

# **STRATEGIC-LEVEL SYSTEMS IN DECISION-MAKING BY ENTREPRENEURS: THE ANTECEDENTS OF SYSTEMS USAGE**

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*Strategic-level systems (SLS) are information systems at the strategic level of an organization designed to address unstructured decision-making. Using the technology acceptance model, the current research examines the antecedents of SLS usage in decision-making among one hundred seventy-seven entrepreneurs, and members of the National Association of Women Entrepreneurs in Malaysia or Entrepreneur Development Unit of the Malaysian Prime Minister's Department. The relationships between SLS usage, perceived system efficacy and usability were investigated, as well as the influence of computing experience, computing training, and computing support on perceptions. Theoretical and practical implications of the research are discussed.*

## *SLS and Strategic Decision Making*

Strategic-level systems (SLS) help senior managers with unstructured problems. One of the central features of strategic decisions is their lack of structure (Mintzberg *et al.* 1976). Mintzberg *et al.* stated that the strategic decision process is characterized by novelty, complexity, and open-endedness. Strategic decisions are those important decisions that typically require a large amount of organizational resources and the firm's environmental consideration (Mason & Mitroff 1981; Pearce & Robinson 1994). This is simply because strategic decisions not only affect the organization in which they are taken, but also affect

the society as a whole (Colignon & Cray 1980). SLS are information systems at the strategic level of an organization, designed to address unstructured decision-making through advanced graphics and communication. SLS help senior management tackle and address strategic issues and long-term trends, both in the firm and in the external environment. They support long-range planning activities of senior management and are concerned principally with matching changes in the external environment with existing organizational capabilities. Strategic-level systems aid in forecasting (*e.g.*, sales trend forecasting, budget forecasting), planning (*e.g.*, operating plan, profit planning, and manpower planning) (Laudon & Laudon 1997), and controlling of activities.

Different perspectives of strategic decision-making and outcomes have been advanced in the literature. Two perspectives of strategic decision-making were discussed in the literature to shed light on how strategic decision-making is made. Early development of the strategic management literature advances the rational normative models of strategic choice (Andrews 1971). The dominant theme in this approach suggests that managers must analyze the firm's external environment and conditions (Pearce & Robinson 1983). From these analyses, lists of external opportunities and threats and internal strength and weaknesses are derived. A strategy is formulated in the context of these opportunities and threats and of firm strengths and weaknesses. This strategy, to the extent possible, should be designed to optimize achievement of the firm's goals (Porter 1980). Thus, according to this approach, strategic decision-making involves a series of sequential, rational, and analytical processes (Huff & Reger 1987) whereby a set of objective criteria is used to evaluate strategic alternatives (Ackoff 1981; Ansoff 1986).

The external control perspective (Romanelli & Tushman 1986) suggests that the success of strategic decisions is largely

determined by characteristics of the external environment. This perspective has grown from two theories: organizational theory and industrial economics. Organizational researchers established that the environment is a source of critical contingencies (*e.g.*, Lawrence & Lorsch 1969). Organization theorists (*e.g.*, Duncan 1972; Lawrence & Lorsch 1969) proposed that environmental turbulence and uncertainty have major effects on organizational functioning. From this earlier work grew resource dependence and natural selection models (Aldrich 1979; Pfeffer & Salancik 1978). These approaches suggest that the design and choice of an organization are based on the complexity of the environment (Bourgeois 1984). For example, natural selection models argue that an organization's potential for survival and superior performance is dependent on the match or fit between organizational design variables and environmental demands (Aldrich 1979).

By combining data from both internal and external sources, SLS create a generalized computing and communications environment that can be focused and applied to a changing range of problems (Laudon & Laudon 1997). Walls *et al.* (1992) assert that a key information requirement of managers at the strategic level is the capability to detect signals of problems in the organizational environment that indicate strategic threats and opportunities. SLS helps senior executives monitor organizational performance, track activities of competitors, spot problems, identify opportunities, and forecast trends. Prior to SLS, it was common for executives to receive numerous fixed-format reports, often hundreds of pages every month, if not every week. The senior management "briefing books" were the first systems developed specifically for executives in the early 1980s to replace paper, delivering the same amount of data to executives in days rather than in weeks. Today, an SLS is apt to include a range of easy-to-use desktop analytical tools.

*SLS Usage, Usability and Efficacy*

Using the Technology Acceptance Model (TAM) (Davis 1989; Davis *et al.* 1989), the present research assesses SLS usage by entrepreneurs and the determinant structure of some key variables. TAM posits that perceived usefulness and perceived ease of use directly influence technology usage behaviour and, in addition, that perceived ease of use indirectly (via usefulness) influences usage. TAM has been widely used to predict user acceptance and use based on perceived usefulness and ease of use. Davis (1989) and Davis *et al.* (1989) developed the TAM by adapting the Theory of Reasoned Action (TRA) (Fishbein & Ajzen 1975; Ajzen & Fishbein 1980) to understand the causal chain linking external variables to IT usage intention and actual use in a workplace. Current research adapts the TAM, because it helps to understand the relationship between perceived efficacy, perceived usability, and SLS usage. TAM is acclaimed for its parsimony and predictive power, which make it easy to apply in different situations. However, there have been some reservations with the model. Venkatesh (2000) writes that, while parsimony is TAM's strength, it is also the model's important constraint. According to Venkatesh, while TAM is very powerful in helping to predict acceptance, it does not help understand and explain acceptance in ways that guide development beyond suggesting that system characteristics impact usefulness and ease of use, thereby placing a limitation on the ability to meaningfully design interferences to promote acceptance. Straub *et al.* (1995) questioned intention as a predictor of actual behaviour. Bentler and Speckart (1979) and Songer-Nocks (1976) earlier disagreed with Fishbein and Ajzen's assertion that attitudes and norms can influence behaviour only indirectly through behavioural intention. Nevertheless, Venkatesh (2000) called for future research using actual usage, instead of usage intention, to test the TAM. Present research has heeded this line of suggestion by investigating actual or current SLS usage as

the dependent variable in studying entrepreneurs – a distinct and important technology user group. Being small in size, most entrepreneurs are short of resources, capital, and expertise, which constrain exorbitant employment and experimentation with sophisticated technologies.

