on the adoption of technologies, we hypothesize that a similar relationship will also exist for the adoption of the Internet. Our hypothesis regarding perceived competitive pressure is:

H5: Perceived competitive pressure will be positively related to the level of SME involvement with the Internet.

5. Research method

A mail survey was conducted to test the preceding research hypotheses. The printed questionnaire had three sections. The first section dealt with general views on the Internet and World Wide Web. The questions in this section included concerns about several Internet issues, perception

about competitors' uses of the Internet, perception about the impact of the Internet, as well as use of other media of communication and distribution. Both open-ended as well as fixed alternative questions were used to capture the relevant information on each of the issues mentioned above.

The second section of the questionnaire was filled out only by SMEs that owned Web sites. The questions in this section dealt with issues related to the web site ownership including costs to develop web site and its operation, types of uses of the Internet and company policies regarding privacy and security, etc. Multiple items were used to measure several of the constructs in Section 1 as well as in Section 2.

The last section of the questionnaire dealt with demographic characteristics including the duration of operating their businesses in RI, number of employees, type of business, adoption status of other technologies. We also collected information about demographic characteristics of the respondents.

The respondents were owners and/or managers of small and medium sized enterprises (SMEs) in a mid-sized town in New England region of U.S.A. Names of businesses were obtained from the membership list of a local chamber of commerce. A questionnaire and a cover letter were mailed to the sampled businesses with a reply paid envelope. A total of 400 questionnaires were mailed out to a randomly chosen sample; 45 respondents returned the questionnaires (response rate of 11.3%). Because of the relatively low response rate, statistical analysis of non-response bias was conducted by examining the differences between early and late respondents (Armstrong and Overton, 1977). The assumption is that respondents who reply late are more similar to non-respondents. Using the date of reply, the survey respondents were classified into two groups (median split) and Student's *t*-tests were conducted for 115 different items used in the questionnaire. We found no significant differences (at 0.05 level) between early and late returns for 114 of 115 items tested.

Sample characteristics

Table I gives some of the essential demographic characteristics of the sample respondents. Over

half the firms responding to the survey had less than five employees but had been in operation for over ten years. In terms of business type, a wide variety of small business is represented in the sample.

Independent variables

Four variables within the internal factor were operationalized in the following ways.

- *Firm size.* Firm size was measured by the number of employees in the firm. The scale ranged from 1 (1–5 employees) to 6 (more than 50 employees) with a mean value of 2.95 and a standard deviation of 1.45.
- *Self efficacy: Concerns about Internet issues.* Sixteen items were used to measure SMEs' concerns with Internet issues. Factor analysis of the responses revealed six factors underlying concerns with the Internet. These have been labeled (1) concerns with managing online customers, (2) cost of Web-based operations, (3) knowledge and competence, (4) privacy-security, (5) Internet suppliers and (6) speed-reliability. The factors, number of items with maximum factor loading corresponding to each item and cumulative variance explained are reported in Table IIa.
- *Prior technology use.* An index of past technology adoption (TecAd) was constructed by considering the number of different technologies previously adopted by an SME. Choices listed in the questionnaire included phone line, computer, fax machine, email account and toll free number. The TecAd index ranged from 1.0 to 6.0 with a mean value of 4.39 and standard deviation of 1.65 in the sample.

TABLE I
Sample characteristics

Characteristic	Sample composition
<i>Number of employees</i>	
1–5	23 (51.1%)
6–10	7 (15.6%)
11–25	7 (15.6%)
More than 25	8 (17.8%)
<i>Length of time in business in the current area</i>	
Less than 2 years	4 (8.9%)
2–10 years	7 (33.4%)
Over 10 years	26 (57.8%)
<i>Web site ownership status</i>	
Have Web sites	23 (51.1%)
Do not have Web site	22 (49.9%)
<i>Business type</i>	
Professional services	8 (17.6%)
Retail	8 (17.6%)
Automotive	3 (6.7%)
Construction	2 (4.4%)
Fishing	1 (2.2%)
Community services	1 (2.2%)
Other	22 (48.9%)
<i>Gender composition of respondents</i>	
Male	28 (62.2%)
Female	17 (37.3%)
Total	45 (100%)

