Engagement of External Expertise in Information Systems Implementation

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ABSTRACT: Most small businesses lack computer experience and do not have sufficient internal computer expertise. Hence, small businesses are more dependent on external expertise such as consultants and vendors than are larger businesses. This paper compares the information systems (IS) effectiveness of a group of small businesses that engage separate consultants and vendors (consultant-vendor approach) with that of another group of small businesses that engage vendors who also provide consultancy service (vendor-only approach). The results show that small businesses that adopt the vendor-only approach have more effective information systems than small businesses that adopt the consultant-vendor approach. Further, the vendor-only approach results in the same level of consultant effectiveness and a better level of vendor support for small businesses compared with the consultant-vendor approach. The relationship between vendor and other parties in the IS implementation project is found to be an important predictor of IS effectiveness.

SMALL BUSINESSES NEED TO INNOVATE AND UPGRADE in order to stay competitive [27]. They can use information technology (IT) to help develop their markets, increase sales turnover, raise profitability, secure their positions within the industries, and gain a competitive edge [4, 15, 43, 46, 52]. However, they lag behind larger businesses in the use of information technology due to their special condition, commonly referred to as resource poverty. This condition is characterized by severe constraints on financial resources, a lack of trained personnel, and a short-range management perspective imposed by a volatile competitive environment [63]. Hence, small businesses face substantially greater risks in information systems (IS) implementation than do larger businesses. As a result, IS projects are less likely to succeed in smaller businesses than in larger ones [16, 64, 65] and the rate of computerization in a small business may even be inhibited [7].

Previous empirical studies have identified a large number of possible determinants of IS effectiveness in small businesses. A key recurring factor critical to IS effectiveness is top management support [2, 10, 24, 44]. However, recent studies have found that external IS expertise, in the form of consultants and vendors, is an important factor that has been neglected in the literature [19, 61, 67]. Based on 114 small businesses, Thong et al. [61] found that although top management support is important for IS effectiveness in small businesses, high-quality external IS expertise is even more critical. Top management may provide the resources needed for the IS implementation, but ultimately it is the external experts who will implement the systems. Hence, it is important to study the different approaches of engaging external IS expertise and to identify attributes of effective consultants and vendors. Given the dearth of prior research on engagement of external IS expertise, such studies can contribute to a theory of engagement of external IS expertise.

Small businesses have poor understanding of computers and lack sufficient internal computer expertise [9, 10, 19, 41, 42]. This poor understanding of computers is a key factor of IS failures in small businesses [56]. Small businesses also face difficulties in recruiting and retaining internal IS experts due to scarce qualified IS experts and limited career advancement prospects. Hence, small businesses have more problems in IS implementation and are more dependent on external expertise, in the forms of consultants and vendors, compared with larger businesses [6, 57].

Prior research on approaches to engaging external IS expertise in small businesses have been mainly descriptive surveys [23, 30, 50, 57] and case studies [18, 19, 37, 38]. There have been no reported empirical studies that examine the effectiveness of these approaches. This paper presents the findings of a study that tests empirically the effectiveness of two common approaches to engaging external expertise by small businesses.

External Expertise

THE IMPORTANCE OF COMPUTER CONSULTANTS TO IS implementation in small businesses has been highlighted by Gable [18, 19] and Kole [37, 38]. Previous researchers [59, 67] have also provided empirical evidence of positive relationships between IS effectiveness and the level of consultant effectiveness. The primary duties of a consultant are to provide consultancy service specifically to help businesses implement effective information systems. Consultancy service can involve performing information requirements analysis of the business needs, recommending suitable computer hardware and software, and managing implementation of the information systems.

Vendors are another source of external expertise for the resource-limited small businesses. The importance of good vendor support has been highlighted by Farhoomand and Hrycyk [17], Garris and Burch [23], and Heintz [30]. There is also empirical evidence that IS effectiveness is significantly associated with good vendor support [41, 66, 67]. The duties of a vendor generally include providing the computer hardware, software packages, technical support, and users training.

Many descriptive studies on engagement of external expertise are practitioner-oriented and prescribe approaches to select, implement, use, and control IS that are usually untested. For example, Newpeck and Hallbauer [50] believe that the hiring of an outside consultant is imperative to making the best decisions regarding the acquisition and use of a computer. Senn and Gibson [57] strongly recommend the hiring of a consultant who has expertise both in computing and in the operations of the small business. Other researchers have focused on ways to manage the vendor, without mention of a consultant. Heintz [30] discusses three approaches in using vendors only for IS implementation: (1) rely on vendor advice, (2) start out with a simple IS and take one step at a time, and (3) prepare a formal request-for-proposal. He rated the third approach as the most desirable. However, this approach assumes that the small business has some computer experience to be able to formulate a proposal. Garris and Burch [23] advise that (1) hardware and software should be purchased from reputable vendors, and (2) these vendors must have a large customer base. They explain that reputable vendors are financially viable and will be around for years, and that a large customer base is a hedge against obsolescence.

