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ADOPTION OF INFORMATION TECHNOLOGY IN SMALL BUSINESS: TESTING DRIVERS OF ADOPTION FOR ENTREPRENEURS

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ABSTRACT

This study reports on how small retailers are adopting IT for their entrepreneurial venture. Three antecedents are posited to influence the information technology adoption in small business environments: (1) the owner's perception of the relative advantage of using information technology, (2) social expectations of information technology use, and (3) the owner's innovativeness in managing their own business. Seventy-one small business owners participated in the study. Our results suggest that among these three key drivers of adoption, the firm's innovativeness is the strongest determinant for adopting traditional information systems. However, in adopting Internet related technologies, the owner's positive perception of the relative advantage of using information technology plays the most critical role. Social expectation does not seem to directly influence the adoption level in either case, but exhibits indirect influence on perceived relative advantage and in turn on the level of Internet adoption. A structural equation model is presented with interpretations based on the strategic management literature, followed by a discussion on implications of these findings.

KEY WORDS AND PHRASES

Small business, information technology adoption, innovation adoption, relative advantage, social expectation, innovativeness.

INTRODUCTION

In today's business, information technologies (IT) have become necessities rather than luxuries. Systems that record and analyze business transactions are now lifelines of many corporations. In many cases, IT has risen beyond its traditional support role and taken up a central role in business strategy formulation (7). Paralleling this Information Revolution, today's small businesses are coming to the center of the business horizon. Small business enterprises contribute more and more to the national and international economies. In the U.S., small businesses employ 53% of the private work force, generate 47% of all sales, are responsible for 50% of the private sector gross domestic product, and produced an estimated 75% of the 2.5 million new jobs created during 1995 (44).

Although there is no reason to believe that IT is any more critical to large corporations than to small businesses, the challenges faced by small businesses are different from those of large corporations. Built on review of the extant literature in small business research, this paper posits a theoretical model consisting of the owner's perception of the relative advantage of using IT, social expectation to use IT, and the firm's innovativeness as antecedents of IT adoption behavior among small independent retailers. The focus of this research is to examine the effects of these variables on small business IT adoption. Seventy-one (71) small independent retailers in the appliance, electronics, furniture, and hobby industries have participated in this study.

The paper is organized into three sections. First, theoretical development of the research question and hypotheses is presented. The next section describes the technical details of the study design, data analysis, and our results. Finally, implications of the findings and conclusions are offered.

THEORY DEVELOPMENT AND HYPOTHESES

IT adoption has been a facet of technological innovation adoption in organizations (27, 31, 40). In the area of innovation diffusion, Rogers (47) defines innovation as an idea, practice, or object that is perceived as new by an individual or other unit of adoption. This suggests that the innovation doesn't have to be newly invented artifacts, but rather something new to the adopting unit. In this regard, managerial implications lie not just within the innovative technology itself, but also within the process of adoption and diffusion. IT has recently infiltrated the fabric of society, and business enterprises are adopting these innovative IT to their advantage. However, it is only recently that IT has had an impact on small retailers and entrepreneurs through the availability of low-priced, easily accessible computing capability. Despite this increased availability and affordability, the perception persists that many small businesses are reluctant to adopt technology that might enhance their operations.

Small business owner-managers face different challenges in adopting and diffusing IT. For example, if a small firm lacks slack resources, it cannot afford to have IT champions to professionally manage the adoption and diffusion process. Research indicates that in large corporations, these champions play critical roles in leading successful innovation adoption and diffusion (4, 17, 37). Furthermore, in small business, with few layers of management, the owner-manager has direct control over the innovation diffusion process. Thus the success of technology adoption and diffusion lies largely on his/her shoulders. The personality and technological leadership of the owner-manager has a direct impact on firm outcomes.

The diffusion of any innovation is known to occur in a temporal sequence (25, p. 185; 42). Applying Rogers' (42) innovation diffusion theory to IT, Cooper and Zmud (9) define stages of diffusion in organizations: initiation, adoption,

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adaptation, acceptance, routinization, and infusion. Initiation includes learning about the innovation and forming opinions about it, adoption refers to a decision to adopt or reject, adaptation refers to modifications in behavior or technology, and acceptance, routinization and infusion are the detail stages of implementation and institutionalization. In the small business literature, most IT innovation diffusion research is concentrated on the downstream stages focusing on acceptance, use and user satisfaction (12, 20, 28, 29, 34, 36, 41, 48). There is very little empirical research focused on upstream issues such as the adoption decision and its antecedents in relation to small businesses.

For the last ten years, only about eight articles have been published directly concerned with these upstream decision-making processes (Table 1). Among these eight, exception studies are conducted by Cragg and King (10), Harrison, Mykytyn and Riemenschneider (15), and Thong (45). Cragg and King (10) examined the evolution of small business computing using cases of six small firms and found that relative advantage, competitive pressure, consultant support and managerial enthusiasm motivate the growth of IT applications.

TABLE 1
Chronological Summary Review of Small Business IT Adoption Literature

Year	Cite	Method	N	Critical Influencing Constructs	Adoption Measure
1999	Thong, 1999	Survey	166 small businesses	CEO's Innovativeness, CEO's Knowledge of IS, relative advantage, Employees' IS knowledge	Adoption decision and the extent of adoption
1999	Premkumar and Roberts, 1999	Survey	78 rural small businesses	Relative advantage, top management support, organizational size, external pressure and competitive pressure	Degree of adoption of four modern communication technologies
1997	Harrison et al., 1997	Survey	162 small businesses	Attitude, subjective norms, perceived control	Intentions to adopt IT
1995	Lefebvre et al., 1995			Technological penetration, firm's experience with technology	Scope and intensity of IT adoption benefits
1995	Iacovou et al., 1995	Structured interviews	7 companies of under 200 employees	External pressure to adopt, perceived benefits, organizational readiness, and	Adoption and Integration of EDI
1994	Julien and Raymond, 1994	Survey	79 small retailers	Sector, status (more affiliated than independent), decentralization, bureaucratization (committee oriented), strategic proactiveness and future-orientedness	IT adoption
1993	Cragg and King, 1993	Interviews	6 manufacturing firms	Motivators (relative advantage, owner's enthusiasm toward computing), and inhibitors (lack of IS knowledge, lack of managerial time, poor support, limited financial resources)	Growth of IS
1990	Kagan et al., 1990	Survey	253 small businesses	Industrial sector, firm size, and remote processing capability	Software sophistication index

Harrison, Mykytyn and Riemenschneider (15) applied the theory of planned behavior in predicting small business executives' decision to adopt IT. The theory posits that intentions to perform behaviors of different kinds can be predicted with high accuracy from attitudes toward the behavior, subjective norms, and perceived behavioral control. These intentions, together with perceptions of behavioral control, account for considerable variance in actual behavior. They tested the theory in study of 162 small businesses. Their data provides evidence that the theory of planned behavior applies to IT adoption. The predictors of action in the theory of planned behavior-attitude, subjective norms, and perceived control - were found to be strongly related to intentions to adopt IS.