In line with [Rahmah and Arfah \(1999\)](#), the indicators used in enhancing the reliability of measuring SLS usage in this study are: (1) use of a wide variety of SLS software packages in CBIS environment (*e.g.*, simulations, graphic, interactive, etc); and (2) the number of business task performed using SLSs (such as budgeting, planning, trend analysis, and forecasting).

Perceived systems efficacy (PSE) is defined as the extent to which executives believe that using SLS will enhance their job performance, while perceived system usability (PSU) is the degree to which using the system is free of effort for the user ([Davis 1989](#); [Davis et al. 1989](#)). Measures of efficacy in this study are perceptions that using SLS will increase productivity, improve job performance, enhance job effectiveness, and be useful in the job. Usability is measured in terms of how clear and understandable is the interaction with the system, ease of getting the system to do what is required, mental effort required to interact with the system, and ease of use of the system. Thus, it is hypothesized as follows:

- $H_1$ : There is a direct positive relationship between PSE and SLS usage.
- $H_2$ : There is a direct positive relationship between PSU and SLS usage.
- $H_3$ : There is an indirect positive relationship (via efficacy) between PSU and SLS usage.
- $H_4$ : The more SLS is perceived as usable, the more it will be perceived as efficacious.

*Computing Experience, Training, and Support*

Computing experience (CE) has been found to be an important determinant of behaviour (Bagozzi 1981). Ajzen and Fishbein (1980) found that experience may make low probability events more salient, thereby ensuring that they are accounted for in the formation of attitude. Taylor and Todd (1995) found a stronger link between behavioural intention and technology acceptance behaviour for the more experienced users. It is believed that executives' prior general experience with computers will influence their perception of the efficacy and usability of SLS.

Computing training (CT) refers to the amount of training users have received from other users or computer specialists within or outside the organisation. Similar to the findings of Raymond and Bergeron (1992); Igbaria *et al.* 1995 and 1997) found that personal computing training has a positive impact on perception and technology acceptance. Current research suggests that executives with more computing training are more likely to find SLS efficacious and usable and in turn use more.

Computing support (CS) refers to the technical support by individuals or groups with computer knowledge within or outside the firm. Its importance has been highlighted in many studies (Cragg & King 1993, Igbaria *et al.* 1995 and 1997). Research reports have shown that systems are more successful when there is user computer support (Bergeron *et al.* 1990; Mirani & King 1994). It is supposed that positive relationships exist between technical support, perceived system's efficacy and usability.

*H*<sub>5</sub>: CE is positively associated with PSE.

*H*<sub>6</sub>: CS is positively associated with PSE.

*H*<sub>7</sub>: CT is positively associated with PSE.

*H*<sub>8</sub>: PSU mediates the relationship between CE, CS, CT and PSE.

*H*<sub>9</sub>: CE is positively associated with PSU.

$H_{10}$ : CS is positively associated with PSU.

$H_{11}$ : CT is positively associated with PSU.

Another dimension in the assessment of the impact of the independent factors on SLS usage is the synergistic effect of the three independent variables. Apart from their individual influence on perceived usefulness and ease of use, computing experience, training, and support will collectively more strongly determine a system's efficacy and usability. The synergistic effect of these three factors denoted in this research as available computing skill (ACS) is suspected to positively correlate with perceived efficacy and usability. This relationship is represented in the following hypotheses:

$H_{12}$ : The greater the ACS, the more SLS is perceived as efficacious.

$H_{13}$ : The greater the ACS, the more SLS is perceived as usable.

## METHODOLOGY

### *Sampling Frame*

The study's sampling frame is drawn from two sources. First is the list of members of the Entrepreneur Development Unit of the Malaysian Prime Minister's Department. The second list is the members of the National Association of Women Entrepreneurs in Malaysia. The lists contain a total of 295 registered members altogether. All the members were surveyed using a structured questionnaire, out of which 177 (60%) usable responses were received. The unit of analysis is entrepreneur or owner-manager who carries the onus of strategic decision-making.

### *Measures*

The questionnaire used in the research has seven parts. Part 1 measures demographic variables, using single items from

Ndubisi *et al.* (2001). The personal characteristics of the entrepreneurs as well as the characteristics of their organization were captured. These are presented in Table 2. Part 2 measures SLS usage with two indicators, namely, the variety of systems used, such as simulation, graphic, interactive software, and the number of tasks in which systems are deployed, *e.g.*, budgeting, planning, trend analysis, and forecasting in line with Ndubisi & Richardson (2002); Rahmah & Arfah (1999); ICOLC (1998).

Parts 3 and 4, respectively, measure perceived system efficacy and perceived system usability. Items for both dimensions were taken from Davis *et al.* (1989). These were measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). System usability has four items, namely, “interaction with the system is clear and understandable” (PSU1), “it is easy to get the system to do what is required” (PSU2), “interacting with the system does not require a lot of mental effort” (PSU3), and “I find the system easy to use” (PSU4). System efficacy also has four items, namely, “using the system improves my job performance” (PSE1), “using the system increases my productivity” (PSE2), “using the system enhances my effectiveness in my job” (PSE3), and “I find the system useful in my job” (PSE4).