Some researchers have examined the engagement of external expertise in a case study setting. Kole [37, 38] proposes a nondevelopmental IS strategy for small businesses that uses a consultant and focuses on the implementation of packaged software. He conducted field studies in three small businesses and found that the small business that adopts this strategy reaps the most benefits. Based on a case study, Gable [18] suggests a twelve-phase model of the small business role in consultant engagement, which includes the participation of separate consultant and vendor. In a later case study of six small businesses, Gable [19] recommends a proactive client role approach to IS implementation as integral to project success. This recommendation is consistent with the observation that small businesses tend to overestimate the impact of external experts in achieving IS selection success, and underestimate the importance of their own involvement [19, 41, 42].

Two Approaches to Engaging External Expertise

ACCORDING TO LUCAS [44], IS IMPLEMENTATION IS AN ONGOING PROCESS that includes the entire development of the system from the original suggestion through the feasibility study, systems analysis and design, programming, training, conversion, and installation of the system. In the case of IS implementation in small businesses, the software solution may be an off-the-shelf package, customized package, or developed from scratch. The stages of a typical IS implementation project in a small business and two main approaches to engaging external expertise are illustrated in figure 1.

Two main approaches to engaging external expertise adopted by small businesses are: (1) the consultant-vendor approach and (2) the vendor-only approach. In the consultant-vendor approach, a small business engages a consultant who will provide information requirements analysis and implementation assistance, and a separate vendor who will provide hardware and software solutions. In the vendor-only approach, a small business engages a vendor who will combine consultancy service with provision of hardware and software solutions. Using the consultant-vendor approach, a small business can benefit from advice given by an impartial consultant who will make independent assessment of the requirements of the client and recommend the best solution available in the market. However, previous research suggests that the small business is less likely to complete the implementation project on time and within budget [59]. This is because small businesses with separate consultants and vendors are more likely to go through a formalized approach to IS implementation, have a lengthy hardware and software evaluation process, and need more communication among the parties involved. Yap [68] warns that, in an unsuccessful IS implementation, the parties involved (consultants and vendors) tend to blame each other. Using the vendor-only approach, the small business owner may save costs in hiring only one party—namely, the vendor—to implement the information system, but this may be an illusion as the vendor may include the cost of consultancy in the cost of IS implementation. Another advantage of the vendor-only approach is the improved communication and coordination that may arise due to the smaller number of parties involved. Because there are fewer stakeholders in the IS implementation, there is less chance of conflict. However, the effectiveness of the consultancy service that a vendor can provide is unclear since there is a potential conflict of interest: the vendor, acting as a consultant, may recommend his or her own product even though it may not be the most suitable for the client [30, 57]. Furthermore, the vendor may lack an understanding of the client's business that is important for successful analysis and design [14].

The consultant-vendor approach is commonly adopted in large businesses and is often recommended as a normative approach. For example, this approach is commonly prescribed to small businesses by the Singapore National Computer Board in its Small Enterprise Computerization Programme [20]. However, small businesses tend to prefer the vendor-only approach, mainly for cost considerations. This raises some interesting research questions. Which approach of engaging external expertise is better for small businesses? Can the vendor provide the needed consultancy service in

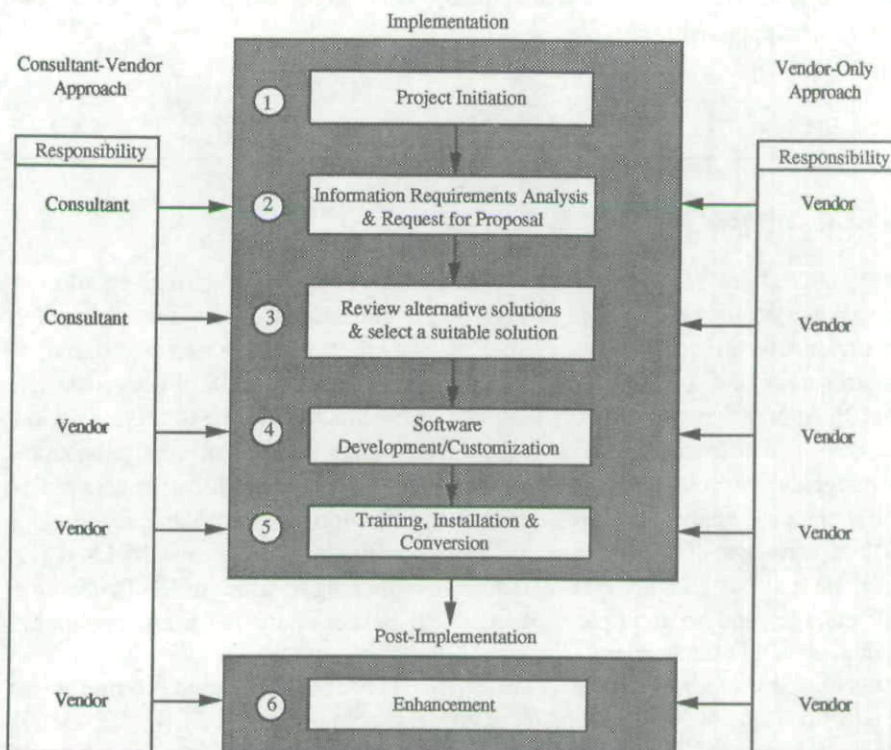Stages of a typical IS implementation project

Figure 1. Approaches to Engaging External Expertise in IS Implementation

addition to supplying hardware and software support? What are the important attributes of good vendor support? To answer these questions, a study was carried out to compare the level of IS effectiveness in two groups of small businesses that have implemented information systems: those that adopt the consultant-vendor approach, and those that adopt the vendor-only approach.