Thong's (45) survey of 166 firms found five critical factors for IT adoption decisions in a small business context: CEO's innovativeness, their knowledge, their perceptions of relative advantage of IT, business size, and employees' IS knowledge. Further, he found that the level of adoption had different antecedents for IT adopters. Only business size and employees' IS knowledge strongly coincided with the level of adoption. Interestingly, competitive pressure had no relationship to the adoption decision or the extent of adoption.

INFORMATION TECHNOLOGY (IT) ADOPTION

The dependent variable for this research is IT adoption in small businesses. The adoption of IT is defined here as the use of computer applications for business purpose. Hardware

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acquisition as well as standard office applications such as word processing and spreadsheets are excluded. Computer hardware is acquired only for the purpose of running applications, and office applications have become the norm rather than the exception these days. Our interest is in examining the extent to which the small businesses are actually using IT and identifying the antecedents of those adoption levels. Thus we are only measuring the systems adopted for business purposes.

IT is characterized into two categories for this research: traditional information systems and Internet technologies. Despite a short history of computing technology, information systems, such as accounting information systems and inventory management systems, have been accepted as important business tools. Compared to these traditional information systems, the recent advent of the Internet and electronic commerce is redefining what we mean by IT. Internet technology is rather new, and the field is experiencing unprecedented transition. This rapid change may cause small business owner-managers to behave differently in adopting Internet technologies. Hence, it is posited here that small business may have a different underlying model for adopting Internet technologies. Two dependent variables are developed and tested. *Information System Adoption* and *Internet Adoption*.

ANTECEDENTS OF IT ADOPTION

Research has shown that innovation diffusion is influenced by a number of factors, notably individual, organizational, technological, and environmental factors (26, 45, 46). Most of these research models and factors are developed based on large corporation studies. Thus, the model needs to be adjusted and factors modified for this sample. First, these small ventures have highly centralized structures, with owner-managers responsible for critical decisions. The central role of the owner-manager suggests that his/her characteristics are more critical to the decision of IT adoption than other factors such as organizational characteristics. Small firms may not have the large, formal organizational structures seen in big corporations. In addition, small businesses are often relatively short on financial resources and are highly susceptible to short-range planning. Hence they do not have funds readily available for IT adoption or tend to look for low cost solutions, which may be inadequate for their purpose. Further, these firms typically have fewer slack resources with which to absorb the shocks of an unsuccessful investment in IT adoption.

This study posits that the owner's characteristics are the primary antecedents of IT adoption in small entrepreneurial environment: their perception of the relative advantage of using IT, the social expectations to use IT, and their innovativeness in managing their business.

Relative Advantage

"Relative advantage...refers to the degree to which an innovation is perceived as being better than the idea it supersedes" (42, p. 53). Studies show that organizations are more likely to adopt innovations when there are experts present in the firm that identify an innovation as desirable and support its implementation (5, 13, 33). Further, it has been found that those who allocate organizational resources influence innovation adoption (2, 14, 26). In entrepreneurial ventures and small firms, these two responsibilities reside with the owner-manager. To the degree that the owner perceives an innovation as offering a relative advantage over the firm's current state, it is more likely to be adopted and implemented. This view has received empirical support in small business research (10, 45) as well as in the innovation diffusion literature (39, 46).

If the small firm owner-manager believes that IT innovation will enhance the efficiency and effectiveness of his/her business or afford him/her more control over the business, he/she will be more likely to adopt the innovation. *More formally:*

H1: The owner-manager's perception of the relative advantages of IT is positively related to the firm's IS adoption level.

H2: The owner-manager's perception of the relative advantages of IS is positively related to the firm's Internet adoption level.

Social Expectations

It is generally accepted that people often base their behavior on other people's expectations. In the context of IT adoption, Moore and Benbasat (35) suggest that "image" associated with users of IT and IT itself is an important determinant of the adoption decision. Rogers (42) also suggests "observability" as a general attribute of innovation that influences adoption decisions. The more visible the outcome of the innovation, the more likely it is that people will adopt it. The theory of planned behavior suggests that people's intentions for specific behavior are determined by their attitude, subjective norms, and perceived control over resources (1). Harrison and Mykytyn (15) found that these subjective norms, maintained by peers and society, strongly influence the intention to adopt IT in small businesses. This suggests that the IT adoption decision in a small business context is not only based on cost-benefit analysis, but also on the social expectations to use IT -- the pressure the owner-managers are receiving. *More formally:*

H3: The presence of social expectations favoring technology use will be positively related to the firm's IS adoption level.

H4: The presence of social expectations favoring technology use will be positively related to the firm's Internet adoption level.

Innovativeness

IT is not the first technological innovation experienced by business. Historically, modernization and industrialization in the last century have involved many different types of technological innovations. For this reason, it is posited here that the firm's existing proclivity toward innovativeness may influence further innovation in the guise of IT adoption. In the innovation literature of business management, innovation is often classified into two categories: administrative innovation and product innovation. Product innovation in manufacturing firms includes those resources associated with a firm's research and development efforts, such as research facilities and the technically skilled individuals employed within them. In a retail service setting, this product innovation takes the form of new product offerings and the development of new market products (8, 32). In contrast, administrative innovation involves changes in structure and managerial processes. A firm's ability to devise new organizational forms and processes enhances its ability to exploit new opportunities internally, such as technological advancement, and externally, such as new or expanding markets (11, 19, 26, 43).