Part 5 measures computing experience, using single item, namely, “state the total number of years of general computing experience” (Ndubisi *et al.* 2001). Part 6 measures computing training. Items include the extent of training in the following area, general computing, application software packages, interactive software, etc. Training was measured on a Likert-like scale ranging from 1 (never or to a very little extent) to 5 (very great extent). The last part (7) measures computing support. Items for this variable were adopted from Igbaria *et al.* (1997) and measured on a five-point Likert scale, anchored at its ends to 1 (strongly disagree) and 5 (strongly agree). The items are: “a specific person (or group) is

available for assistance with system difficulties” (CS1); “specialized instruction and education on software is available to me” (CS2), and “guidance is available to me in selecting software, hardware, etc. (CS3).

### Analysis

The Hierarchical Multiple Regression Model (Abrams 1999) was employed to predict the relationships in the construct. The predictor variables (*i.e.*, the independent and the intervening variables) were entered into the model in different stages. The hierarchical regression is employed so that the increase in  $R^2$  corresponding to the inclusion of each category of predictor variables and the unique variance in IT usage explained by the predictor categories could be examined. The  $R^2$  for all sets can be analysed into increments in the proportion of Y variance, due to addition of each new set of predictor variables to those higher in the hierarchy. These increments in  $R^2$  are squared multiple semi-partial correlation coefficients. The following general hierarchical model equation for four sets in alphabetical hierarchical order was adopted from Cohen & Cohen (1975):

$$R_{Y \cdot TUVW}^2 = R_{Y \cdot T}^2 + R_{Y \cdot (U \cdot T)}^2 + R_{Y \cdot (V \cdot TU)}^2$$

Using this general formula, each term in the right hand side of the equation is the coefficient of determination at each stage of introduction of a set of predictor variable in the regression.

- $R_{Y \cdot T}^2$  - represents the coefficient of determination for the set of variables introduced in stage 1.
- $R_{Y \cdot (U \cdot T)}^2$  - represents the coefficient of determination for the set of variables in stage 2.
- $R_{Y \cdot (V \cdot TU)}^2$  - represents the coefficient of determination for the set of variables used in stage 3.

The mediator effect of perceived efficacy and usability were measured based on Baron and Kenney (1986). According to Baron and Kenney (1986, p. 1176), a variable functions as a mediator when it meets the following conditions: (a) variations in levels of the independent variable significantly account for variations in the presumed mediator, (b) variations in the mediator significantly account for variations in the dependent variable, and (c) when a and b are controlled, a previously significant relation between the independent and dependent variables is no longer significant or it is significantly decreased. If Z = dependent variable, X = Independent variable, and Y = Intervening variable:

$$Z = f(X) = a+bX;$$

$$Z = f(Y) = e+fY;$$

$$Y = f(X) = c+dX$$

$$Z = f(X, Y) = g+hX+jY$$

Full effect:

$$* b \neq 0$$

$$* d \neq 0$$

$$* f \neq 0 \quad \text{also } j \neq 0$$

$$* h = 0$$

Partial effect:

$$* b \neq 0$$

$$* d \neq 0$$

$$* f \neq 0 \quad \text{also } j \neq 0$$

$$* h \neq 0 \quad \text{but } h < b$$

## RESULTS AND DISCUSSION

### *Psychometric Properties*

The psychometric properties of the scales are stronger than those produced in past studies. Confirmatory Factor Analysis was performed on the questionnaire items in order to establish their suitability for performing the subsequent multivariate analyses. The results presented are based on parsimonious sets of variables, guided by conceptual and practical considerations, namely acceptance of factor loadings of .50 and above (Hair *et al.* 1998), and cross loadings mostly below .20. In one or two cases, where cross loadings slightly exceeded the .20 roof, loadings were much

higher than .50 level to justify acceptance. The oblique factor rotation was employed for this analysis, because the factors are conceptually linked, and oblique rotation represents the clustering of variables more accurately (Hair *et al.* 1998), as compared to the orthogonal rotation, which keeps factors uncorrelated throughout the rotation process. High communality values are recorded for

*Table 1: Rotated Factors and Item Loadings – Oblique Method*

Items	Factors						Communalities
	1	2	3	4	5	6	
SLS-U1	<b>.863</b>	.035	.067	.004	-.123	.030	.712
SLS-U2	<b>.782</b>	.015	-.194	-.093	-.061	-.101	.748
PSE1	-.008	<b>-.914</b>	.032	-.030	.044	.065	.886
PSE2	-.078	<b>-.735</b>	.161	.176	-.067	-.078	.795
PSE3	-.099	<b>-.783</b>	-.060	.084	.075	.073	.844
PSE4	-.167	<b>-.524</b>	-.144	.281	.174	-.081	.697
PSU1	-.292	-.021	<b>.689</b>	-.113	.082	.035	.747
PSU2	-.036	.034	<b>.794</b>	.017	-.156	-.206	.800
PSU3	.044	.051	<b>.774</b>	.049	.171	.024	.670
PSU4	-.113	-.043	<b>.845</b>	.054	.022	.012	.840
CS1	.019	-.038	-.044	<b>-.883</b>	-.097	.077	.858
CS2	.053	-.098	.082	<b>-.878</b>	.000	.066	.863
CS3	-.019	.180	.119	<b>-.801</b>	-.057	-.049	.814
CT1	.095	.027	.075	.063	<b>.799</b>	-.188	.788
CT2	-.007	.056	-.102	-.032	<b>.920</b>	-.009	.909
CT3	.073	-.034	.256	-.031	<b>.784</b>	-.139	.813
CT4	-.257	.095	-.148	.024	<b>.775</b>	.118	.711
CE	-.009	.108	.000	.332	.124	<b>.678</b>	.629

each variable, indicating that the total amount of variance an original variable shares with all other variables included in the analysis is high. Overall, the results in Table 1 show that the construct measures are valid. Put differently, the measures define the concept of study very well.