Based on the discussion above, the following null hypotheses are formulated:

Hypothesis 1_0:There is no difference in the level of IS effectiveness between small businesses that adopt the consultant-vendor approach and small businesses that adopt the vendor-only approach.

Hypothesis 2_0:There is no difference in the level of consultant effectiveness between small businesses that adopt the consultant-vendor approach and small businesses that adopt the vendor-only approach.

Hypothesis 3_0:There is no difference in the level of vendor support between small businesses that adopt the consultant-vendor approach and small businesses that adopt the vendor-only approach.

In each case, the alternative hypothesis is that there is a difference in the level of the dependent variable (IS effectiveness, consultant effectiveness, vendor support) be-

tween the two groups of small businesses. No directions are specified in the alternative hypotheses as we feel that there are equally strong arguments for either of the two engagement approaches.

Measures

IS Effectiveness

POPULARLY, IS EFFECTIVENESS IS DEFINED AS THE EXTENT to which a given information system actually contributes to achieving organizational goals—that is, its effect on organizational performance [28]. However, there is no consensus among IS researchers on the conceptualization and operationalization of IS effectiveness [12, 26, 60]. Approaches to measuring IS effectiveness that have been utilized in previous research include cost–benefit analysis, system usage estimation, user satisfaction, incremental performance in decision-making effectiveness, information economics, utility analysis, analytic hierarchy approach, and information attribute examination [60]. In a review of the literature on IS effectiveness, DeLone and McLean [12] conclude that it is unlikely that any single, overarching measure of IS effectiveness will emerge; and so multiple measures will be necessary for a more complete evaluation of IS effectiveness.

In the context of small business, IS effectiveness has been measured in terms of user satisfaction [29, 34, 41, 49, 53, 54, 55, 59, 67], system usage [10, 34, 41, 53, 55, 59], application impact [10], and organizational impact [29, 59]. According to the model of IS success developed by DeLone and McLean [12], these four measures fall under Shannon and Weaver's [58] effectiveness level of information and Mason's [47] influence level. Hence, all four measures are appropriate for measuring IS effectiveness. These four measures are discussed below (see Table 1).

The first measure of IS effectiveness, user satisfaction, is an attitudinal measure toward use of the resulting information systems. This measure is popularly operationalized by the Bailey-Pearson instrument and its derivatives. Recently, a number of IS researchers have expressed reservations over these instruments and measurement of user satisfaction in general [13, 22, 25, 32, 39, 48, 62]. However, these instruments are still used widely in research on IS implementation in both large and small businesses as there are no other equivalent instruments that can supersede them satisfactorily. Moreover, the use of previously developed standard instruments allows for comparison of results with other similar studies and accumulation of knowledge.

The second measure of IS effectiveness, system usage, is a measure of actual behavior. This measure is acceptable when users are not obligated to use the system [33]. In this study, the issue of involuntary use should not pose a problem as we are interested in responses from the top management of the small businesses. However, it should be noted that the extent of voluntary use is probably limited to either use the system or do it manually. Furthermore, system usage is differentiated into online usage and offline usage, as these are two different types of behaviors that are not necessarily related [60].

Table 1   Research Variables

Variables (Cronbach α^*)	Operationalization	Scales
User satisfaction ($\alpha = 0.94$)	1. Convenience of access 2. Currency of reports 3. Timeliness of reports 4. Reliability of reports 5. Relevancy of reports 6. Accuracy of reports 7. Completeness of reports	Average over 7 items, each 7 point scale. Adapted from Raymond [54].
Online usage	1. Computer accesses	Hours/month
Offline usage	1. Computer report usage	Hours/month
Total application impact	1. Levels of importance and success of each application	Computed as product of application importance score (4-point scale) and success score (4-point scale) summed over all applications: (Σ Importance$_i^*$ Success$_i$). (DeLone [10])
Average application impact	1. Levels of importance and success of each application	Total application impact divided by number of applications. Adapted from DeLone [10].
Organizational impact ($\alpha = 0.80$)	1. Pretax profit 2. Sales revenue 3. Staff productivity 4. Competitive advantage 5. Operating cost 6. Quality of decision making	Average over 6 items, each 7-point scale. Adapted from DeLone [11].
Overall IS effectiveness	1. Overall IS effectiveness	7-point scale
Consultant effectiveness ($\alpha = 0.83$)	1. Effectiveness in performing information requirements analysis 2. Effectiveness in recommending suitable computerization solution 3. Effectiveness in managing implementation 4. Relationship with other parties in the project (CEO, users, vendor)	Average over 4 items, each 7-point scale
Vendor support ($\alpha = 0.93$)	1. Adequacy of technical support during IS implementation 2. Adequacy of technical support after IS implementation 3. Quality of technical support 4. Adequacy of training provided 5. Quality of training provided 6. Relationship with other parties in the project (CEO, users, consultant)	Average over 6 items, each 7-point scale

The third IS effectiveness measure, application impact, provides an indication of the success of all computer applications in the small business, taking into account the importance of individual applications. Application impact is computed as the product of each application success score (four-point Likert-like scale) and importance score (four-point Likert-like scale), summed over all applications [10]. The importance scores can be treated as weights. A weakness with this measure is that a small business with more computer applications will score highly on application impact even though all its applications are rated unsuccessful. To allow for a uniform comparison across the small businesses, the total application impact score can be divided by the number of applications. However, this does not solve all potential problems. If a small business has only one application and rates it as very successful, it will score higher than another small business that has more applications but rates them lower. In this study, both operationalizations are used: total application impact and average application impact.