In the context of small firms, opportunities for administrative innovation may be limited. These ventures are operating with few employees, often directly supervised by the owner-manager. Organizational structure is very flat and decision making is centralized. Thus, the owner-manager leads

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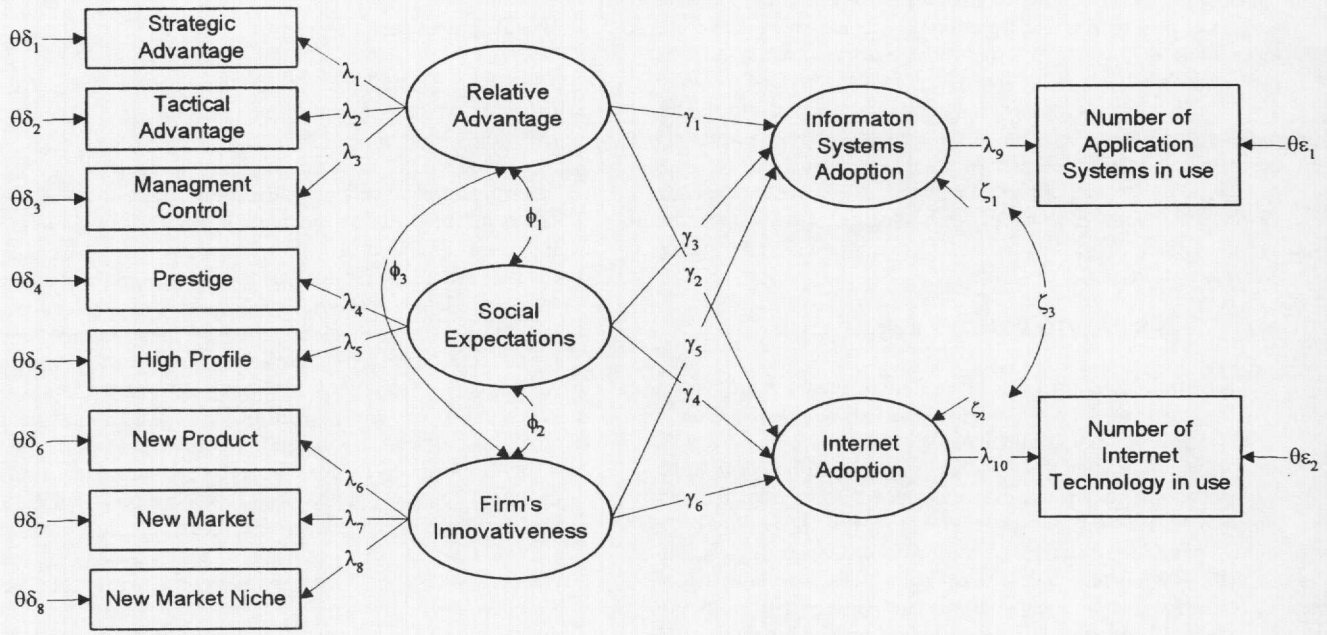
the product innovation and market expansion activities. Here, the firm's innovativeness is examined through investigation of small firm product innovation. Small businesses keen on product innovation (innovativeness) will be more likely to adopt IT. *More formally:*

H5: The level of innovativeness within a firm will be positively related to the firm's IS adoption level.

H6: The level of innovativeness within a firm will be positively related to the firm's Internet adoption level.

The complete model is offered in Figure 1, and includes measure and latent constructs as well as the hypothesized relationships. Notations in this diagram will be used in the following discussions of operationalization and analysis.

FIGURE 1
Small Business IT Adoption Model



RESEARCH DESIGN

Operationalization

Operationalized items are summarized in Table 2. Measurement items were generated by modifying existing scales whose validity and reliability have been previously demonstrated. The next section explains the details of operationalization and measurement.

IT Adoption

The dependent variable of interest in this study is the level of IT adoption. That is, to what degree has the small firm recognized the value of technology for the firm and actually implemented it. The dependent variables measuring technology adoption were operationalized as the total number of adopted IT.

Two indices of IT adoption are examined here. The first information systems (IS) adoption is operationalized as the number of different types of information systems in use. Respondents were given a list of the systems most commonly used by small business and were asked to check systems in use in their firm. The choices were accounting, inventory control, sales, purchasing, and personnel information systems. The second dependent variable, the adoption of Internet technologies, is operationalized as the number of Internet technologies in use by the firm. Choices were e-mail, home pages, electronic sales, and electronic purchase. Each of these dependent measurements also included an open choice for subjects to list other systems they currently use which may not be listed in the question.

Relative Advantage of IT Use

The relative advantages of IT use measures the degree to which an innovation is perceived as better than its precursor. In this study, it is the owner-manager's perception that IT will improve business effectiveness, efficiency and management control. These items were adapted from Moore and Benbasat (35) who proposed that three technology-related characteristics are important determinants in innovation adoption decisions: relative advantage, compatibility and complexity. However, in the small business context, Thong (45) found out that compatibility and relative advantage loaded on the same factor, and complexity played no part in the adoption decision. Thus, only relative advantage items are used here. Respondents were asked about their perceptions of the role of IT in increasing effectiveness, efficiency and management control in their business. The reliability (Cronbach alpha) of these three items was .95.

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TABLE 2
Construct Operationalization

Construct	Item	Item Description
Relative Advantage	Effectiveness	The information technology enhances the effectiveness of my business.
	Efficiency	The information technology enhances the efficiency of my business.
	Management control	The information technology gives the business owner greater control.
Social Expectations	Prestige	People in my organization who use computers have more prestige than those who do not.
	High profile	People in my organization who use computers have a high profile.
Innovation	New product	Offering new product lines or services
	New market	Targeting new markets or segments
	New market niche	Creation of products/services for the market before other competitors do so
Information Systems Adoption	Number of information systems in use	Accounting, Inventory Control, Sales, Purchasing, Personnel and Payroll, Others (Please specify)
Internet Technology Adoption	Number of Internet technologies in use	Business use of electronic mail, Informational business home pages, Sales of your product/services through the Internet, Purchasing your supplies through the Internet, Others (Please specify)

Social Expectation for IT Use

In addition to competitive pressures, many internal pressures and expectations are felt in small business environments. Because the owner-manager is the most critical strategic decision maker in the small business, the pressure they feel from stakeholders in the firm (e.g. employees, customers, suppliers) is an important determinant of IT adoption. An "image" construct from Moore and Benbasat (35) was adapted for our survey to measure social expectations of IT use. The items associated with the construct measure the owner-manager's perception about images of IT and its users: whether they consider IT as prestigious and IT users as high profile workers. The reliability (Cronbach alpha) of these items was .80.

