

Effects of resource constraints on information technology implementation in small businesses

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Abstract

The information systems (IS) literature has identified many possible factors of information technology (IT) implementation success in small businesses. However, none has investigated the relative importance of these factors. Without knowing the relative importance of key factors, small businesses may be expending their limited resources and energy on less important factors which have limited contribution to IT implementation success. This paper investigates the relative importance of seven key factors including CEO involvement, user involvement, IS planning, IT investment, custom-developed applications, users' IT knowledge, and external expertise on IT implementation success. The key factors were identified based on the resource constraints of small businesses, Attewell's (1992) theory of lowering knowledge barrier, and the empirical literature on IT implementation in small businesses. The results show that the important factors include effective external expertise, adequate IT investment, high users' IT knowledge, high user involvement, and high CEO involvement.

Keywords

Implementation, resource constraints, external expertise, small businesses.

1 INTRODUCTION

Information technology (IT) can play an important role in small businesses. Some potential benefits to small businesses include raising profitability, increasing productivity, improved decision-making, and even gaining a competitive edge. Many key factors have been identified in the literature as critical to IT implementation success in small businesses (Cragg and King, 1993; DeLone,

1988; Doukidis *et al.*, 1992; Lees, 1987; Montazemi, 1988; Raymond, 1985). However, prior literature has not investigated the relative importance of these key factors. Without knowing the relative importance of key factors, small businesses may be expending their limited resources and energy on less important factors which have limited contribution to IT implementation success. Hence, the objective of this paper is to identify the more important factors of IT implementation success in small businesses.

The rest of this paper is organized as follows. Section 2 describes the theoretical background while section 3 presents the research model. Section 4 describes the research methodology and section 5 presents the data analysis results. In section 6, the results are discussed. Finally, section 7 concludes the paper.

2 THEORY DEVELOPMENT

Small businesses have very distinct characteristics from large businesses (Blau *et al.*, 1966; Blili and Raymond, 1993; Cohn and Lindberg, 1972; Dandridge, 1979; Raymond, 1985). They suffer from a condition referred to as resource poverty with symptoms of financial constraints, time constraints, and expertise constraints (Welsh and White, 1981). They have to control their cash flows carefully, do not have the necessary inhouse IT expertise, and tend to have a short-range perspective with regard to IT implementation. They also tend to have simple and highly centralized structures with the chief executive officers (CEOs), who are usually also the owners, making most of the critical decisions. They tend to employ generalists rather than specialists. Operating procedures are not written down or standardized. While large businesses also suffer from many of the same constraints, the effect on small businesses is more significant. Skills, time, and resources necessary for planning are not major issues in large businesses, yet these same issues represent the major difficulties in small businesses. Small businesses tend to choose the cheapest system which may be inadequate for their purpose and underestimate the amount of time and effort required for IT implementation (Yap, 1989). Inadequate time spent on IT implementation increases the risk of implementation failure. Hence, small businesses face greater risks in IT implementation than larger businesses due to their distinct characteristics (Ein-Dor and Segev, 1978).

Attewell (1992) has proposed a theory of technology diffusion to explain adoption of business computing by organizations. His theory emphasizes the role of external entities as knowledge providers to lower the knowledge barrier or knowledge deficiency on the parts of potential IT adopters. Businesses tend to delay inhouse adoption of IT because they have insufficient knowledge to implement IT successfully. In response to this knowledge barrier, mediating entities come into existence which progressively lower this barrier, and make it easier for businesses to adopt and implement IT without extensive inhouse expertise. These mediating entities can capture economies of scale in learning. After developing many systems, the IT vendor would have learned from earlier attempts and develop a relatively error-free system. Similarly, the consultant would have acquired a wealth of experience in IT implementation. Hence, consultants and IT vendors can play an important role in assisting small businesses to implement IT successfully.

3 RESEARCH MODEL

Based on the distinct characteristics of small businesses, the IT implementation environment in a small business can be conceptualized in terms of three types of resource constraints. These resource constraints are time, finance, and expertise. While these constraints could also be viewed as facilitators, we adopted the view of constraints to be consistent with Welsh and White's (1981) theory of resource poverty. Further, due to Attewell's (1992) theory of lowering knowledge barrier, small businesses that lack internal IT expertise may need to engage IT expertise from the external environment. Figure 1 presents the conceptual model.

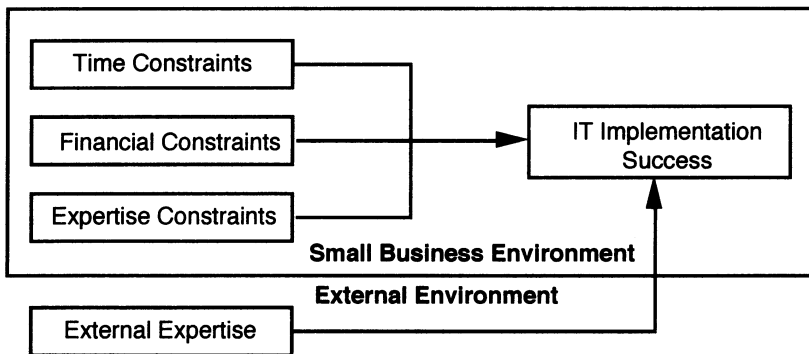


Figure 1 Conceptual model.