The fourth IS effectiveness measure, organizational impact, is a measure of the impact of the information systems on the performance of the business. IS effectiveness only has meaning to the extent that IS contributes to organizational effectiveness. In a small business, the impact and value of the information systems are likely to be achieved by, for example, time savings, and formalizing and restructuring the work processes [29]. In this study, organizational impact is a perceptual measure of the impact of information systems on the small business performance in the following areas: staff productivity, operations efficiency, decision making, sales revenues, profit, and competitive advantage. These performance items have been suggested by DeLone [11]. Finally, an overall measure of IS effectiveness is included.

Consultant Effectiveness

In this study there is a need to assess the consultant's performance in the different areas of IS implementation. Based on the IS implementation stages identified in figure 1, the following items were chosen: (1) consultant effectiveness in performing information requirements analysis, (2) consultant effectiveness in recommending a suitable computerization solution, (3) consultant effectiveness in managing the implementation, and (4) relationship between consultant and other parties in the project. These four items cover succinctly the consultant's involvement in IS implementation (see Table 1).

Vendor Support

Based on a review of vendor support literature [29, 41, 45, 59, 66, 67], attributes of vendor support were identified (see Table 1). They are: (1) adequacy of technical support during IS implementation, (2) adequacy of technical support after IS implementation, (3) quality of technical support, (4) adequacy of training provided, (5) quality of training provided, and (6) relationship with other parties in the IS implementation project. The other parties in the project are the chief executive officer (CEO), users, and the consultant, if one is engaged. The choice of attributes was guided

by two ideas. First, there is a need to differentiate between adequacy and quality of the attributes. The adequacy of technical support and training provided are not fully reflective of the effectiveness of the technical support and training provided, respectively. The quality of these services is equally important. Second, there is a need to measure the adequacy of technical support in two phases: during implementation and after implementation. This is because the effectiveness of vendor support may deteriorate after the information system has been delivered and payment has been made. Lucas et al. [45] found that, although active vendor support during systems installation is highly correlated with satisfaction variables, vendor support after installation is even more highly correlated with satisfaction variables.

Research Methodology

The Sample

THERE IS NO ONE GENERALLY ACCEPTED DEFINITION OF A SMALL BUSINESS. Three commonly used criteria for defining a small business include number of employees, annual sales, and fixed assets [3, 31]. In this study, 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) the number of employees in the business should not exceed 100; (2) the business's fixed assets should not exceed S$8 million (S$1.00 = US$0.60 approximately); and (3) the business's annual sales should not exceed S$15 million.

The names and addresses of small businesses that fulfill the ASME criteria were obtained from a small business database maintained by the National Computer Board in Singapore. Nonprofit businesses, publicly owned businesses, and wholely owned subsidiaries of large businesses were excluded from the survey sample. One hundred and three small businesses were contacted by a letter and a followup telephone call to solicit their cooperation in this study. Fifty-seven small businesses agreed to participate, giving an effective response rate of 55.3 percent. The remaining businesses declined to participate due to reasons of time pressures and confidentiality.

Data Collection

The study was conducted in two phases: a pilot study and a questionnaire survey. Two questionnaires, the Project Manager Questionnaire and the Computer User-Manager Questionnaire, were designed for data collection.

In the pilot study phase, three small businesses were randomly chosen from the database to pretest the questionnaires. Three project managers and nine computer user-managers completed the questionnaires. Next, interviews were conducted with the project managers and computer user-managers to determine whether there were any problems with the questionnaires. Based on feedback from these small businesses, very minor modifications were made to the questionnaires for the next phase of the

study. Responses from the three pilot study companies were not included in the final sample.

In the questionnaire survey, members of the research team visited the small businesses to administer the questionnaires and to clarify respondents' queries. The respondents were assured of the confidentiality of their responses. Each small business completed one Project Manager Questionnaire and an average of three Computer User-Manager Questionnaires. The Project Manager Questionnaire was completed by the in-house person in charge of IS implementation. On average, this questionnaire took thirty minutes to complete. It solicited data on (1) levels of consultant effectiveness and vendor support; (2) levels of organizational impact, application impact, and overall IS effectiveness; and (3) information systems characteristics such as hardware and type of computer applications. Forty-two percent of the responding project managers are CEOs, the rest are members of top management in the businesses. The Computer User-Manager Questionnaires were completed by managers who were users of computer systems and reports. On average, this questionnaire took ten minutes to complete. It requested data on system usage and user satisfaction. For the purpose of this study, only data specific to applications provided by vendors were included.

Upon completion of the questionnaires, open-ended interviews were conducted to get a better feel of the IS implementation in the small businesses. Interviews with respondents were conducted separately and respondents were assured of the confidentiality of their responses. On average, each interview with a project manager lasted one hour, while each interview with a computer user-manager took twenty minutes. Respondents were asked to explain in greater details their responses to the questionnaires and to relate their experiences with the IS implementation projects. Through these interviews, it was possible to check that the respondents understood the questions. The interview data also helped in interpretation of the questionnaire data. Where necessary, followup telephone calls were used to clarify any ambiguous issues.