Table 2: Respondents' Profiles

<b>Organization's Industry Type</b>	<b>Percent (%)</b>	<b>Respondents by Prior Computer Experience</b>	<b>Percent (%)</b>
Manufacturing	24.9	11 years or more	11.3
Service	75.1	1-5 years	44.1
		6-10 years	44.6
<b>Years of Establishment</b>	<b>Percent (%)</b>	<b>Respondents by Age</b>	<b>Percent (%)</b>
5 years or less	31.6	41 years or more	44.0
More than 5 years	68.4	40 years or less	56.0
<b>Number of Employees</b>	<b>Percent (%)</b>	<b>Respondents by Race</b>	<b>Percent (%)</b>
101 or more	14.6	Chinese	73.4
Below 5	25.5	Malay	19.8
5-100	59.9	Indian	6.8
<b>Respondents by Job Function</b>	<b>Percent (%)</b>	<b>Respondents by Sex</b>	<b>Percent (%)</b>
Owner/non manager	7.9	Male	58.2
Owner/manager	92.1	Female	41.8
<b>Respondents by Educational Qualification</b>	<b>Percent (%)</b>		
University graduate	45.2		
Non-University graduate	54.8		

The internal consistency of the instrument was tested via reliability analysis. Reliability estimates (Cronbach alpha) for U,

PSE, PSU, CT, and CS were .78, .90, .88, .75, and .90, respectively, suggesting a high degree of reliability. The results very well exceed .60 (Hair *et al.* 1998) lower limit of acceptability.

#### *Individual and Organization Profile*

Table 2 gives the key demographic make-up of the entrepreneurs and their organization. The majority (68.4%) of the firms have been established for more than five years. Approximately 15% are considered medium size, having between 100-200 employees, 60% are small size (5-100 employees), and 25% are very small in size (below 5 employees). Many of the firms (75%) operate in the service sector, while the rest (25%) are manufacturing outfits. Close to 55% of the respondents are university graduates, 56% have over five years of computing general experience, 58% are male, 92% are owner-managers, 73% are Chinese, 20% are Malays, and the remaining 7% are Indians.

### HYPOTHESES TESTING

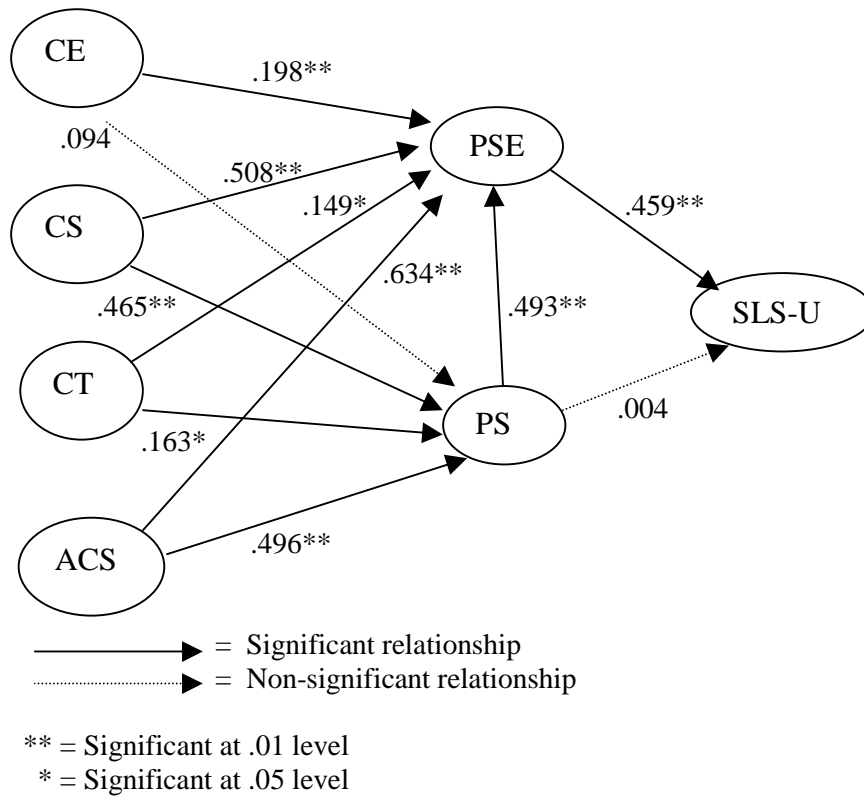
Figure 1 below shows the framework of the research model with beta coefficients. The thick lines represent significant relationships and the broken lines stand for non-significant relationships.

#### *PSE, PSU and SLS Usage (U)*

Table 3 summarizes the regression analysis for hypotheses  $H_1$  and  $H_2$ . Total variance in SLS usage explained by PSE and PSU is 21.4 percent. At 1% significance level, PSE shows a significant evidence of direct association with SLS usage. In other words, the more SLS is perceived to be efficacious, the more its use. This result strongly supports the acceptance of hypothesis  $H_1$ . This finding is in consonance with the results of many previous TAM studies, such as Davis (1989); Davis *et al.* (1989); Mathieson

(1991); Igarria *et al.* (1997); and Ndubisi *et al.* (2001). Technology adoption decisions (Venkatesh & Brown 2001) or usage decisions (Ndubisi *et al.* 2001) have been typically

Figure 1: Schema of the Research Constructs and Beta Coefficients



characterised by a strong productivity orientation. The strength of the PSE and SLS usage relationship is robust, and the direction of the beta coefficient and t-value for the PSE construct is the same as was hypothesized; thus it is concluded that PSE is a powerful

determinant of SLS usage. For these executives, the outcome of deploying SLS is very important in influencing sustained usage. Where SLS is instrumental in increasing productivity, improving job performance, enhancing job effectiveness, and useful in the job, executives are prone to use more.