In the following subsections, we describe the elements in the conceptual model, identify specific key factors under each constraint and develop hypotheses for statistical testing. The hypotheses are formulated in terms of a causal model. Prior literature has conducted only bivariate analysis such as correlation analysis. In this paper, a structural equation modeling technique is used for data analysis. This technique can be used to examine the relative importance of factors in a causal model (Chin and Gopal, 1993). Note that the categorization of key factors is not completely unambiguous as some key factors may overlap with other constraints.

3.1 IT Implementation Success

The measure of IT implementation success in this study is user satisfaction. It is an attitudinal measure toward use of the resulting information systems. This measure of IT implementation success is a popular measure in the IS literature. In small business research, user satisfaction has often been used as the dependent variable (Lees, 1987; Montazemi, 1988; Raymond, 1985; Raymond, 1985; Thong *et al.*, 1994; Yap *et al.*, 1992; Yap *et al.*, 1994). While some IS researchers have expressed reservations over these instruments and measurement of user satisfaction in general (see review by Thong and Yap, 1996), user satisfaction is still used widely in research on IT implementation in both large and small businesses. This

is because there are no other equivalent instruments that can supersede it satisfactorily. Moreover, the use of user satisfaction allows for comparison of results with prior studies.

3.2 Time Constraints

Time constraints refer to the limited amount of time available for activities beyond the usual job responsibilities of individuals in the small businesses. Due to their limited time, the CEOs and their employees who will ultimately use the IT solution cannot be very involved in the IT implementation projects. Three potential key factors that are affected by time constraints are discussed below.

CEO Involvement

The CEO of a small business has limited time to spend on IT implementation. But if the CEO can afford to be more involved in the IT implementation project, the chances of a successful implementation is much higher. CEOs have the authority to influence other members of the business and are more likely to succeed in overcoming organizational resistance to accept IT (Keen, 1981; Markus, 1983). Jarvenpaa and Ives (1991) noted that hands-on management in IT implementation might be much more important in a small business where the CEO commonly makes most key decisions and is perhaps the only one who can harness IT to business objectives. This is especially true in a small business where the CEO is the person who understands the business best. A supportive CEO is also more likely to commit scarce resources and adopt a longer-range perspective to the benefits of IT implementation. There is empirical evidence of the importance of CEO involvement to successful IT implementation in small businesses (Couger and Wergin, 1974; DeLone, 1988; Yap *et al.*, 1992). Hence, user satisfaction is likely to be high when the level of CEO involvement is high.

H1: User satisfaction is positively related to the level of CEO involvement.

User Involvement

Employees in a small business tend to be generalists rather than specialists in a certain field. They have multiple job functions to perform within a time constraint. Hence, if the small business encourages the ultimate users to be involved in the IT implementation by allowing them time offs from their usual responsibilities, then the IT implementation is more likely to be successful. Benefits include a better fit of the IT with user requirements, ease of operating the IT due to learning experience during the design phase, feeling of ownership, and reduced resistance to change (Hirschheim, 1985; Robey and Farrow, 1982). Empirical studies in small businesses have also found user involvement to be positively correlated to user satisfaction with the IT (Lees, 1987; Montazemi, 1988; Wong, 1986; Yap *et al.*, 1992).

H2: User satisfaction is positively related to the level of user involvement.

IS Planning

Similarly, if the small business can afford to spend more time in planning, the chances of IT implementation success will be higher. The importance of IS planning in terms of requirements analysis, system analysis and design, and IT controls has been stated in the literature. Ginzberg (1981) identified the extent of project definition and planning as a key recurrent issue in IT implementation success. More effort spent on IS planning can lead to better fit of the business requirements with the final IT solution. There is also empirical evidence of positive correlation between user satisfaction and level of IS planning in small businesses (DeLone, 1988; Montazemi, 1988; Wong, 1986). Hence, user satisfaction is likely to be high when the level of IS planning is high.

H3: User satisfaction is positively related to the level of IS planning.

3.3 Financial Constraints

Financial constraints refer to the limited amount of finance available for activities beyond the normal operations of the small businesses. Due to their financial constraints, small businesses may not have adequate funds for their IT implementation projects. Two potential key factors that are affected by financial constraints are discussed below.