Quantitative data on the organizational characteristics (e.g., business sector, number of employees, annual sales) of the small businesses were obtained from the Registrar of Companies (ROC) and the Central Provident Fund Board (CPF Board) in Singapore. All companies are required to lodge their annual reports with the ROC, while the CPF Board maintains data on the number of employees in all businesses in Singapore.

Instrument Validation

In this study, all the research variables were operationalized with perceptual measures. The reliability of the research variables was determined by computing their respective Cronbach alphas (see Table 1). All the reliability coefficients were at least 0.8, which is the minimum level generally required [51]. The corrected item-total correlation coefficients of user satisfaction (0.72 to 0.87), organizational impact (0.51 to 0.66), consultant effectiveness (0.61 to 0.77), and vendor support (0.73 to 0.88) were also high, indicating reasonable reliability of the research variables. To assess whether the items of the independent variables constituted different scales of vendor support and

Table 2   Factor Analysis of Independent Variables

Items	Factors	
	Consultant effectiveness	Vendor support
1. Effectiveness in performing information requirements analysis	0.74	
2. Effectiveness in recommending suitable computerization solution	0.89	
3. Effectiveness in managing implementation	0.64	
4. Relationship with other parties in the project (CEO, users, vendor)	0.78	
1. Adequacy of technical support during IS implementation		0.88
2. Adequacy of technical support after IS implementation		0.87
3. Quality of technical support		0.79
4. Adequacy of training provided		0.69
5. Quality of training provided		0.72
6. Relationship with other parties in the project (CEO, users, consultant)		0.77

Note: Figures are factor loadings.

consultant effectiveness, a varimax rotated principal component factor analysis was performed. Table 2 indicates that all the loadings are greater than 0.50, as Nunnally [51] recommends. Hence, the independent variables passed the test for construct validity. Similarly, a varimax rotated principal component factor analysis was performed on the dependent variables. Table 3 shows that the dependent variables were indeed different constructs of IS effectiveness.

As the unit of analysis is at the business level rather than at the individual-user level, computer user-managers' responses for user satisfaction and system usage were aggregated within each business for the purpose of statistical analysis. The aggregation of measures does not necessarily result in bias if it can be justified on a theoretical basis [40]. In this study, respondents are members of top management in the small businesses and have an overall view of IS effectiveness in their respective businesses. Hence, their satisfaction and usage levels are representative of the total user satisfaction and system usage of top management within their businesses. Analysis of variance revealed significantly greater variance on user satisfaction between the small businesses than within them ($F_{56,67} = 1.84$; F-prob = 0.008). Analysis did not, however, yield significant differences in variances for the system usage measures: online usage ($F_{56,68} = 0.884$; F-prob = 0.68) and offline usage ($F_{56,68} = 1.19$; F-prob = 0.24). However, it is still possible to proceed with statistical analysis because the standard deviations are high enough (see Table 5 below) [1, 55].

Table 3   Factor Analysis of Dependent Variables

Items	Factors			
	User satisfaction	System usage	Application impact	Organizational impact
1. Convenience of access	0.80			
2. Currency of reports	0.89			
3. Timeliness of reports	0.87			
4. Reliability of reports	0.80			
5. Relevancy of reports	0.76			
6. Accuracy of reports	0.75			
7. Completeness of reports	0.83			
1. Online usage		0.71		
1. Offline usage		0.72		
1. Total application impact			0.86	
1. Average application impact			0.74	
1. Pretax profit				0.77
2. Sales revenue				0.83
3. Staff productivity				0.65
4. Competitive advantage				0.67
5. Operating cost				0.56
6. Quality of decision making				0.66

Note: Figures are factor loadings.

Characteristics of Samples

TABLE 4 PRESENTS THE CHARACTERISTICS OF THE TWO GROUPS SURVEYED: small businesses that adopt the consultant-vendor approach, and small businesses that adopt the vendor-only approach. These two groups were tested for lack of comparability on the basis of business size (number of employees and sales), computer experience, computer expenditure, type of hardware and software, and software application complexity. Since business sector and hardware profile are categorical data, chi-square tests were used to test for bias in the groups. The other characteristics, such as number of employees, annual sales, computer experience, computer expenditure, and software application complexity, were tested with the t-test. T-test was used as it is considered more powerful than nonparametric tests and has been proven to be quite robust [35]. The statistical tests show that there are no significant differences between the characteristics of the two groups. Furthermore, the two groups of small businesses have quite similar profiles of software applications. In summary, we may conclude that the two groups have similar organizational characteristics.

Results

TABLE 5 PRESENTS RESULTS OF STATISTICAL tests on the hypotheses.

Hypothesis 1: IS Effectiveness

User Satisfaction

The users in both groups reported relatively high levels of satisfaction with their information systems, with means greater than 5.5 on a 1–7 scale (see Table 5). However, small businesses that adopt the vendor-only approach have significantly more satisfied users than small businesses that adopt the consultant-vendor approach. Further analysis shows that the means of all user satisfaction items in the vendor-only approach group are also significantly higher than those in the consultant-vendor approach group.