Another important TAM construct is ease of use. Davis (1989); Adams *et al.* (1992); Segars and Grover (1993); and Hendrickson and Collins (1996) are some of the works that have reported a strong ease of use and usage relationship. However, the current research found no significant evidence to support direct usability (PSU) and SLS usage relationship at 5% significance level, effectively suggesting the rejection of hypothesis  $H_2$ . This finding is contrary to the original TAM relationship that links usability and usage to a direct association. One possible explanation for this result is the claim that SLS is easy to use and requires only a minimum of experience (Laudon & Laudon 1995), which may have watered down the importance of ease of use factor. However, albeit the strength of the relationship was not as strong as anticipated, the direction of the coefficients is the same as predicted, thus creating an enticement to conclude there is a moderate impact by PSU on SLS usage among Malaysian entrepreneurs.

Table 3: PSE, PSU, and U

Perception	Beta coefficients	t-value	p-value
Efficacy (PSE)	.459	4.884	.000
Usability (PSU)	.004	.042	.966

$$R^2 = .214$$

Does the failure to establish a significant direct relationship between PSU and U at 5% significance level nullify the possibility of an indirect relationship (via PSE) as well (see hypothesis  $H_3$ )?

To test for this relationship, another regression that hierarchically regressed PSU (step 1) and PSE (step 2) against usage was conducted, coupled with Baron and Kenney's (1986) test of mediator effect. Table 4 summarizes the results of this regression analysis. From Table 4, it is observed that the beta coefficient for model 1 is significantly higher than that of model 2. When added to the increase in  $R^2$  of .108, this explains the mediation effect of PSE in the relationship between PSU and SLS usage. Clearly, 10.8% of the variation in usage is explained by the mediation effect of PSE. Therefore, there is an indirect positive relationship (via efficacy) between perceived usability and SLS usage (hypothesis  $H_3$ ). Entrepreneurs are neither directly motivated to use nor de-motivated from using SLS because the systems are easy or difficult to use; instead if they consider usable systems as efficacious systems, then only will their SLS usage be affected. This result again points to the importance of outcome orientation in SLS usage, thereby corroborating the notion by Ndubisi *et al.* (2001) and Venkatesh and Brown (2001) that technology usage decisions (SLS in the present case) is characterised by a strong productivity orientation.

Table 4: PSU and U (with PSE mediating)

Perception	Beta coefficients without efficacy (model 1)	Beta coefficients with efficacy (model 2)
PSU	.352**	.004
PSE	–	.459**
	$R^2 = .106$	$R^2 = .214$
	Change in $R^2 = .108$	

\*\* =Significance at .01 level

CE, CS, CT, PSU, and PSE

Hypotheses  $H_4$ ,  $H_5$ ,  $H_6$ , and  $H_7$  test the influence of PSU, CE, CS, and CT, on PSE. The results of the multiple regression analyses are summarized in Table 5. Total variance in PSE explained by PSU, CE, CS, and CT is 77.4%. This figure is higher than that produced by past TAM studies, for example, Ndubisi *et al.* (2001). There is a significant positive relationship between PSU, CE, CS (at .01 level), CT (at .05 level) and PSE. The strengths of these relationships are significant and strong, and the direction of the coefficients agrees with the prediction made in the hypotheses. These results lead us to conclude that the more SLS

Table 5: PSU, CE, CS, & CT on PSE

	<b>t-value</b>	<b>p-value</b>
PSU	8.319	.000
CE	3.290	.001
CS	7.729	.000
CT	2.171	.031
$R^2 = .774$		

usage is perceived as usable, the more the computing experience, computing support, and computing training, the more SLS is perceived as efficacious. Computing experience has shown to be helpful in forming favourable usefulness perception (Bagozzi 1981; Taylor & Todd 1995). Fazio and Zanna's (1981) empirical evidence suggested that attitude based on direct experience with the attitude object predicts behaviour better than attitude formed based on indirect experience. Computing support determines perceived efficacy and, in turn, SLS usage, because, generally, people have the tendency to patronize products or shops that are backed by after-sales services more than those with no sales support (Ndubisi *et al.* 2001), more so when the product is highly technical, as in the case of SLS. Warranty and guaranty are other forms of technical support, and buyers are generally known to rate

highly and seek after products with these attributes. Bergeron *et al.* (1990) and Montazemi and Cameron (1996) have recognized the importance of computing support, and Igarria *et al.* (1997) the importance of computing training, in technology usage.

In addition, hypothesis  $H_8$  theorizes that the relationship between CE, CS, CT, and PSE are mediated by PSU. This hypothesis was tested using hierarchical regression with CE, CS, and CT (in stage 1) and PSU (in stage 2) against PSE. The differences in the correlation coefficients for the two models, coupled with Baron and Kenney's (1986) test of mediator effects were used as evidences to support this postulation. These results are summarized in Table 6. The beta coefficients for model 1 are higher than those of model 2; when added to the increase in  $R^2$  of .164, this explains the mediation effect of PSU in the relationships between CE, CS, CT, and PSE. It is clear that 16.4% of the variation in PSE is explained by the mediation effect of PSU. Specifically, usability mediates the relationship between computing training computing experience, computing support, and perceived efficacy.