Innovativeness

Measures of innovativeness were adapted from the product innovation measures used by Hoffman and Hegarty (16). The three items of the product innovation question how frequently the following activities are occurring in the firm: offering new products, targeting new markets and creation of products/services for the market before other competitors do so. The reliability (Cronbach alpha) of this typology for product innovation was .74.

Sample

The data for this study was collected from seminar participants at two national meetings held in a large southwestern city in the U.S. Those attending the seminars were owner-managers of small independent retail stores representing the appliance, furniture, electronics, and hobby industries. The individuals responding were the top decision-makers in their firms. One hundred and twenty-five (125) owners attended the first seminar for retailers in the appliance, furniture, and electronics industries, and 63 participated in the second seminar for retailers in the hobby industry: 188 participants overall. Thirty-six completed surveys were returned in the first seminar, and 35 from the latter. A total of 71 surveys were returned for a response rate of 37.8% (28.9 and 55.5%, respectively).

ANALYSIS AND RESULTS

Descriptive Statistics

The correlation among variables is reported in Table 3. As expected, the correlation of measures for the same construct is relatively strong and significant at 0.05 level (signified as thin gray cells). Relative advantage items reveal significant correlation with Internet adoption and innovativeness items reveal significant correlation with IS adoption (signified as dark gray cells). Finally, Internet adoption and IS adoption are correlated (r=2.55), significant at 0.05 level. The preliminary analysis of the correlation matrix suggests that the hypothesized model may fit this data well. Descriptive statistics for the sample are reported in Table 4.

Test of Research Model

Structural equation modeling (SEM) was applied using the LISREL VIII software package (22). LISREL tests the hypothesized model's fit to the data using the sample covariance matrix. SEM has substantial advantages over traditional statistical techniques. First, it allows researchers to construct unobservable latent variable structure from multiple indicators. Using a set of simultaneous equations, this technique decomposes the variance/covariance matrix into comparable components in the model, including measurement errors for each indicator, the strength of measures for each latent

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construct, estimated error terms for the latent construct, and directional or bi-directional coefficients among these latent constructs. Second, it can test the measurement model and the structural path model simultaneously. The measurement model refers to proper loadings of measures onto corresponding latent constructs and the structural model refers to the relationship among these latent constructs.

TABLE 3
Correlation

		1	2	3	4	5	6	7	8	9	10
1.	Strategic Advantage	1.000									
2.	Tactical Advantage	.879**	1.000								
3.	Management Control	.827**	.858**	1.000							
4.	Prestige	.434**	.295*	.383**	1.000						
5.	High Profile	.312**	.236*	.302*	.671**	1.000					
6.	New Product	.003	-.067	-.071	.028	-.089	1.000				
7.	New Market	.056	.095	.132	-.108	-.169	.490**	1.000			
8.	New Market Niche	.057	.101	.030	-.017	.060	.445**	.526**	1.000		
9.	IS Adoption	.263*	.260*	.286*	.249*	.088	.208	.330**	.260*	1.000	
10.	Internet Adoption	.317**	.345**	.328**	.266*	.215	-.021	.189	.106	.255*	1.000

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

Model Specifications

As SEM is a theory driven technique, the measurement and structural models need to be specified before analysis. The model specification was based on the small business IT adoption model presented in Figure 1.

First, it was necessary to accommodate the use of single indicators for the IT adoption constructs (21). As we have one measure for each endogenous construct, prior to analysis, values of the measurement error terms for these endogenous constructs -- Internet adoption and IS adoption -- were fixed at 0.30 before standardization ($\theta\delta_9$ and $\theta\delta_{10}$). This estimated measurement error of 0.30 is based on a conservative assumption that the reliability of these measures is 0.70. This also means that the internal consistency for these measures is conservatively assumed to be 0.49, as the internal consistency is calculated as the square of the reliability measure. Though there is no established internal consistency specifically to the measures of IT adoption in the literature, this conservative estimate is more realistic than the estimate of zero error.

Second, for scaling the latent constructs, error terms for independent latent constructs are standardized and fixed to one, so that the latent constructs use the same scale as the measurement items. It is the default option in LISREL VIII.

Third, independent latent constructs (relative advantage, social expectations, and innovativeness) are allowed to correlate with each other. This is achieved by specifying the variance/covariance matrix of independent latent constructs (ϕ) as symmetric and free. As diagonal elements are fixed to one for scaling purpose, practically only off diagonal elements are left open to be estimated. As a result, we should be able to see whether these independent constructs are correlated to each other. These are left free because our small business IT adoption model does not address whether any of these constructs are directionally related to each other. For example, we do not know whether previous IS adoption influences Internet adoption or Internet adoption influences IS adoption, though they may be related to each other. Also, it is theoretically premature to predict whether relative advantage influences innovativeness or vice versa, though they may not be completely orthogonal to each other. Thus, the paths among these constructs are left free to be estimated as correlations. The statistics generated for these relationships will provide clues for further theoretical development in small business IT adoption.

Lastly, the error terms for two dependent constructs (IS adoption and Internet adoption) are left free to be estimated, and these error terms are also left free to be correlated by specifying ζ matrix symmetric and free. By allowing these error terms to be correlated, we should be able to see whether the significant correlation between IS adoption and Internet adoption (r-0.255) reported in the correlation table is actually attributable to unmeasured systematic error or due to the influence from independent constructs.