System Usage

There are no significant differences between small businesses that adopt the vendor-only approach and small businesses that adopt the consultant-vendor approach in the levels of online usage and offline usage (see Table 5). There are large variations in the patterns of system usage in both groups. On average, small businesses in both groups use the computer systems for about an hour every day.

Application Impact

The *t*-tests show that although there is no significant difference between the two groups in the level of total application impact, there is a significant difference in the level of average application impact (see Table 5). The mean scores of average application impact in both groups are high, with means greater than 10 on a 1–16 scale. Further analysis shows that the median number of applications in both groups is 7.

Organizational Impact

Small businesses that adopt the vendor-only approach have a higher level of organizational impact than small businesses that adopt the consultant-vendor approach (see Table 5). Further analysis shows that the significant difference in organizational impact is manifested through decreased operating cost.

Overall IS Effectiveness

There is evidence of a significant difference between the two groups in the level of overall IS effectiveness (see Table 5). Small businesses that adopt the vendor-only

Table 4   Characteristics of Samples

	Consultant-vendor approach ($n = 28$)[a]	Vendor-only approach ($n = 29$)[a]	Total ($n = 57$)[a]	Statistical test
Sector				
Construction	4	3	7	$\chi^2 = 2.742$
Service	4	9	13	df = 2; $p = 0.433$
Commerce	8	5	13	
Manufacturing	12	12	24	
Number of employees				
1–24	11	10	21	T-test
25–49	7	7	14	$t = 0.37$; $p = 0.714$
50–74	3	8	11	
75–99	0	2	2	
> 99	7	2	9	
Annual sales (S\$ million)[b]				
< \$2.499	7	5	12	T-test
\$2.5–\$4.999	6	6	12	$t = 1.14$; $p = 0.262$
\$5.0–\$14.999	12	7	19	
> \$15.0	3	5	8	
Computer experience (years)				
0–1	0	2	2	T-test
2–3	12	7	19	$t = 1.13$; $p = 0.264$
4–5	5	8	13	
6–10	10	9	19	
> 10	1	3	4	
Computer expenditure (S\$'000)				
0–50	7	9	16	T-test
51–100	6	9	15	$t = 0.95$; $p = 0.345$
101–200	8	5	13	
> 200	6	5	11	

approach have more effective information systems than small businesses that adopt the consultant-vendor approach.

Hypothesis 2: Consultant Effectiveness

No significant difference was found in the level of consultant effectiveness between the two groups (see Table 5). Both groups have equally effective consultancy service, indicating that vendors acting as consultants can provide the same level of consultant effectiveness to small businesses as specialized consultants.

Table 4   *Continued*

	Consultant-vendor approach $(n = 28)^a$	Vendor-only approach $(n = 29)^a$	Total $(n = 57)^a$	Statistical test
Hardware				
Minicomputers	15	8	23	$\chi^2 = 4.470$
Microcomputers and LAN	4	9	13	$df = 2; p = 0.107$
Microcomputers only	9	12	21	
Software application complexity[c]				
Mean	2.395	2.142	2.266	*T*-test
Standard deviation	0.576	0.675	0.636	$t = 1.52; p = 0.133$
Software application				
Accounts receivable	26	28	54	
General ledger	25	24	49	
Accounts payable	26	22	48	
Inventory control	19	19	38	
Sales order processing	20	17	37	
Sales analysis	17	14	31	
Payroll	14	17	31	
Purchasing	9	12	21	

[a] Figures may not add up due to missing data.
[b] S$1.00 = US$0.60 approximately.
[c] Measured as summation of complexity scores (4-point scales) for all applications divided by number of applications

Hypothesis 3: Vendor Support

Small businesses that adopt the vendor-only approach have significantly better vendor support than small businesses that adopt the consultant-vendor approach (see Table 5). Further analysis shows that the significant difference between the two groups is manifested through the adequacy of technical support during IS implementation, quality of technical support, quality of training provided, and relationship with other parties in the project. These findings are discussed further in the next two sections.

Discussion

THE MAIN FINDING OF THIS STUDY IS THAT SMALL BUSINESSES that adopt the vendor-only approach have more effective information systems than small businesses that adopt the consultant-vendor approach. The differences in the levels of IS effectiveness may be attributed to improved coordination and communication in the IS implementation project when the number of parties involved is kept to a minimum. A

Table 5   Hypotheses Testing

Variables	Consultant-vendor approach ($n = 28$)		Vendor-only approach ($n = 29$)		Statistical test	
	Mean	S.D.	Mean	S.D.	t-statistic	2-tailed p
IS effectiveness						
User satisfaction[a] (7-point scales)	5.525	0.989	6.019	0.584	2.28	0.027[**]
Online usage[a] (hours/month)	27	52	29	42	0.17	0.869
Offline usage[a] (hours/month)	26	45	17	18	1.02	0.314
Total application impact (range from 1 to 168)	75	36	81	43	0.54	0.591
Average application impact (range from 1 to 16)	10	3	12	3	1.81	0.076[*]
Organizational impact (7-point scales)	4.554	0.671	4.929	0.648	2.15	0.036[**]
Overall IS effectiveness (7-point scale)	4.857	1.239	5.571	0.836	2.53	0.015[**]
Consultant effectiveness (7-point scales)	4.866	1.149	4.980	1.055	0.51	0.614
Vendor support (7-point scales)	4.054	1.627	4.891	1.197	2.21	0.032[**]

[a] Average of three computer users-managers' responses.