Table 6: CE, CS, & CT on PSE (with PSU mediating)

	Beta coefficients without usability-model 1	Beta coefficients with usability-model 2
CE	.198**	.156**
CS	.508**	.302**
CT	.149**	.046
PSU	–	.493**
	$R^2 = .435$	$R^2 = .599$
	Change in $R^2 = .164$	

#### CE, CS, CT, and PSU

This section tests for the validity of hypotheses  $H_9$ ,  $H_{10}$ , and  $H_{11}$ . Is there evidence supporting direct positive association

between CE, CS, CT, and PSU? The regression results for this test are summarized in [Table 7](#). The coefficient of determination for the regression is .343, indicating that 34.3% of variation in PSU is explained by CE, CS, CT. Computing support (CS) has a strong influence at 1% significance level on ease of use, while computing training (CT) holds influence on ease of use at 5% significance level. Thus, there is validity for hypotheses  $H_{10}$  and  $H_{11}$ . As was observed with perceived efficacy, the support of a systems' designers, vendors, or technicians in the form of before- and after-sales aid will help to ease complexity in the system's use, as well as help to build confidence in users. The importance of CS in determining technology usage has been reported by [Bergeron \*et al.\* \(1990\)](#), [Montazemi and Cameron \(1996\)](#), and [Igarria \*et al.\* \(1997\)](#).

*Table 7: CE, CS, CT on PSU*

	<b>Beta Coefficients</b>	<b>t-value</b>	<b>p-value</b>
CE	.094	1.460	.146
CS	.465	6.653	.000
CT	.163	2.259	.025
	$R^2 = .343$		

Computing training is another important influence on usability. Executives, irrespective of their previous interaction with computers in general, will find the need for training whenever a new system (*e.g.*, SLS) is introduced, the only difference being in the magnitude. [Ndubisi \*et al.\* \(2001\)](#) asserted that, because of the complexity and delicate nature of different applications, users are often in need of training, and the more training they received, the easier they found using the system. [Raymond and Bergeron \(1992\)](#) and [Igarria \*et al.\* \(1995; 1997\)](#) have recognized the importance of computing training in technology usage. Computing experience shows no significant influence on usability at 5% significance level. Albeit the direction of the coefficients was as hypothesized,

the strength of the relationship (p-value = .146) was not as great as anticipated. This finding supports the view of [Laudon and Laudon \(1997\)](#) that SLS requires a minimum of experience. In other words, executives do not need a world of computing experience to use these systems.

#### *CS, PSE, and PSU*

Available computing skill (ACS) reflects the synergism of computing support (CS), computing training (CT), and computing experience (CE). The total variance in perceived efficacy and usability explained by ACS is 40.1% and 24.6%, respectively. At 1% significance level ( $\beta = .634$ ; t-value = 10.675\*\*), ACS shows a strong influence on perceived efficacy of SLS. ACS's influence on perceived usability is also significant at 1% level ( $\beta = .496$ ; t-value = 7.558\*\*). These results show that the synergistic effect of computing experience, computing support, and computing training strongly directly determine the efficacy and usability of SLS among entrepreneurs. Thus, there is significant evidence to uphold hypotheses  $H_{11}$  and  $H_{12}$ . Moreover, there is an indirect relationship through PSU between ACS and PSE. This mediator effect of usability is established from the following results (model 1  $\beta = .634$ \*\*); model 2  $\beta = .381$ \*\*). Although  $\beta$  for model 1 (regression result without usability) and for model 2 (with usability introduced in stage 2) are both significant, that for model 2 is less than that for model 1 by .253. This, coupled with the  $R^2$  difference of .126, explains the mediator effect of PSU in the ACS and PSE relationship.

### IMPLICATIONS OF THE RESEARCH

The current research has theoretical implications, in that it presents convincing evidence for understanding the way in which entrepreneurs use and increase usage of strategic level systems.

Systems efficacy (or outcome) strongly determines SLS usage, while system usability indirectly, through efficacy, determines usage. One of the important TAM relationships is the direct influence of perceived ease of use on technology usage. This study failed to find empirical evidence to support the direct influence of usability on SLS usage. If SLS is easy to use, as the literature claimed, then it is in order that the ease of use factor isn't important to executives, as observed from the results. Albeit there is no statistical support for a direct relationship between usability and SLS usage, it is important to note that the outcome of present research shows an indirect relationship, via system efficacy. Perceived system efficacy directly influences SLS usage, while usability determines SLS usage only indirectly, via perceived efficacy.

Nearly all (if not all) the studies testing the impact of outcome orientation and process orientation on systems usage have been conducted in the developed nations. These studies have shown that both orientations are important determinants. However, the current study, which is one of the few conducted in a developing nation (Malaysia), has found no evidence for the usability-usage relationship. Does the level of economic development of nations or differences among user groups provide an answer to such incongruity in the results?

[Igbaria et al. \(1997\)](#) conducted a test on small enterprises in New Zealand, [Montazemi and Cameron \(1996\)](#) in America; both results show that outcome and process orientations are significant determinants. Besides the current research, [Ndubisi \(2003\)](#) conducted a study among women entrepreneurs in the less developed Malaysia; that study also found process orientation to be insignificant. [Ramayah et al. \(2003\)](#) studied another group of IT users different from entrepreneurs in developing Malaysia and also found that process orientation is not important, hence adding to the suspicion that users in developed nations may differ from those in

less developed countries, as well as providing a deeper look into the Malaysian scene. Therefore, the level of economic, human capital, and infrastructure development may make a difference in their technology usage pattern and usage drivers. Future research may be aimed in this direction.