Overall Model Fit

The hypothesized model demonstrates a strong fit. Table 5 reports a summary of the model fit measures with known threshold values in the last column. The model χ^2, which is an absolute index derived from fit between observed and predicted covariance matrices, is 32.42 with 27 degrees of freedom (p=0.22). As the null hypothesis for this χ^2 test is that the predicted covariance matrix is different from the observed matrix, a larger p value suggests that there is no reason to believe the predicted matrix is different from the observed matrix. The specified model fits the observed matrix very well.

Standardized residuals, another absolute measure of the fit, range from –2.82 to 2.23. Table 6 reports standardized residuals. Only one residual exceeds the critical value of |2.58|, also suggesting good fit. These residuals are presented in Figure 2 as a Q-plot. The slope is linear and approximately equal to one, with no apparent outliers. This provides additional evidence of model fit and no apparent misspecifications.

Measurement Model

Manifest-to-latent parameter estimates are reported in Table 7 with corresponding t-statistics, and squared multiple correlation (SMC) for each measure. The result discloses that the measurement variables are significantly related to their

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TABLE 4
Descriptive Statistics

No. of Employees	2	3	4	5	6	7	8	9	10	11	12	14	15	18	22	25	26	27	28	33	38	40	45	64	Total
Frequency	14	8	6	3	7	5	3	1	2	3	3	2	1	1	2	2	1	1	1	1	1	1	1	1	71
%	19.7	11.3	8.5	4.2	9.9	7.0	4.2	1.4	2.8	4.2	4.2	2.8	1.4	1.4	2.8	2.8	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	

Sales	Less than 250K	250K to 500K	500K-1M	1M to 2.5M	2.5M to 5M	More than 5M	Total
Frequency	5	14	13	17	17	5	71
%	7.04	19.72	18.31	23.94	23.94	7.04	100.0

Earnings	Less than 250K	250K to 500K	500K - 1M	1M to 2.5M	Total
Frequency	51	10	6	1	68
%	75.00	14.71	8.82	1.47	100.00

Number of PC	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	35	38	Total
Frequency	2	5	5	9	8	9	6	6	5	1	7	2	1	1	1	1	1	1	71
%	2.82	7.04	7.04	12.68	11.27	12.68	8.45	8.45	7.04	1.41	9.86	2.82	1.41	1.41	1.41	1.41	1.41	1.41	00

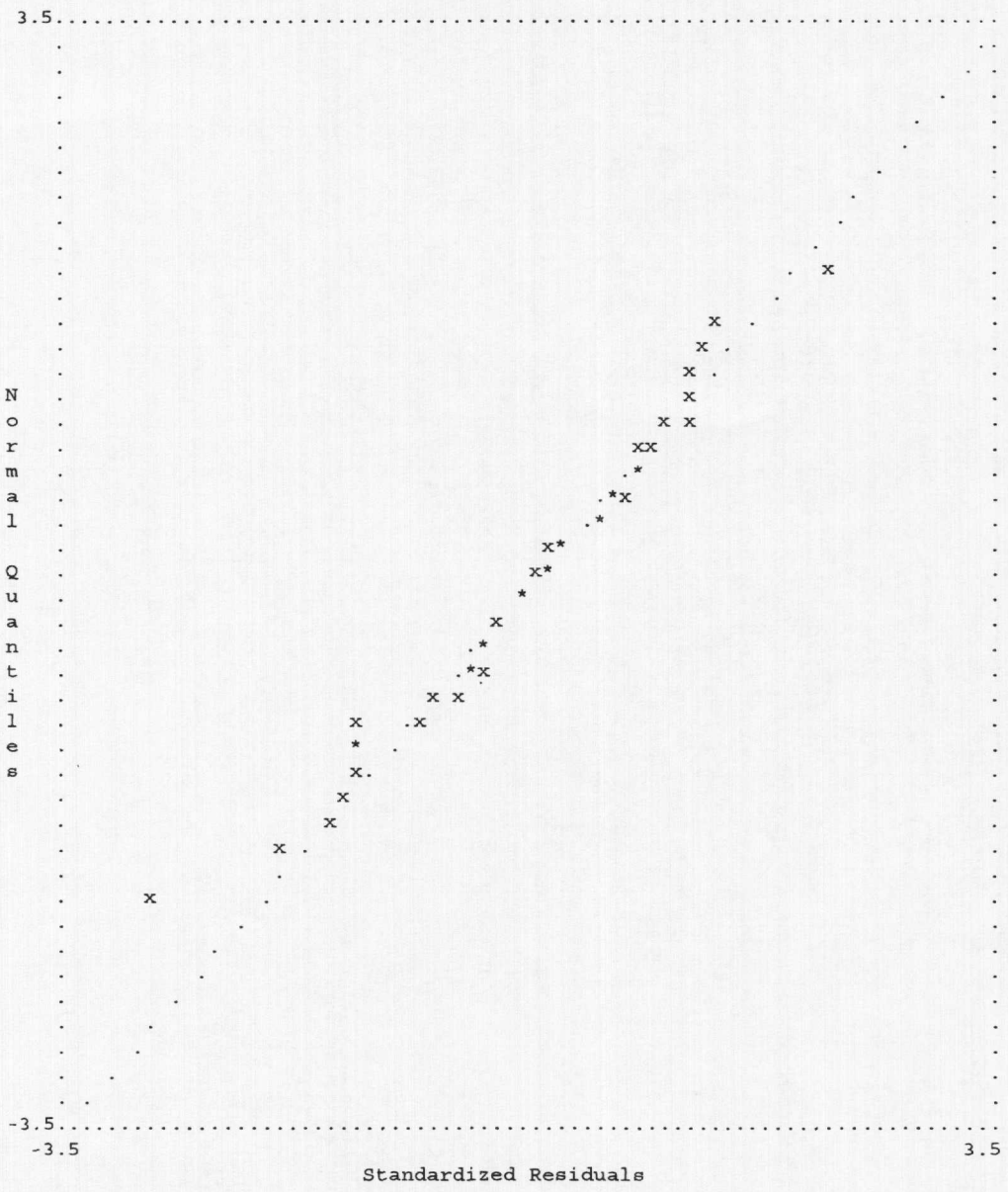
Number of information systems in use	0	1	2	3	4	5	6	Total
Frequency	1	3	7	12	14	23	11	71
%	1.4	4.2	9.9	16.9	19.7	32.4	15.5	100