[*] $p < 0.1$; [**] $p < 0.05$; [***] $p < 0.01$.

Scales: 1 = least favorable; 7 = most favorable, except for application impact, where the bigger number means more favorable.

small business tends to have fewer resources and operates under time and resource (budget, manpower, etc.) constraints. This limits the available time and energy that the business can spend on the IS implementation project. If the small business engages separate consultants and vendors, the project manager has to convey his or her needs to the consultant who in turn will communicate with the vendor. There are also occasions when the vendor will need to communicate directly with the small business. These include user involvement during system design and acceptance testing. Thus, the consultant-vendor approach needs a three-way network for coordinating the IS implementation project (see figure 2a). In the case of the vendor-only approach, the consultant is eliminated from the network of communication and the vendor is allowed
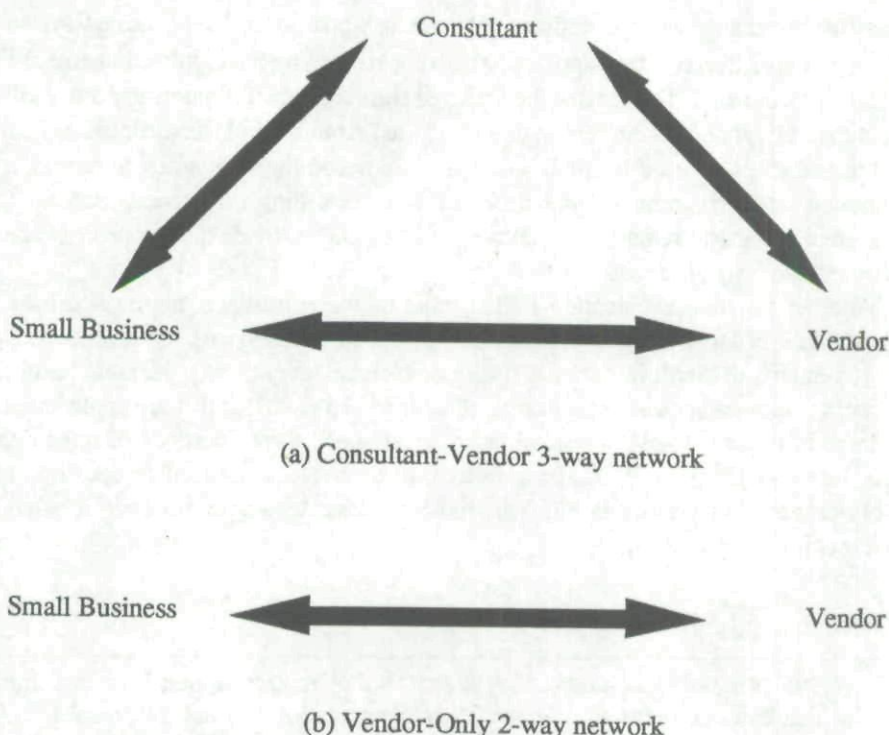
Consultant

Small Business ⟷ Vendor

(a) Consultant-Vendor 3-way network

Small Business ⟷ Vendor

(b) Vendor-Only 2-way network

Figure 2. External Expertise Network of Coordination

to take over the consultant's responsibilities. This will result in a direct two-way communication between the vendor and the small business (see figure 2b). This two-way network has fewer coordination costs than the three-way network since it minimizes the amount of coordination and communication required between the small business and the external experts. Furthermore, the benefits of engaging a separate consultant in a small businesses are not as great as in a large business when the systems involved are basic transaction processing and management information systems such as accounting systems, inventory control, sales order processing, sales analysis, payroll, and purchasing (see Table 4), which are straightforward and not highly complex. Whatever benefits that are achieved by having a separate consultant are probably outweighed by the increased coordination and communication required.

Another finding is that vendors who combine consultancy service with provision of hardware and software solutions can provide the same level of consultant effectiveness and better vendor support to small businesses compared with separate consultants and vendors. One possible explanation is that the vendor knows his or her product better than the consultant. Hence, the vendor can gauge better whether the product can fulfill the information requirements of the small business. However, a major disadvantage of engaging vendors who also provide consultancy service is the potential conflict of interest of the vendor. Since the priority of the vendor is to market products, the small business owner may have to modify requirements to suit the vendor's product and settle for a less than optimal information system [68]. Alternatively, the small business

may have to change work procedures, for better or worse, to work with the new system. This potential disadvantage appears to be compensated by the highly competitive IT marketplace, which dictates that the prices of similar products do not vary drastically and that the products meet reasonable standards. As mini- and microcomputer hardware and software used in small businesses are becoming standardized commodity products, it is common to find different vendors selling the same products. To differentiate and to remain competitive, vendors must provide quality products and services at reasonable costs.

Another possible explanation is that most of the consultants have gained their experience in large businesses and often do not fully appreciate the problems and requirements of small businesses. These consultants may do considerable harm to small businesses because organizational theories and practices that are applicable to a large business may not fit a small business; after all, a small business is not a little big business [5, 57, 63]. To be effective, these consultants need to take off the "big-organization glasses" and look at small businesses separately, not in the relational view commonly used [8].