Culture may also hold an explanation for the differences in usage and usage determinants. Hofstede and Bond (1988) identified five dimensions along which cultures vary, namely, power distance (PDI), uncertainty avoidance (UAI), individualism-collectivism (IND), masculinity-femininity (MAS), and long-term orientation (LTO). Power distance refers to the extent to which the less powerful members of a society accept or expect power to be distributed unequally. Uncertainty avoidance refers to the extent to which the members of a society are uncomfortable with unclear, ambiguous, or unstructured situations. Individualism-collectivism is the extent to which each member of a society is primarily concerned with personal interest or interest of the immediate family or the extent all society members are integrated into cohesive in-groups. Masculinity describes a society in which men are expected to be assertive, competitive, and concerned with material success, while women fulfil the role of nurturer and family welfare caretaker.

Throughout much of Asia, the collectivist orientation is dominant. In the highly individualistic US culture, however, a person whose individual accomplishments are publicly acknowledged is likely to be pleased by the recognition (Macquin & Rouzies 1998). Quest for recognition of accomplishments and innovativeness by US entrepreneurs may be among the reasons for their higher levels of SLS adoption, as compared to their Malaysian counterparts. Also, Americans have higher tolerance for ambiguity than many Asian nationals, including those of Malaysia; this may also be a plausible explanation for the lesser usage of SLS by the Malaysian entrepreneurs, as well as the strong influence of

vendor's technical support, training, and computing experience on perceived efficacy and usability by Malaysian entrepreneurs. Long-term orientation or perseverance of most Asian nations, as compared to the US and UK (see Hofstede & Bond 1988), could also explain the non-influence of perceived usability among Malaysian entrepreneurs. Since Asians have general tenacity in the pursuit of goals (Hofstede & Bond 1988), such doggedness, added to their phobia for change, could result in longer usage of a particular system, thereby making ease of use less important. Davis *et al.* (1989) have shown that ease of use, while important in determining early adoption, may not be an important determinant of sustained usage.

All technology usage studies among Malaysia businesses cited above show that process orientation, such as ease of use, is not an important driver. It is consequently important to have a more careful examination of the Malaysia scenario. Malaysia is a multi-cultural country in the Pacific Rim, with a population of 22 million, made up of 60% Malays, 26% Chinese, 8% Indians; the remaining 6% includes about 40 other races. It is common knowledge in Malaysia that the majority of entrepreneurial ventures in the country are owned by the Chinese, which explains the response imbalance (73% Chinese, 20% Malays, & 7% Indians).

The study also shows that Chinese entrepreneurs reported greater usage than their Malay and Indian counterparts. Between the Chinese and the Malays, Lim (1998) argues that there exist significant differences. Lim quotes various authors to support the contention that, for instance, the Malays are high in uncertainty, the Chinese are low; the Malays have short term orientation, the Chinese have long term orientation; the Malays are more collectivistic and cooperative, the Chinese are more individualistic and competitive; the Malays have less phobia for failure (*tidak apa*), the Chinese have high phobia for failure (*kia tsu*). These

explain why Chinese are more hard working (see Wafa, Ahmad-Saufi, & Chong 2003). Therefore, it is plausible that, given the hard-work orientation, phobia for failure, competitiveness, and low uncertainty avoidance of Chinese, relative difficulty of use of SLS may not deter adoption of beneficial systems. The majority of the respondents (73%) in this study is Chinese; future research should strive for more respondents from other races. This can be achieved more easily today, as the government has managed to groom more entrepreneurs from other races.

Chen (1982) pointed out that the Chinese business is a product of its culture and traditions. Chen also mentioned that Sun Tzu conceptualized the market place as a battlefield. He argued that the Chinese treat business competition as life-or-death warfare. Hard work closely reflects the social values of the Chinese and the focus of hard work is normally on material results. These characteristics explain why SLS benefits will determine usage more than difficulty of use will deter it. As long as the system is perceived to deliver beneficial results, entrepreneurs (especially the Chinese, who form the majority of Malaysian entrepreneurs), rather than shy away for the reason of lack of usability, will commit themselves to figure it out.

#### *Policy implications of the research*

At the national level, the Malaysian government has been encouraging greater IT usage by individuals and organizations, big and small, more than any other developing nation. Some of the various information technology agencies formed to develop, monitor, and manage an efficient information technology service for the public and private sectors are the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU), the National Information Technology Council (NITC), the National Consultative Committee on Information Technology (NCCIT), the Malaysian Institute for Microelectronics Systems (MIMOS), the

Standard and Industrial Research Institute of Malaysia (SIRIM), the National Council for Scientific Research and Development (NCSRD), and the Malaysian Science and Technology information Centre (MASTIC), under the Ministry of Science and Technology and the Environment (MOSTE).

Moreover, the government has been indefatigably investing huge amount of Ringgit in a number of information technology projects over the last few years. Noteworthy among them are Electronic Data Interchange (EDI), Joint Advanced Research Integrated Networking (JARING), Malaysian Science and Technology Information Centre (MASTIC), South Investment Trade and Technology Data Exchange Centre (SITTDEC), Sirim on-line, Public Services Network (PSN), Computer on-line Payment Services (COPS), Public Sector Open Systems Programme (PSOP), and Civil Service Links (CSL). Additionally, the abolition of the 10% sales tax on computers, software and accessories in Malaysia has helped consumers not only to possess a computer, but also to increase the marketing of computers in the nation.