- *Past media use.* Similarly, an index of media use was constructed by considering the number of different media used in the past. Media listed in the questionnaire included newspaper, magazines, flyers, radio, television, bulk direct mailings, telemarketing, billboards, catalogs, e-mail alerts, and advertising on World Wide Web. Only the non-Internet based media was

TABLE IIa
Factors related to SMEs' concerns about Internet issues

Self efficacy factor	Number of highest loading items	Cumulative variance explained (%)	Reliability coefficient (Cronbach's alpha)
Managing online customers	4	17.7	0.81
Cost of Web-based operations	3	32.2	0.77
Knowledge and competence	3	45.8	0.81
Privacy-security	2	58.9	0.86
Internet suppliers	2	71.6	0.90
Speed-reliability	2	82.0	0.66

TABLE IIb
Factors related to SMEs' perceptions about competitors' uses of the Internet

Factor	Number of highest loading items	Cumulative variance explained	Reliability coefficient Cronbach's alpha
Customer-service	5	33.6	0.88
Environmental monitoring	4	63.4	0.87
Market-research	1	79.1	–

included in the index, which ranged in value from 0.0 to 7.0 with a mean value of 2.50 and standard deviation of 1.86.

The external variable included in the study was related to the competitive environment. We relied on a measure of perceived competition.

- *Competitive pressures: Perceptions about competitors' uses of the Internet.* Ten items were used to measure perceptions about competitors' uses of the Internet. Factor analysis revealed three factors related to – customer service, environmental monitoring and market research. The factors and cumulative variance explained are reported in Table IIb.

The creation of independent variables from the multiple items in the questionnaire reveal high reliabilities (as reflected in Cronbach's alpha measure of the subscales). The six subscales for SMEs' concerns about Internet issues had reliability coefficients ranging from 0.66 to 0.90; the two sub scales for SMEs' perceptions about competitive pressures had reliability coefficients of 0.87 and 0.88.

Dependent variable

The primary dependent variable of interest is Internet adoption. In this study Internet adoption

has been examined using a three-stage model – pre-adoption, adoption and routinization. This has been adapted from the six phases identified by Kwon and Zmud (1987). The data on Internet adoption by SMEs in our sample supports the phased involvement approach. Although 91 percent of our sample owned a computer, about half (51%) owned a website but only 15 percent use the website to sell products and services over the Internet.

Explaining internet adoption behaviors

We used logistic regression analysis to test the hypotheses regarding factors and their influence on Internet adoption by SMEs. Binomial logistic regression is used since the dependent variable is a dichotomy (owning or not owning website, selling or not selling on the Internet). Because of the small sample size, logistic regression models were not estimated by simultaneously considering all the independent variables. Instead, separate logistic regression models were run to determine the influence of each of the independent variables on the two phases of involvement:

1. Internet Adoption – Web site ownership; and
2. Routinization – Use of Web for E-commerce application.

TABLE III
Phased adoption of the internet

Adoption stage	Characteristics of an SME	No. of SMEs in the study
Pre-adoption	Owens at least a computer but no Web site.	41 (91.0%)
Adoption	Owens a Web site but does not sell on the Internet.	23 (51.1%)
Routinization	Sells on the Internet.	7 (15.6%)