IT Investment

Small businesses have scarce financial resources and may not allocate sufficient funds for IT implementation. This often leads to selection of an IT solution that does not meet all the requirements of the business (Yap, 1989). IT implementation involves huge investments and often has organization-wide implications. The future of the business may be jeopardized by unsuccessful investments in IT because a technical failure in the IT can have a major negative impact on the business that is heavily dependent on it. The setback has even greater implication for a small business as it may even result in business failure (Senn and Gibson, 1981). Hence, it is likely that increased allocation for IT investment will increase IT implementation success.

H4: User satisfaction is positively related to the level of IT investment.

Custom-Developed Applications

IT applications can be classified into three categories: (1) general-purpose packages; (2) dedicated packages; and (3) custom-developed applications. General-purpose packages are tools such as DBase and Lotus 1-2-3 while dedicated packages serve some particular functions like accounts receivable or inventory control. General-purpose packages are not very attractive because of the lack of integration among the different application tools and the lack of end-users computer literacy (Montazemi, 1988). Although dedicated packages are perceived to be cost-effective (Kole, 1983), selection, implementation and use of software packages are not easy in practice (Gross and Ginzberg, 1984; Lynch, 1984). There is a tradeoff with flexibility since the package may have to be customized or the business may need

to change its operating procedures (Lucas *et al.*, 1988). The hidden costs of implementing dedicated packages may actually outweigh their potential benefits making custom-developed applications, which although have higher initial costs, a better choice in the long run (Lynch, 1984; Montazemi, 1988). Use of applications which are custom-developed to meet the unique requirements of the business is expected to result in higher user satisfaction.

H5: User satisfaction is positively related to use of custom-developed applications.

3.4 Expertise Constraints

Expertise constraints refer to the limited amount of expertise in the small businesses to carry out activities beyond designated job responsibilities. Due to their lack of IT expertise, small businesses usually do not have the capability to carry out their own IT implementation projects. A potential key factor that is affected by expertise constraints is the level of users' IT knowledge.

Users' IT Knowledge

There is generally a lack of internal IT expertise in a small business (DeLone, 1988; Gable, 1991). Employees are usually employed to work on the daily operations of the business and not for their ability to program or use software packages. Further, it is difficult to recruit and retain IT professionals in a small business due to the tight labor market for IT professionals and the absence of a career ladder for them in a small business. However, if the employees have adequate IT knowledge, they can contribute more effectively to the IT implementation through their involvement in the requirements and design phases. They will also have more realistic expectations from the IT and are more comfortable participating in the IT implementation process (Hirschheim, 1985; Nelson and Cheney, 1987). Insufficient IT knowledge has been found to lead to IT selection failure and failure to use the IT (Neidleman, 1979).

H6: User satisfaction is positively related to the level of users' IT knowledge.

3.5 External Expertise

Because of the lack of inhouse IT expertise, small businesses are likely to be much more dependent on external expertise such as consultants and vendors (Couger and Wergin, 1974; Cragg and King, 1993; Senn and Gibson, 1981). These external experts can compensate for the lack of IT knowledge in the small business and lower the IT knowledge barrier to successful IT implementation. The responsibilities of a consultant are to provide consultancy service specifically to help businesses implement effective information systems. Consultancy service can include performing information requirements analysis, recommending suitable computer hardware and software, and managing IT implementation. The responsibilities of a vendor generally include providing the computer hardware, software packages, technical support, and training of users. In some IT implementation, the vendor also plays the role of a consultant, and thus performs

extra duties in addition to its usual responsibilities (Thong *et al.*, 1994). In view of the possibility of the consultant being the vendor, we will treat the responsibilities of the external experts as a combination of the duties of the consultant and the vendor. In the research model, external expertise is a second-order latent construct of both types of external expertise. There is prior empirical evidence to suggest positive correlations between user satisfaction and external expertise (Lees, 1987; Wong, 1986; Yap *et al.*, 1992).

H7: User satisfaction is positively related to the effectiveness of external expertise.

The detailed research model is presented in Figure 2.

4 METHODOLOGY

The measures used in this study were developed through an extensive literature review followed by iterative reviews by both practitioners and experienced IS faculty. Further, the research variables had been used in prior studies and found to demonstrate adequate reliability and validity. Details on operationalization of the constructs can be found in Thong (1996).

The criteria for defining a small business are adopted from the Association of Small and Medium Enterprises (ASME) in Singapore. A small business is one that satisfies at least two of the following criteria: (1) number of employees should not exceed 100; (2) fixed assets should not exceed US\$7.2 million; and (3) annual sales should not exceed US\$9 million.

The names and addresses of small businesses that have computerized were obtained from a database maintained by the Singapore National Computer Board. Nonprofit businesses, public-listed businesses, and wholly owned subsidiaries of large businesses were excluded from the survey sample. Three hundred and four small businesses fulfill the ASME criteria and were included in the study. One hundred and thirty small businesses responded, giving a response rate of 43%. Responses from 16 businesses were excluded from the final sample because of incomplete data resulting in 114 usable sets of questionnaires. In order to assess the possibility of nonresponse bias, we compared the responses of the early returns with the late returns. The MANOVA test did not detect any significant differences in the research variables, and hence nonresponse bias was not a concern.