Adopted Information Systems	Accounting	Inventory	Sales	Purchasing	Personnel	Other
Number of firms using	59	59	57	52	41	15
% over total 71 firms	83	83	80	73	66	21

Number of Internet technologies in use	0	1	2	3	4	5	Total
Frequency	11	6	14	25	12	3	71
%	15.5	8.5	19.7	35.2	16.9	4.2	100

Internet Technology	Email	Web Page	E Sales	E Purchase	Other
Number of firms using	52	49	38	24	9
% over total 71 firms	73	69	54	34	13

FIGURE 2
Q-plot of Standardized Residuals



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respective constructs, and not related to other constructs. The parameter estimates are strong, ranging from 0.65 to 0.95 (λs). The corresponding t-statistics are computed as the ratio of the estimate to its standard error. While standard errors present the accuracy of estimates, t-statistics test the significance of these estimates. If the t-value is between -1.96 and 1.96, the parameter estimate is not significantly different from zero, meaning that it will not make the fit of the model significantly worse if it is fixed to zero. For the significance of the parameter estimates, we are looking for t-values larger than |1.96|. The t-values for manifest-to-latent parameters range from 52.5 to 10.59, signaling the significance of these parameters.

TABLE 5
Goodness of Fit Statistics

Item	Value		Critical Value	Reference
Degrees of Freedom	27	---		
Minimum Fit Function Chi-Square	32.89 (P=0.20)		P>0.05	
Chi-Square/Degrees of Freedom	1.218		<3.0	
Root Mean Square Error of Approximation (RMSEA)	0.047		<0.05	
Independence CAIC*				
Model CAIC	424.53		Model CAIC < Saturated CAIC	
Saturated CAIC	178.98			
	290.22			
Normed Fit Index (NFI)				
Non-Normed Fit Index (NNFI)	0.91		>0.90	
Comparative Fit Index (CFI)	0.97		>0.90	
Incremental Fit Index (IFI)	0.98		>0.90	
Relative Fit Index (RFI)	0.98			
	0.85		>0.80	
Root Mean Square Residual (RMR)				
Standardized RMR	0.079		<0.10	
Goodness of Fit Index (GFI)	0.047		<0.10	
Adjusted Goodness of Fit Index (AGFI)	0.92		>0.90	
	0.84		>0.80	

TABLE 6
Residuals

	1	2	3	4	5	6	7	8	9	10
1. IS Adoption	--									
2. Internet Adoption	--	--								
3. Strategic Advantage	-0.07	-0.35	--							
4. Tactical Advantage	-0.46	0.22	0.84	--						
5. Management Control	0.62	0.13	-1.85	1.20	--					
6. Prestige	1.28	-0.25	2.23	-2.82	0.81	--				
7. High Profile	-1.28	0.25	0.84	-0.74	0.71	--	--			
8. New Product	-0.32	-1.46	-0.50	-1.31	-1.28	0.93	-0.47	--		
9. New Market	0.16	1.18	-0.22	0.57	1.18	-0.79	-1.35	-0.32	--	
10. New Market Niche	0.12	-0.08	0.06	0.58	-0.25	0.52	1.05	1.44	-1.32	--

The SMCs are the measures of the strength of a linear relationship. SMC can be interpreted as the variation accounted for by the corresponding latent construct. The SMCs for the measures of independent constructs range from 0.35 to 0.90. We can conclude that the constructs and corresponding measurement model are reasonably well defined.

Structural Model: Test of Research Hypotheses

Structural parameter estimates are reported in Table 8 along with corresponding t-statistics and SMC. These structural parameters and t-statistics are the basis for testing the research hypotheses. As in the measurement model interpretation, we are looking for t-values larger than |1.96|. Greater t-value represents significant relationship. Of six research hypotheses presented for this research, two are supported. The full structural model is shown in Figure 3.

Hypotheses 1 and 2 were tests of the effect of relative advantage on IS and Internet adoption. The structural parameter estimate for the relative advantage - IS adoption link is .17 (t=1.30) and thus insignificant. Hypothesis 1 is rejected, meaning the perceived relative advantage of IT use may not be a significant driver for the IS adoption. However, the link between relative advantage and Internet adoption is significant, .29 (t=2.05), in support of Hypothesis 2.

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TABLE 7
Measurement Model

Measurement items and parameter symbols			Value	t value	SMC
Measurement Loading for	Effectiveness	λ_1	0.93*	10.17	0.86
	Efficiency	λ_2	0.95*	10.59	0.90
	Management control	λ_3	0.90*	9.73	0.81
	Prestige	λ_4	0.95*	6.76	0.90
	High profile	λ_5	0.71*	5.38	0.50
	New product	λ_6	0.60*	4.80	0.35
	New market	λ_7	0.83*	6.73	0.70
	New market niche	λ_8	0.65*	5.25	0.42
	IS adoption	λ_9	0.93	--	--
	Internet adoption	λ_{10}	0.92	--	--
Measurement error Terms for	Effectiveness	$\theta\delta_1$	0.14***	3.82	
	Efficiency	$\theta\delta_2$	0.10***	2.97	
	Management control	$\theta\delta_3$	0.19***	4.50	
	Prestige	$\theta\delta_4$	0.10	0.46	
	High profile	$\theta\delta_5$	0.50***	3.51	
	New product	$\theta\delta_6$	0.65***	4.94	
	New market	$\theta\delta_7$	0.30**	2.15	
	New market niche	$\theta\delta_8$	0.58***	4.51	
	IS adoption	$\theta\delta_9$	0.14	--	
	Internet adoption	$\theta\delta_{10}$	0.15	--	

Parameter estimates are the completely standardized solutions.
***significant at 0.01 level: p>0.01 ($t_{crit=0.01, df=27} = 1.314$)
**significant at 0.05 level; p>0.05 ($t_{crit=0.05, df=27} = 1.703$)
*significant at 0.10 level: p>0.10 ($t_{crit=0.10, df=27} = 2.473$)