These initiatives by the Malaysian government have no doubt differentiated the nation's IT usage and usage drivers from those of other developing nations. For example, while the costs of hardware and software, as well as training, have been cited as major barriers to technology use by Mexican, Brazilian, and Argentine entrepreneurs, their Malaysian counterparts have enjoyed significant amount of cushioning of the effect of cost of technology from the government. Recently, the government launched the e-procurement program to support on-line industrial purchases; such programs are left in the hands of the unready private sector in many developing nations. Not only that, the active involvement of the government in providing these applications means that entrepreneurs will have wider opportunities for hands-on computing experience, which has been linked in prior research

to perceived usefulness and ease of use. Such also is the case with computing support and computing training directly or indirectly provided by the government. These may explain the differentials in use and antecedents of use of SLS among Malaysian entrepreneurs and their counterparts from other less developed nations.

*Table 8: Business Internet Usage and Web Pages in Selected Countries*

Country	Year	Source	Internet Usage	Own Web Page
Finland	2001	1	91%	63%
Sweden	2001	1	86%	75%
Netherlands	2001	1	80%	50%
Norway	2001	1	77%	57%
UK	2001	1	63%	61%
Malaysia	1999	2	<50%	20%
Romania	1997	3	<30%	< 1%
China	2000	4	<20%	.6%

- Sources:
1. [Statistics Finland \(2002\)](#)
  2. [MSC Technology Centre \(1999\)](#)
  3. [Integrated Strategies \(1997\)](#)
  4. [Yao \(2003\)](#)

It is notable that government's direct involvement in facilitating IT diffusion has proven to be very effective. As shown in [Table 8](#), [Statistics Finland \(2002\)](#) reports that from 77% to 91% of businesses in Scandinavia with more than ten employees have connections to the Internet, while 57% to 75% of these have their own web pages. Comparable figures for the United Kingdom are 63% and 61%, respectively. In comparison, Romania, with a population of 22.5 million, records only 423,000 PCs in use by businesses and administration. An April 1997 survey conducted by Romania Business Economics indicates that the number of

Romanian companies that have sites on the Internet is less than 1000, which does not represent even 1% of the total registered companies (527,067 in June 1996) in Romania ([Integrated Strategies 1997](#)). However, only about 30% of this figure is connected to the Internet. In China, there are an estimated 7 million small and medium businesses, out of which only 39,000 are online as at January 2000. In Malaysia, about 50% and 20% of small and medium enterprises have Internet access and own web sites respectively as at 1999 ([MSC Technology Centre 1999](#)). In larger companies with over 150 employees and annual revenues of at least RM25 million, over 86% have Internet access and 40% have own web site in the same period ([MSC Technology Centre 1999](#)).

On an individual note, as at 2002, personal computers per 1000 population in developed economies are higher compared to the less developed economies. As shown in [Table 9](#), while number of PCs per 1000 inhabitants and Internet access per 1000 inhabitants in the US have reached 658.9 and 551.4 respectively. Compare these figures to those of some of the less developed nations, where the government has not done much to encourage IT utilization, as shown in [Table 9](#) for Sudan, China, Cambodia and Romania. In Cambodia for example, the figures are 2.0 PCs per 1000 inhabitants and 2.2 Internet users per 1000 inhabitants. Malaysia is somewhere in the middle; for the year 2002, the number of PCs per 1000 inhabitants and Internet users per 1000 inhabitants are 146.8 and 319.69 respectively ([ITU 2003](#)).

This research also has implications for SLS marketing. Marketers should emphasize systems' benefits in future designs. However, this should not be at the expense of usability or user friendliness; after all, easy to use systems are deemed useful systems. They should provide adequate computing support and training in order to consummate a greater usage of the SLS among executives, because these factors are very important in determining

*Table 9: Personal Computers and Internet Access in 25 Selected Countries*

<b>Country</b>	<b>Year</b>	<b>PCs per 1000 inhabitants</b>	<b>Internet Users per 1000 inhabitants</b>
USA	2002	658.9	551.38
Singapore	2002	622.0	504.36
Australia	2002	565.1	481.74
Canada	2002	487.0	512.83
Finland	2002	441.7	508.93
Germany	2002	431.3	411.94
N. Zealand	2002	413.8	484.37
UK	2002	405.7	423.10
Japan	2002	382.2	448.86
France	2002	347.1	313.83
Italy	2002	230.7	352.44
Seychelles	2002	160.8	145.21
Malaysia	2002	146.8	319.69
Mauritius	2002	116.5	99.13
Romania	2002	69.2	83.02
China	2002	27.6	46.01
Ukraine	2002	19.0	17.95
Moldova	2002	17.5	34.09
Honduras	2002	13.6	25.17
Albania	2002	11.7	3.90
Samoa	2002	6.7	22.17
Sudan	2002	6.1	2.58
Bangladesh	2002	3.4	1.53
Cambodia	2002	2.0	2.17

Source: [ITU \(2003\)](#)

their perceptions of SLS efficacy and usability. These computing aids should be provided at minimal cost or, better still, at no extra cost to entrepreneurs, who mostly lack the financial capacity of executives in large firms. For the entrepreneurs themselves,

especially the non-SLS users, the current research is an eye opener, as it highlights some of the various strategic-level systems and their uses.

### CONCLUSION AND FUTURE RESEARCH DIRECTIONS

This research has tackled the issue of the antecedents of SLS usage by looking at the influences of system efficacy and usability, as well as the impact of computing experience, computing support, and computing training, on perceptions. SLS usage was influenced directly by perceived efficacy and indirectly (via efficacy) by perceived usability. One of the findings of the study is the non-influence of computing experience on system's usability, which supports the claim that SLS requires minimum experience to use. Future research could probe this issue further, by replicating this study in large organizations, to allow generalization if similar results emerge.

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