The study was conducted in two phases: a pilot study and a survey. In the pilot study phase, five small businesses were randomly chosen from the small business database to pretest the questionnaires. Based on feedback from these small businesses, very minor modifications were made to the questionnaires. Responses from these small businesses were not included in the final sample. In the survey phase, two questionnaires were used for data collection. The first questionnaire was completed by the inhouse person who was administratively responsible for IT implementation. It solicited data on the research variables and IT characteristics. The second questionnaire was completed by managers who were users of the computer systems and computer-produced reports. It requested data on user satisfaction and level of IT knowledge. Multiple views of respondents were

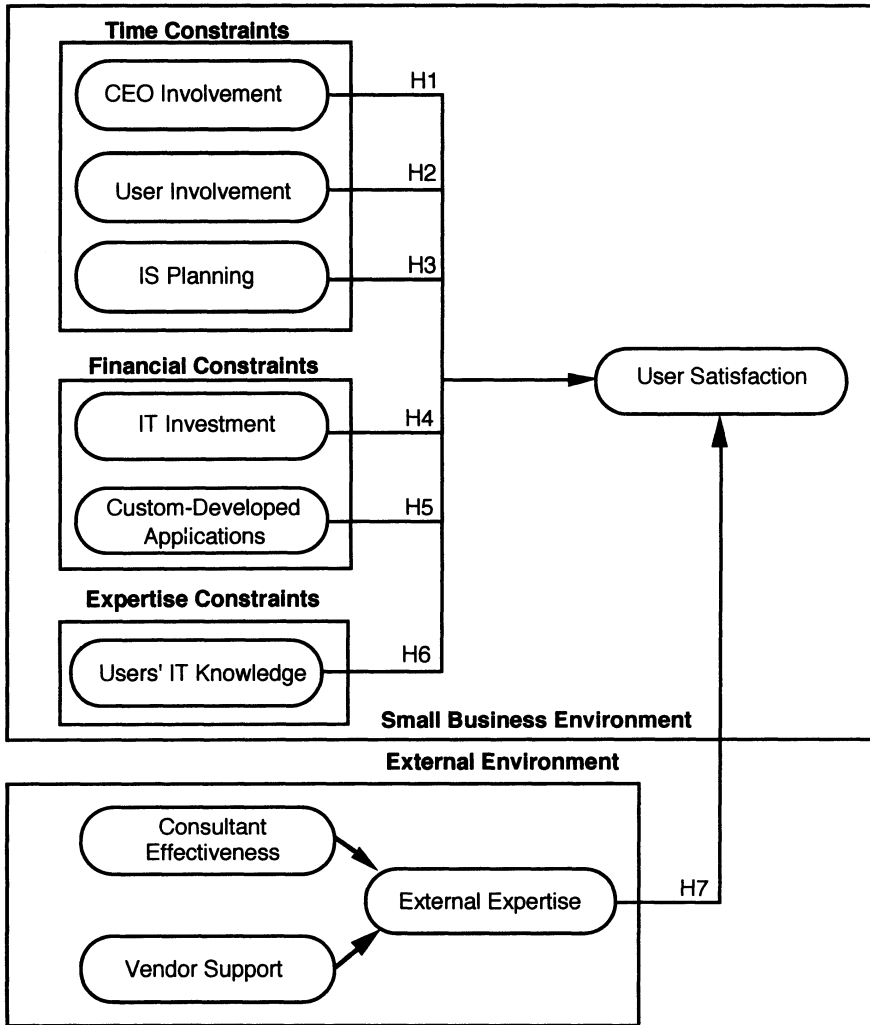


Figure 2 Research model.

solicited to determine a more accurate picture of the IT implementation success. The respondents were assured of the confidentiality of their responses.

As the unit of analysis is at the organization level rather than at the individual user level, computer user-managers' responses were aggregated within each small business for purpose of statistical analysis. Analysis of variance revealed significantly greater variance for user satisfaction and IT knowledge between the small businesses than within them. Hence, there was statistical support for aggregating the individual responses to the organization level.

5 FINDINGS

The responding small businesses were in the manufacturing (50%), commerce (22%), and service (28%) sectors. They satisfied the criteria of a small business as defined earlier. They employed an average of 50 employees and the mean annual sales was US\$6 million. They had a mean of four years of IT usage experience, and the majority had spent more than US\$30 000 on their IT implementation. Their hardware platforms ranged between microcomputers (30%), microcomputers with local area networks (31%), and minicomputers (39%). Most of these small businesses had implemented operational and management information systems applications such as accounting systems, inventory control, sales analysis, sales order processing, and payroll. Finally, all of them had engaged external expertise.