TABLE IV
Logistic regression of factors related to website ownership

Independent variable	Coefficient (<i>p</i> -value)	Cox & Snell R^2 Nagelkerke R^2	# firms	% correctly classified
<i>Firm size</i>				
Size	0.45 (0.064)	C&S R^2 = 0.08; N R^2 = 0.11	43	58.1 % (Chance: 51.4%)
Constant	-1.25 (0.097)			
<i>Self-efficacy</i>				
Privacy-security	-0.24 (0.080)	C&S R^2 = 0.10; N R^2 = 0.13	37	64.9% (Chance: 51.4%)
Internet suppliers	0.22 (0.338)			
Cost of web-based operations	-0.12 (0.468)			
Managing online customers	-0.05 (0.635)			
Speed-reliability	0.08 (0.678)			
Knowledge and competence	0.03 (0.858)			
Constant	0.98 (0.448)			
<i>Prior technology use</i>				
TecAd	0.53 (0.020)	C&S R^2 = 0.14; N R^2 = 0.19	44	63.6 % (Chance: 50%)
Constant	-2.39 (0.031)			
<i>Prior media use</i>				
Media	0.15 (0.370)	C&S R^2 = 0.02; N R^2 = 0.03	44	59.1 % (Chance: 52.3%)
Constant	-0.28 (0.583)			
<i>Perceived competitive pressure</i>				
Customer-service	1.22 (0.03)	C&S R^2 = 0.34; N R^2 = 0.45	25	80.0% (Chance: 56%)
Environmental monitoring	-2.08 (0.074)			
Communication	-0.27 (0.520)			
Constant	1.74 (0.296)			

Internet adoption

Table IV shows the logistic regression results for the ownership of Web site with different independent variables. All variables – all four internal and one external – correctly classify the sample better than would be expected by chance alone. The percent correctly classified ranged from 80% for perceived competitive pressure to 58% for firm size. In terms of regression coefficients, prior technology use ($p < 0.02$), customer service subscale of perceived competitive pressure ($p < 0.03$) are very significant, and firm size ($p < 0.06$), market research subscale of perceived competitive pressure ($p < 0.07$) and privacy-security concern subscale of self-efficacy ($p < 0.08$) are marginally significant. All other variables and subscales are not significant.

Routinization – use of the web for e-commerce application

Table V shows the logistic regression results for use of the Internet for the selling purposes. This analysis excluded those firms who did not own a web site and therefore the sample size is smaller.

In this set of analysis, only prior technology use (63.6%), self-efficacy (83.3%) and perceived competitive pressure (85.0%) correctly classify the sample better than would be expected by chance alone. Firm size and prior media use do no better than would be expected by chance. In terms of regression coefficients, only the customer service subscale of perceived competitive pressure ($p < 0.03$) is very significant; and prior technology use ($p < 0.06$) is marginally significant. All other variables and subscales are not significant.

TABLE V
Logistic regression results for commerce on the internet

Independent variables	Coefficient (<i>p</i> -value)	Cox & Snell R^2 Nagelkerke R^2	# firms	% correctly classified
<i>Firm size</i>				
Size	-0.02 (0.951)	C&S R^2 = 0.00; N R^2 = 0.00	20	65.0%
Constant	-0.551 (0.645)			(Chance: 65.0%)
<i>Self-efficacy</i>				
Privacy-security	1.20 (0.196)	C&S R^2 = 0.52; N R^2 = 0.73	18	83.3%
Internet suppliers	-0.54 (0.54)			(Chance: 66.7%)
Cost of web-based operations	-1.71 (0.244)			
Managing online customers	1.01 (0.544)			
Speed-reliability	0.37 (0.508)			
Knowledge and competence	0.38 (0.727)			
Constant	-6.92 (0.322)			
<i>Prior technology use</i>				
TecAd	1.14 (0.064)	C&S R^2 = 0.26; N R^2 = 0.34	22	63.6%
Constant	-5.78 (0.078)			(Chance: 50%)
<i>Prior media use</i>				
Media	-0.24 (0.372)	C&S R^2 = 0.04; N R^2 = 0.06	21	66.7%
Constant	-0.06 (0.945)			(Chance: 66.7%)
<i>Perceived competitive pressure</i>				
Customer-service	0.77 (0.027)	C&S R^2 = 0.45; N R^2 = 0.62	20	85.0%
Environmental monitoring	-0.49 (0.274)			(Chance: 61.5%)
Communication	0.19 (0.608)			
Constant	-5.01 (0.098)			