TABLE 8
Structural Model

From	To	Parameter	Value	t value	
Relative Advantage	IS Adoption	$\gamma 1$	0.17	1.30	IS Adoption=0.30
Relative Advantage	Internet Adoption	$\gamma 2$	0.29**	2.05	Internet Adoption=0.21
Social Expectations	IS Adoption	$\gamma 3$	0.24*	1.69	
Social Expectations	Internet Adoption	$\gamma 4$	0.21*	1.45	
Innovativeness	IS Adoption	$\gamma 5$	0.43***	3.20	
Innovativeness	Internet Adoption	$\gamma 6$	0.18*	1.34	
Relative Advantage	Social Expectations	$\phi 1$	0.41***	3.60	
Social Expectations	Innovativeness	$\phi 2$	-0.10	-0.68	
Innovativeness	Relative Advantage	$\phi 3$	0.09	0.64	
Latent error term for IS Adoption		$\xi 1$	0.70***	4.49	
Latent error term for Internet Adoption		$\xi 2$	0.79***	4.76	
Correlation between latent error terms		$\xi 3$	0.08	0.67	

Parameter estimates are the completely standardized solutions.
***significant at 0.01 level: p>0.01 (tcrit=0.01, df=27=1.314)
**significant at 0.05 level: p>0.05 (t crit=0.05, df=27=1.703)
*significant at 0.10 level: p>0.10 (t crit=0.10, df=27=2.473)

The next pair of hypotheses, Hypotheses 3 and 4, are not supported. The path between social expectation and IS adoption has a value of .24 (t=1.69) and the path between social expectation and Internet adoption has a value of .21 (t=1.45), both insignificant. It seems that social expectation is not a strong driver for either case of IT adoption in small businesses.

The relationship between the firm's innovativeness and the dependent variables, hypotheses 5 and 6, also shows mixed results. Firm innovativeness is a driver of IS adoption, with a value of .43 (t=3.20), thus supporting Hypothesis 5. However, the path between firm innovativeness and Internet adoption is insignificant, with a value of .18 (t=1.34). Hypothesis 6 is rejected. These results are summarized in Table 9.

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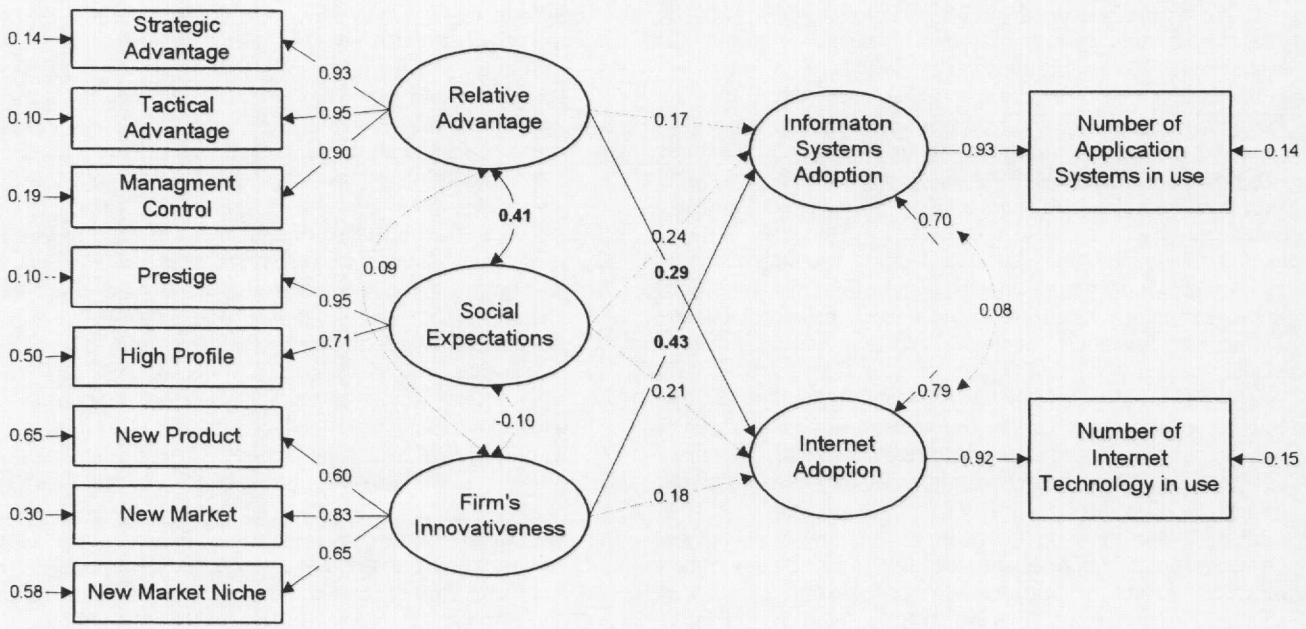
FIGURE 3



Parameters are presented as completely standardized solutions. Solid lines represent critical relationships while dotted lines represent insignificant relationships at p=0.05 level.

TABLE 9
Hypotheses Testing Results (tested at 0.05 level)

	Independent	Dependent	Result
H1	Relative advantage on use of IT	IS Adoption	Reject
H2	Relative advantage on use of IT	Internet Adoption	Supported
H3	Social expectations to use IT	IS Adoption	Reject
H4	Social expectations to use IT	Internet Adoption	Reject
H5	Firm's innovativeness	IS Adoption	Supported
H6	Firm's innovativeness	Internet Adoption	Reject

In addition to the direct relationships among latent constructs hypothesized for this research, two correlation coefficients in the analysis are noteworthy. The first one is the strong and significant correlation between relative advantage and social expectations (r=0.41, t=3.60). It means that, although social expectation may not directly influence adoption decisions, it may still exert indirect influence through its relationship with perceived relative advantage. Implications of this finding will be discussed further in the next section.

The second correlation worth noting is the insignificant and weak correlation between latent error terms of IS adoption and Internet adoption (r=0.08, t=0.67). This suggests that the strong correlation exhibited in the preliminary correlation analysis (r=0.255) is mostly due to the effect of independent constructs and not due to any systematic error.