The effects of five sample characteristics (number of employees, annual sales, computer experience, type of hardware, and business sector) on IT implementation success were examined. Correlation analysis showed that there was no evidence of significant correlations at the 10% level between user satisfaction and the first three variables. The effects of type of hardware configuration and business sector on user satisfaction were tested using one-way ANOVAs. Similarly, there was no evidence of significant relationships ($p > 0.10$). In summary, these sample characteristics had no effect on IT implementation success.

Given the early stage of theory development in IT implementation in small businesses and the relatively small sample size, partial least squares (PLS) is the preferred technique for data analysis in this study. PLS is an approach to assess a model involving multiple constructs with multiple observed items by simultaneously assessing both the structural model and the corresponding measurement model in an optimal fashion (Fornell and Larcker, 1981).

Testing the measurement model involves examining convergent and discriminant validity, which indicates the strength of the constructs used to test the research model. Two tests may be used to assess convergent validity. The first test is composite reliability of each construct. The second test is average variance extracted by each construct. Nunnally's (1978) guideline of 0.80 for assessing reliability

Table 1 Assessment of the measurement model

<i>Construct</i>	<i>Composite Reliability</i>	<i>Average Variance Extracted</i>
CEO Involvement	0.92	0.70
User Involvement	0.87	0.64
IS Planning	0.85	0.53
IT Investment	1.00	1.00
Custom-developed Applications	1.00	1.00
Users' IT Knowledge	0.80	0.58
Consultant Effectiveness	0.90	0.70
Vendor Support	0.95	0.75
User Satisfaction	0.93	0.65

coefficients can be used to assess composite reliability. Fornell and Larcker's (1981) criterion that the average extracted variance should be 0.50 or more is usually used to assess the shared variance coefficients.

Table 1 presents the assessment of the measurement model. All the composite reliability coefficients exceeded 0.80 while the average extracted variances were higher than 0.50. In conclusion, the constructs in the measurement model demonstrated adequate reliability and convergent validity.

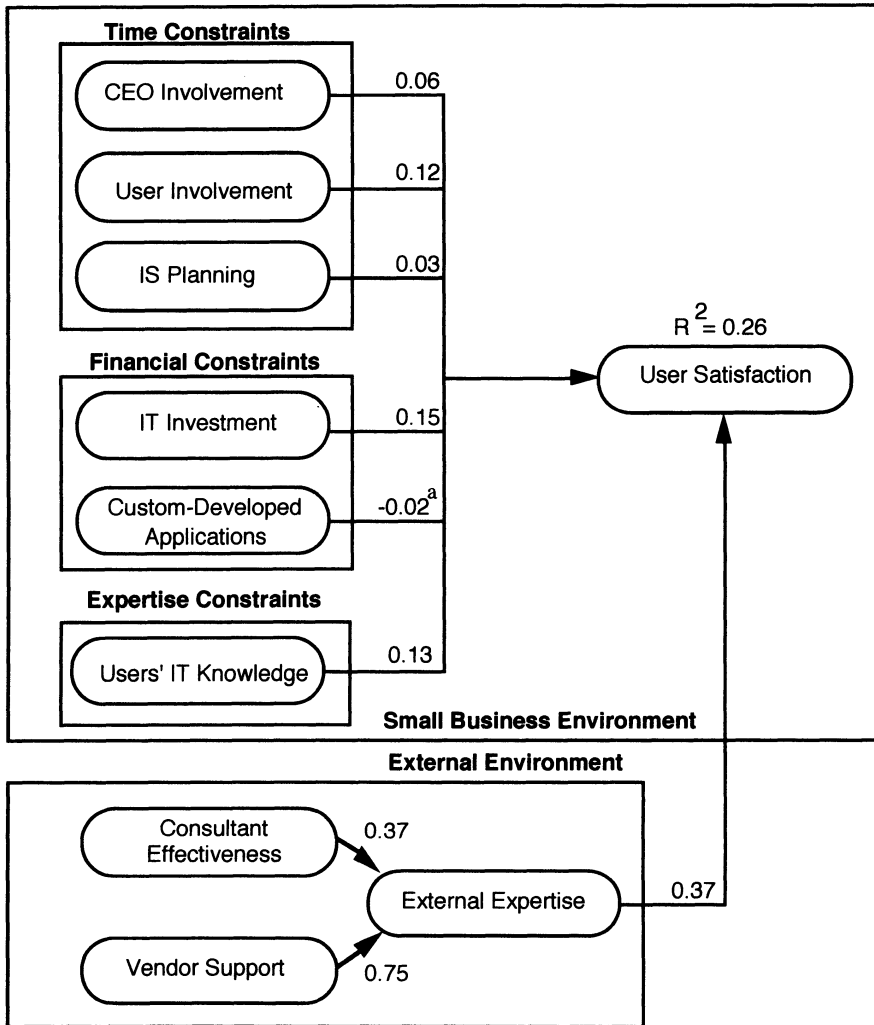
Discriminant validity is the degree to which items differentiate between constructs. Each item should correlate more highly with other items of the same construct than with items of other constructs. To assess this, the squared correlation (shared variance) between two constructs should be less than the average variances extracted by the items measuring the constructs (Fornell and Larcker 1981). Table 2 presents the results of the test for discriminant validity. In all cases, the shared variance between two constructs was less than the average variances extracted by the items measuring the constructs. Hence, the measurement model discriminated adequately between the constructs.