TABLE VI
Effects of different factors on Internet adoption and e-commerce application

Independent variables	Significant effect on Internet adoption?	Significant effect on e-commerce application?
<i>Firm size</i>	Yes	No
<i>Self-efficacy</i>		
Privacy-security subscale	Yes	No
<i>Prior technology use</i>	Yes	Yes
<i>Prior media use</i>	No	No
<i>Perceived competitive pressure</i>		
Customer-service subscale	Yes	Yes
Environmental monitoring subscale	Yes	No

6. Discussion and conclusion

The empirical results from this study confirm previous research suggesting a phased approach to Internet adoption. Firms in our sample are at different stages in the adoption process – 91 percent of the sampled SMEs owned a computer, about half (51%) owned a website but only 15

percent use the website to sell products and services over the Internet. In future research on adoption behaviors, it is important to examine firm behaviors in terms of the various phases of adoption.

The research results also indicate that the influence patterns of internal and external factors vary with the phase of adoption. The factors found

to have significant effect on Internet adoption and e-commerce application (at 90% or higher level of confidence) are summarized in Table VI.

Prior technology use, as a component of the internal factor, contributes to *both* phases of adoption process – ownership of a web site as well as its use for commerce applications. Similarly, customer service subscale of perceived competitive pressure, an external factor, significantly influences both phases of the adoption process. Other variables, however, have limited influence. For instance, market research subscale of perceived competitive pressure, privacy-security subscale of self-efficacy and firm size had a significant effect on ownership of a website but had no effect on the use of a website for commerce. This indicates that once a firm decides to own a web site, these variables become less relevant for further use of the Internet.

Contrary to our hypothesis, we found no support for the prior use of marketing media; this variable did not influence the ownership of a Web site or its use for commerce applications. It appears from the data that use of media such as telemarketing, catalogs, billboards does not lead to adoption of a website. Instead, prior adoption of communication-related technologies such as toll free numbers, fax machines, email account is a better predictor of Internet adoption behaviors.

Within the self-efficacy component of the internal factor, privacy-security concern is the only variable of significance. Other concerns regarding managing online customers, cost of Web-based operations, knowledge and competence, Internet suppliers and speed-reliability did not have any influence. Similarly, within the perceived competitive pressure component of the external factor, only customer service is statistically significant. The other two subscales – environmental monitoring and market research – had no impact on adoption behaviors. These merit further investigation.

Research limitations

As in most empirical studies, certain characteristics of our research method limit the generalizability of the research findings. Because we used

a mail survey, proportionately more firms with technology investments returned our questionnaire; those firms without websites were probably less motivated to return the questionnaires. This led to a higher level of web site ownership (adoption behavior) than comparable surveys (such as survey conducted by Dun and Bradstreet, 2000). By using the phased approach to the study of adoption behaviors, the study provides more insights regarding the adoption behaviors of SMEs. It also places greater demand on sample size requirements. The relatively small sample size used in the analysis means that caution is needed in the interpretation of the results, particularly for the routinization stage.

Research implications

In attempting to influence firm behaviors regarding Internet adoption and its use for commercial purposes, some challenges still lie ahead in terms of increasing the level of website ownership among SMEs. Like the Dun and Bradstreet survey (2000) which found 38% of small businesses to have built web pages, 51% of our sample own a web site. To move web site owners further along the Internet use scale, our research suggests that we focus more on firms that have adopted other related technologies and those that hold particular beliefs regarding competitive behaviors. As the number of firms using the website for customer service and market research increases, it is likely that this change in the competitive environment will impact the perception of competitive pressure and further accelerate SMEs' movement toward the routinization stage of the Internet adoption process.

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Note

¹ Enterprises with number of employees less than 500 (OECD, 1997).

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