DISCUSSION

The results of this study provide evidence that the owner's perceived relative advantages of IT use and the firm's existing willingness to innovate are closely related to the adoption of IT. Social expectations may not be an important factor in making decisions to adopt IT in small business context.

It is interesting to note that the drivers of Internet adoption are different from those of traditional IS adoption. In this sample, the degree of Internet adoption was strongly related to the owner's perception of the relative advantages of using IT, but the degree of IS adoption was related to the firm's previous innovation experience. Surprisingly, perceived relative advantage is not significantly related to traditional IS adoption, and the firm's innovativeness in other areas plays no role in adopting Internet technologies.

These findings can be explained using strategic management literature. The literature in strategic management suggests that the strategic advantages of IT are realized only when technologies are used in a strategically innovative way. The first firm to use a technology in an innovative way enjoys the first-mover advantage (3, 47), but only until competitors catch up. For example, the Automatic Teller Machine was innovative when first introduced, but is now considered a necessary tool for any firm in the banking industry. Similarly, American Airlines' SABRE system was an innovative idea for processing instant airline reservations, but now every airline has its own reservation system. Thus, it seems that traditional IS are no longer conceived as components of distinctive competencies

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but rather are standard elements of doing business. These systems are necessary, but not sufficient to create competitive advantage.

When small business owners are adopting traditional IS, they do not think about the relative advantages offered by the technology. IS applications are considered a necessary component of operations, even in small businesses. If the firm has already exhibited a willingness to innovate, adopting new IS represents a less daunting challenge and is thus more readily accomplished. Firm members have experienced innovation processes before and are better able to understand and integrate innovation.

In contrast, the antecedent for adopting Internet technologies differs from that for IS adoption. The significant driver for Internet adoption is the owner's perceived relative advantages. Internet technologies are new and no business model has yet been established for use. Conversations with small business owners in the sample suggest that they feel that Internet technologies offer numerous advantages, not the least of which is greater control over their firm's operations and a more level playing field among competitors. The newness of Internet technology provides early adopters with an opportunity to achieve the competitive benefits of first-mover advantage. Owner-managers' perceptions of the relative advantages provided through IT are the strongest reason for Internet adoption. The more owner-managers perceive relative advantages made possible through internet-related technologies, the greater are the adoption levels of those technologies.

Surprisingly, innovativeness was not related to the adoption of Internet technologies. There are several possible explanations for this. First, as noted previously, Internet technology is still evolving. When owner-managers innovate through the adoption of information systems, they are adopting systems that are new for the firm but technologically well established. The level of risk associated with internet technologies may be perceived by owner-managers as much higher. For these firms that have previously carried out innovative operations, it may well be that there is a risk threshold associated with innovation beyond which they hesitate to venture. A second explanation for our finding is sample specific. It may be because retailers in industries such as furniture and appliances may not view the Internet as a realistic outlet for product sales, and so they have not examined other potentially beneficial Internet technologies.

Social expectations to use IT do not directly influence the level of adoption of either Internet technology or IS. Previous research on IT adoption among small businesses has relied on firm size to explain this. The relationship between social expectations and the intention to adopt IT appears strongly influenced by the firm size (6, 24, 45). Because our sample is comprised of small firms, it is perhaps not surprising to find that social expectations were not a significant drive of IT adoption.

However, a serendipitous finding implies that social expectation exerts an indirect influence on Internet adoption. Our result includes a strong correlation between relative advantage and social expectations. This path was estimated as a correlation because there is no theory predicting directional relationships between the two variables. The significant and strong correlation between relative advantage and social expectation is theoretically informative.

People learn from their interaction with the environment. Small business owner-managers are not exempt from this source of learning. They do not learn about the relative advantages of using IT solely as individuals. They learn it from the trade press, their friends, business competitors and peers - social interactions. A simple path analysis reveals that there is a significant indirect effect (0.11) between social expectations and Internet adoption through relative advantage.

Thus, the findings provide evidence that Internet technologies are adopted for reasons different from traditional information systems. Internet adoption is primarily driven by perceived relative advantage while traditional IS adoption is driven by the firm's existing willingness to innovate. Social expectations to use IT do not exercise direct influence on the level of IT adoption, but the strong correlation with relative advantage suggests an indirect influence on Internet adoption.

Practically, our findings suggest that, in general, small business owner-managers recognize and value IT but they perceive different types of technology differently based on its innovative characteristics and usability in their business. Owner-managers view information system applications as necessary to their operations, but they do not believe that these systems offer greater advantage or control for their firms. This is perhaps surprising, given the far-reaching effect of these applications. IS applications provide more and better information, as well as greater cost and labor savings, all in a more timely fashion. However, findings from the owner-managers in this sample suggest that these benefits are already accepted, in use throughout the industry. Moreover, these systems are particularly attractive to firms that have been previously innovative. Firms that have successfully innovated in the past are more comfortable with innovation adoption and diffusion of these traditional and relatively established technologies. They understand that it takes time and work to realize the benefit of IS.

Internet adoption, on the other hand, is driven by perceptions of relative advantages. This technology is still evolving, and there is less certainty about its impact on firm performance. The owner-managers who are proactive in assessing Internet technologies and benefits are better able to exploit the Internet's potential for their firm, and thus create short-term competitive advantages. As Internet technology becomes more accepted and diffused, it is reasonable to believe that businesses will begin to consider Internet technology as necessary for operations rather than as a key component of competitive advantage, just as they view IS.

LIMITATIONS AND FUTURE RESEARCH

A critical limitation of this research is that it is a cross-sectional analysis. The cross-sectional design of this study makes the determination of causality problematic. Further, as the actual measurement point was after IT adoption, we cannot ascertain the temporal sequence of innovation adoption. It is possible, though less likely, that small business owners may have changed their perception of relative advantage after they have adopted IT. A longitudinal study using a larger sample would be useful to validate our conclusions.

This study sought to examine antecedents of IT adoption among small businesses. Although generalizability is enhanced through analysis of several industries in the retail sector, more research is necessary to further our understanding of the processes at work in IT adoption. Further research should explore the actual processes through which the IT innovation is adopted and diffused within the small firm context, as well as the impact of IT adoption on outcomes for the small firm.

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