Following confirmation of adequate psychometric properties in the measurement model, we proceeded to examine the structural model. Figure 2 presents the test of the structural model. The model accounted for 26% of the variance in user satisfaction. The percentage of variance explained was greater than 10%, implying a satisfactory and substantive model (Falk and Miller, 1992). All except one of the standardized path coefficients were significant at the 5% level. However, a path coefficient may be statistically significant but not meaningful. Pedhazur (1982) recommended using the 0.05 level as the threshold point. Following this evaluation, the PLS analysis indicated that all hypotheses except for 3 and 5 were supported. External expertise was most closely related to user satisfaction.

Table 2 Discriminant validity of measurement model

<i>Construct</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>
1. User Satisfaction	0.65								
2. Consultant Effect.	0.06	0.70							
3. Vendor Support	0.19	0.30	0.75						
4. CEO Involvement	0.04	0.06	0.02	0.70					
5. User Involvement	0.06	0.07	0.02	0.18	0.64				
6. IS Planning	0.06	0.15	0.07	0.15	0.07	0.53			
7. Users' IT Knowledge	0.07	0.06	0.01	0.01	0.03	0.05	0.58		
8. IT Investment	0.02	0.04	0.00	0.00	0.00	0.00	0.07	1.00	
9. Custom-developed Applications	0.00	0.02	0.00	0.02	0.02	0.00	0.00	0.00	1.00

Note: Diagonals=average variance extracted; off-diagonals=shared variances. Shared variances=0.00 means below 0.01.



(Note: ^aAll coefficients significant at 0.05 or better except for this path.)

Figure 3 Assessment of structural model.

6 DISCUSSION

The data analysis shows that external expertise is more important than the other key factors in IT implementation success in small businesses. The lack of other resources in a small business may be compensated by effective external expertise in the forms of consultants and vendors. In a small business with a simple

organizational structure and limited inter-personal and departmental politics, IT implementation is basically a technical matter (Thong *et al.*, 1994). Further, the level of users' IT knowledge is the third most important factor of IT implementation success in its own right. This finding suggests that the lack of IT knowledge is the primary barrier to successful IT implementation and is consistent with Attewell's (1992) notion of "knowledge barriers".

Attewell has argued that external institutions play critical roles in lowering the knowledge barriers to IT diffusion, making it easier for businesses to adopt and use IT without extensive inhouse expertise. In the case of small businesses, consultants and vendors perform the role of external institutions which lower the knowledge barriers and make it easier for small businesses to implement IT successfully. Under such circumstances, it is imperative to engage external experts who are experienced, understand the requirements of small businesses, and able to maintain good working relationships. Potential computer users should be sent for IT courses to increase their appreciation of the process and potential of IT implementation. With increased IT knowledge, users would be able to contribute more effectively to the IT implementation process and develop more realistic expectations of IT.

IT investment is the second most important determinant of IT implementation success. This finding provides empirical support for Ein-Dor and Segev's (1978) hypothesis that budgeting adequate financial resources will increase the likelihood of IT implementation success. DeLone (1981) has also found that small businesses tend to spend proportionately less of revenue on IT implementation than large businesses. If small businesses could allocate sufficient resources for IT investment, notwithstanding their tight cash flow, they will be able to engage more experienced external experts and contract for better IT solutions that meet their objectives. If small businesses decide to choose the lowest-cost external experts and IT solutions, they may end up with IT solutions that do not meet their business requirements. These scaled-down IT solutions could ultimately even end up as white elephants in the small businesses.

However, the use of more expensive custom-developed applications has no significant effect on IT implementation success. A possible explanation is that the trade-off between benefits and pricing of custom-developed applications is not significant as compared to dedicated packages. Only 28% of the applications in the small businesses are custom-developed while the majority of small businesses tend to use dedicated packages. It may be the case that these dedicated packages more than meet the needs of small businesses which tend to be operational and transactional systems rather than complex strategic systems. As the vendors who developed these dedicated packages would have gained much experience from implementing their packages in many businesses, these packages would be well-tested and most bugs ironed out. Hence, quality of these dedicated packages may be much higher than custom-developed applications that have not been tested in other businesses. Use of custom-developed applications is not correlated with level of IT investment. Future research could examine the importance of other attributes of software packages such as perceived usefulness or ease of use in small businesses.