Further Analysis

FROM THE PRECEDING DISCUSSION, IT IS NOTED that vendor support is an important factor that can contribute to effective IS implementation in small businesses. This section examines the attributes of vendor support in greater detail.

Table 6 presents the correlation analyses between attributes of vendor support and measures of IS effectiveness. Two major findings are highlighted here. First, the levels of user satisfaction, average application impact, and overall IS effectiveness are significantly correlated with the level of vendor support. Second, all attributes of vendor support identified in this study have significant positive relationships with user satisfaction and overall IS effectiveness. These findings suggest that, to achieve a high level of user satisfaction and overall IS effectiveness, it is important to have a high level of vendor support. Good vendor support is characterized by adequate and high-quality technical support during and after implementation, adequate and high-quality training, and a good relationship between the vendor and the other parties in the project.

Further analyses were also carried out to identify attributes of vendor support that have the most influence on measures of IS effectiveness. Table 7 presents the multiple regression analyses of vendor support attributes on user satisfaction, average application impact, and overall IS effectiveness, the three measures of IS effectiveness that have been found to be significantly correlated with attributes of vendor support. The results show that a significant proportion of the variances in both user satisfaction and overall IS effectiveness can be explained by one single attribute: relationship between vendor and other parties in the project.

This finding is in general agreement with the findings in other studies on the engagement of external expertise. For example, Gable [19] found that a proactive client involvement throughout consultant engagement is integral to the success of

Table 6   Correlation between Measures of IS Effectiveness and Vendor Support Attributes

Variable (n = 57)	Online usage	Offline usage	User satisfaction	Organizational impact	Total application impact	Average application impact	Overall IS effectiveness
Vendor Support	0.003[a]	−0.067	0.523***	0.198	0.096	0.287**	0.391***
Items							
1. Adequacy of technical support during IS implementation	−0.016	0.027	0.476***	0.125	0.145	0.297**	0.301**
2. Adequacy of technical support after IS implementation	0.055	−0.067	0.421***	0.255*	0.064	0.188	0.291**
3. Quality of technical support	−0.001	−0.028	0.468***	0.172	0.167	0.303**	0.384***
4. Adequacy of training provided	−0.009	−0.058	0.349***	0.096	−0.014	0.158	0.286**
5. Quality of training provided	0.002	−0.094	0.413***	0.125	0.005	0.212	0.330**
6. Relationship with other parties in the project (CEO, users, consultant)	−0.027	−0.130	0.620***	0.252*	0.156	0.361***	0.455***

[a] Pearson correlation.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

computer system selection. Through path analysis of a computer system selection success model, Gable and Sharp [21] found that the relationship between the client and the consultant is critical to success. Furthermore, while no direct effect of client involvement on success is identified, there is a large indirect effect through the relationship between client and consultant. The importance of a good relationship is also applicable to small business engagement of a vendor for IS implementation. Small businesses need to develop and maintain good relationships with their vendors. As IS implementation is beset with difficulties and uncertainties—for example, user requirements are not stated clearly or change over time—modifications to the vendor's product and the small business work procedures may be necessary. Good relations facilitate understanding, constructive compromise, and reasonable expectations regarding costs. Thus, the importance of relationship may have been understated

Table 7

Variables	Beta	B	SE B	T	Sig T	R^2
A. Regression of vendor support attributes on user satisfaction						
Step one: Relationship with other parties in the project	0.62	0.37	0.06	5.85	0.000	0.38

$F_{1,55} = 34.27$; F-prob = 0.000; $n = 57$

B. Regression of vendor support attributes on average application impact						
Step one: Relationship with other parties in the project	0.36	0.79	0.28	2.87	0.006	0.13

$F_{1,55} = 8.22$; F-prob = 0.006; $n = 57$

C. Regression of vendor support attributes on overall IS effectiveness						
Step one: Relationship with other parties in the project	0.46	0.39	0.10	3.79	0.000	0.21

$F_{1,55} = 14.37$; F-prob = 0.000; $n = 57$.

previously and small businesses that neglect it do so at their own peril. To develop a good relationship with the vendor, small businesses should attempt to maximize their compatibility with their vendors. They can do so by adequately screening vendors, getting references from other businesses that have engaged the vendors before, and involving employees who are responsible for IS implementation in vendor selection. The small business may also want to pursue a longer-term and deeper relationship or partnership, which involves levels of commitment and trust between client and vendor that greatly exceed those found in more conventional external expertise engagement [36]. Such long-term relationships are likely to result in lower cost and higher quality of IT products and services.

Conclusions

THREE CONCLUSIONS MAY BE DRAWN FROM THIS STUDY. First, for small businesses that want to implement operational systems such as accounting systems, inventory control, sales order processing, sales analysis, payroll, and purchasing, there is no apparent advantage in engaging a separate consultant to provide information requirements analysis, recommend computer hardware and software, and manage implementation of the information system. Vendors can be equally effective in providing these services. Second, small businesses ought to examine the past records of potential vendors before engaging them for IS implementation. Small businesses should pay

particular attention to the adequacy and quality of technical support during and after implementation, the adequacy and quality of user training, and the relationship between the vendor and other parties involved in IS implementation. These attributes have been found to be positively correlated with measures of IS effectiveness. Third, small businesses should strive to develop a good working relationship with their vendors. The relationship between the vendor and other parties in the IS implementation project has been found to be an important predictor of effective IS implementation.

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