After technical expertise and finance variables, time-constrained variables are the next most importance factors for IT implementation success. Due to time constraints in small businesses, the CEOs and potential IT users usually could not spend enough time on IS planning and IT implementation. Among the three *a priori* time-constrained variables, user involvement in IT implementation is the most important for successful IT implementation. If the users participate actively in the process of IT implementation, they will be able to ensure that their suggestions and requirements are incorporated in the IT, feel a sense of ownership over the final IT solution and lower their resistance to adapt to new work procedures. Adequate involvement of users can compensate for the lower CEO involvement. While CEOs should be involved in key decisions affecting the business and business processes, they need not be actively involved throughout the IT implementation process. In fact, given the heavy demand on CEOs' time and attention, it is impractical to advise CEOs to devote a significant amount of attention to the IT implementation project in small businesses. Surprisingly, the level of IS planning has no effect on IT implementation success. A possible explanation is that most small businesses do not consciously conduct IS planning. Beyond deciding on how much to spend on IT, they are likely to depend on the external experts in formulating other details of IS planning. IS planning is positively correlated with level of consultant effectiveness. Due to the recognized importance of IS planning in IT implementation research, further studies need to be conducted to determine the attributes of IS planning that may have an effect on IT implementation success in small businesses.

There are three limitations worth noting in interpreting the findings of this study. First, as this is a cross-sectional study, causality of relationships cannot be demonstrated completely. Longitudinal studies need to be carried out to confirm the direction of causality. Second, in making generalization from the research sample, one has to take into consideration the context of Singapore, a newly industrialized Asian country. The findings may not be universally true, but they are likely to be applicable to IT implementation success in small businesses with similar cultural contexts. Third, there may be other key factors that have not been included in this study. Future research could extend the current research model for investigation.

7 CONCLUSION

This paper has developed and tested a model of IT implementation success in small businesses. The objective was to study the relative importance of various key factors of IT implementation success categorized as technical expertise, financial, and time constraints. The PLS analysis showed general support for the IT implementation model with external technical expertise factor being the most important followed by financial and time constrained factors.

The implication for small business management is that to achieve a high level of IT implementation success, they should direct their efforts at lowering three types of barriers. The first barrier is technical expertise constraints. They need to engage experienced consultants and vendors to lead their IT implementation and increase the level of IT knowledge among potential IT users. The second barrier is financial

constraints. Small businesses need to allocate sufficient funds for their IT investment. While they should not throw money at IT investment, which has not been shown to be effective, they should not go for the lowest-cost solutions which do not fulfill their business requirements. Rather than purchasing more expensive custom-developed solutions, well-tested dedicated packages may well meet their needs. The third barrier is time constraints. The busy CEO should ensure that potential IT users are given time-offs from their usual duties to participate in the IT implementation process. These users can provide useful inputs that lead to an IT solution that meets the requirements of the business.

The implication for research is to identify other key factors due to the three types of constraints that can lead to more successful IT implementation in small businesses. Potential factors not included in this study include perceived usefulness and ease of use of the software packages. Further, the model needs to be tested in other samples to determine its generalizability. While small businesses everywhere suffer from resource constraints, do their contextual environments have any effect? If found to be important, these factors need to be incorporated into the model.

8 REFERENCES

- Attewell, P. (1992) Technology diffusion and organizational learning: the case of business computing. *Organization Science*, **3**, 1-19.
- Blau, P.M., Heydebrand, W.V. and Stauffer, R.W. (1966) The structure of small bureaucracies. *American Sociological Review*, **31**, 179-191.
- Blili, S. and Raymond, L. (1993) Information technology: threats and opportunities for small and medium-sized enterprises. *International Journal of Information Management*, **13**, 439-448.
- Chin, W.W. and Gopal, A. (1993) An examination of the relative importance of four beliefs constructs on the GSS adoption decision: a comparison of four methods. *Proceedings of Twenty-Sixth Hawaii International Conference on System Sciences*, Vol. IV, 548-557.
- Cohn, T. and Lindberg, R.A. (1972) *How Management Is Different in Small Companies*. American Management Association, New York.
- Couger, J.D. and Wergin, L.M. (1974) Systems management: small company MIS. *Infosystems*, **21**, 30-33.
- Cragg, P.B. and King, M. (1993) Small-firm computing: motivators and inhibitors. *MIS Quarterly*, **17**, 47-60.
- Dandridge, T.C. (1979) Children are not little 'grown-ups': small business needs its own organizational theory. *Journal of Small Business Management*, **17**, 53-57.
- DeLone, W.H. (1981) Firm size and the characteristics of computer use. *MIS Quarterly*, **5**, 65-77.
- DeLone, W.H. (1988) Determinants of success for computer usage in small business. *MIS Quarterly*, **12**, 51-61.

- Doukidis, G.I., Smithson, S. and Lybereas, T. (1992) Approaches to computerization in small businesses in Greece. *Proceedings of the Thirteenth International Conference on Information Systems*, Dallas, Texas, 139-148.
- Ein-Dor, P. and Segev, E. (1978) Organizational context and the success of management information systems. *Management Science*, **24**, 1064-1077.
- Falk, R.F. and Miller, N.B. (1992) *A Primer for Soft Modeling*. The University of Akron Press, Akron, Ohio.
- Fornell, C. and Larcker, D.F. (1981) Structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, **18**, 39-50.
- Gable, G.G. (1991) Consultant engagement for first time computerization: a proactive client role in small businesses. *Information & Management*, **20**, 83-93.
- Ginzberg, M.J. (1981) Key recurrent issues in the MIS implementation process. *MIS Quarterly*, **5**, 47-59.
- Gross, P.H.B. and Ginzberg, M. J. (1984) Barriers to the adoption of application software packages. *Systems, Objectives, Solutions*, **4**, 211-225.
- Hirschheim, R.A. (1985) User experience with and assessment of participative systems design. *MIS Quarterly*, **9**, 295-304.
- Jarvenpaa, S.L. and Ives, B. (1991) Executive involvement and participation in the management of information technology. *MIS Quarterly*, **15**, 205-227.
- Keen, P.G.W. (1981) Information systems and organizational change. *Communications of the ACM*, **24**, 24-33.
- Kole, M.A. (1983) Going outside for MIS implementation. *Information & Management*, **6**, 261-268.
- Lees, J.D. (1987) Successful development of small business information systems. *Journal of Systems Management*, **25**, 32-39.
- Lucas, H.C.Jr. (1981) *Implementation: The Key to Successful Information Systems*. McGraw-Hill, New York.
- Lucas, H.C.Jr., Walton, E.J. and Ginzberg, M.J. (1988) Implementing packaged software. *MIS Quarterly*, **12**, 537-549.
- Lynch, R.K. (1984) Implementing packaged application software: hidden costs and new challenges. *Systems, Objectives, Solutions*, **4**, 227-234.
- Markus, M.L. (1983) Power, politics, and MIS implementation. *Communications of the ACM*, **26**, 430-444.
- Montazemi, A.R. (1988) Factors affecting information satisfaction in the context of the small business environment. *MIS Quarterly*, **12**, 239-256.
- Neidleman, L.D. (1979) Computer usage by small and medium sized European firms: an empirical study. *Information & Management*, **2**, 67-77.
- Nelson, R.R. and Cheney, P.H. (1987) Educating the CBIS user: a case analysis. *Data Base*, **18**, 11-16.
- Nunnally, J.C. (1978) *Psychometric Theory*. McGraw-Hill, New York.
- Pedhazur, E.J. (1982) *Multiple Regression in Behavioral Research: Explanation and Prediction..* Second Edition, Holt, Rinehart and Winston, New York.
- Raymond, L. (1985) Organizational characteristics and MIS success in the context of small business. *MIS Quarterly*, **9**, 37-52.
- Raymond, L. (1990) Organizational context and information systems success: a contingency approach," *Journal of Management Information Systems*, **6**, 5-20.

- Robey, D. and Farrow, D. (1982) User involvement in information system development: a conflict model and empirical test. *Management Science*, **28**, 73-85.
- Senn, J.A. and Gibson, V.R. (1981) Risks of investment in microcomputers for small business management. *Journal of Small Business Management*, **19**, 24-32.
- Thong, J.Y.L. (1996) *Information systems adoption and implementation in small businesses in Singapore*. PhD Thesis, National University of Singapore.
- Thong, J.Y.L. and Yap, C.S. (1996) Information systems effectiveness: a user satisfaction approach. *Information Processing and Management*, **32**, 601-610.
- Thong, J.Y.L., Yap, C.S. and Raman, K.S. (1994) Engagement of external expertise in information systems implementation. *Journal of Management Information Systems*, **11**, 209-231.
- Welsh, J.A. and White, J.F. (1981) A small business is not a little big business. *Harvard Business Review*, **59**, 18-32.
- Wong, G.K. (1986) An empirical study of small business firms assimilating computer technology. CISRP, Graduate School of Management, UCLA.
- Yap, C.S. (1989) Issues in managing information technology. *Journal of the Operational Research Society*, UK, **40**, 649-658.
- Yap, C.S., Soh, C.P.P. and Raman, K.S. (1992) Information system success factors in small business. *Omega*, **20**, 597-609.
- Yap, C.S., Thong, J.Y.L. and Raman, K.S. (1994) Effect of government incentives on computerization in small business. *European Journal of Information Systems*, **3**, 191-206.

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