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Findings of Bruneian Senior Government Executives' Use of the Internet

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Abstract

In gearing up the task of e-Government, the governments of the various economies are investing heavily in Information Technology (IT). The success of e-Government program therefore depends upon the IT literacy and skills of the senior government executives, especially in the use of the Internet. This study focuses on one hundred senior government executives of the ten different ministries of Brunei Darussalam. The results indicate that 70% of the senior executives have positive attitude about the Internet. Results further show that 50% of these senior executives are in fact using the Internet and 66% of them are underutilizing the technology by just sending and receiving e-mails. The study further develops a normative model by using Davis's Technology Acceptance Model (TAM) and by adding external variables. A Structural Equation Modeling technique is used to test the parsimony of the model. The final model has confirmed that external variables such as; PC training, PC self-efficacy and task variety contribute toward both the beliefs: perceived usefulness and perceived ease of use. Only perceived ease of use contributes in determining the attitude that further predicts the Internet use of the senior government executives.

Key Words: Senior Government Executives, Internet Usage, Technology Acceptance Model (TAM), Structural Equation Modeling (SEM)

INTRODUCTION

The dawn of a new millennium has witnessed a global increase in the use of the Internet that in turn has brought dynamic changes in managing and communicating with the others and enhancing inter-organizational efficiency. This manifold increase has not only brought a revolution in the business world but has also made the Internet a favorite research topic amongst researchers.

While a lot of Internet research was undertaken in business (Soh *et al.* 1997), studies were conducted to examine the factors that influenced end-users adoption of IT. Researchers focused their studies on the application of the Internet to the various social groups such as; academics, students, business owners and chief executives. One of these groups is a senior business manager or senior executives as reported by Pijpers *et al.* (2001). A senior executive is defined as one "who is concerned with the strategic directions of their organization's business (Seeley and Target, 1999)". Although a senior executive represents a small percentage of the user population within an organization, they however, reflect a distinct pattern of technology adoption. It is therefore important that they should be treated as a special group due to the nature and type of the duties performed. We should understand that a senior executive differs in a number of ways with respect to other people in an organization. Firstly, they are appointed to the senior positions due to their vision, management style, experience and personality and are not influenced by peers or subordinates. It is therefore unlikely that any pressure imposed on them about using IT for their job will directly affect their work practice. Secondly, they are not required by superiors or subordinates to use IT and its use is purely optional.

In the past some studies were undertaken to reflect the adoption and use of Executive Information Systems (EIS) to support the senior executive for decision-making (Bajwa *et al.* 1998; Pijpers *et al.* 2001). However, the choice of using EIS remained optional for the senior executives. Contrary to EIS the advent and development in the Internet has reengineered the various inter-organizational functions and systems such as emails and surfing through the Web. Organizations have quickly responded to these systems and have further set up one standard for the whole organization to make communications and exchange information electronically for everyone within the organization and senior executives are not exceptions. In fact, these inter-organizational developments have made the use of the Internet as a compulsory tool within the organization. However, the success of these inter-organizational systems depends more on senior executives' beliefs about IT, anxiety about the use of IT, self-efficacy, prior on-job PC training and a positive attitude and exposure toward IT applications.

Despite its relative importance, however, senior executives are not reaping the full benefits of the technology that ultimately led to organizational ineffectiveness. The lack of senior executive involvement in using IT and its applications can further be considered as a big threat to organizational competitiveness. There are several reasons for these impediments: (1) senior executives have little time to play around with new technologies. (2) senior executives are reluctant to use the technology due to PC anxiety, and (3) senior executives have lack of skill and proficiency and further lack of availability of dedicated staff to answer their queries. Many senior executives argued that the real reason of not using IT is that they do not see any connection between what IT does and their task as an executive. In addition, the majority of these senior executives are now in their late 40s and 50s and they did not undertake any IT related course during their college years and they did not undertake much on-job IT training during their career. However, with the recent development in IT, enormous pressure has built up to use IT for competitiveness as a strategic weapon to enhance the productivity. Business demands that senior executives must act as role models and to remain in the forefront in order to compete globally. This demands a complete revision of work practice by the senior executives. How far the senior executives are successful in redesigning their work practice is still not known.

Prior research has studied various factors that have contributed to IT acceptance within the organizations and also focused more on studying the top management support and role of CEOs as an antecedent variable in predicting IT acceptance (Igbaria and Iivari, 1997; Seeley and Target, 1999). Unfortunately the majority of these studies were undertaken in the western world that are more technology oriented and resourceful and are confined to the business world. However, scant information is available on the senior executives' use of IT within South-east Asia. As pointed earlier there is a strong need to extend the studies on IT usage to the various social groups. With this assumption this pioneering study was conducted to study senior government executives' pattern of the Internet use within Brunei Darussalam. There are several reasons for selecting the senior executives from the government. Firstly, most of the assumptions cited earlier regarding senior executives not using the technology exist within senior government executives and professionally these senior government executives perform the identical tasks within their organizations as compared to their business counterparts.

Another reason for this study is that the results of these prior studies might not be applicable to the senior government executives of a small but technologically emerging country like Brunei Darussalam. The country is culturally different not only from those of the western world but also from several of Asia-Pacific countries. Brunei Darussalam is a small sultanate located on the northwest coast of Borneo island. Strategically located between the two technological hubs i.e., Singapore and Malaysia, it has a total population of nearly 0.3 million (Brunei Statistical Year Book, 1999) with main economic activity dominated by the oil and gas sector. The country gross domestic product per capita was B$ 23,865 (US$1= 1.70) in 1999. The government has conceived an IT vision and has taken a range of measures to improve IT infrastructure and the Internet business environment in the country. Realizing the limitation as to the size of the domestic market, Brunei business environment is determined to utilize the Internet as a major development tool. Brunei is a technologically oriented country with impressive IT infrastructure. Coping with the ASEAN and APEC economies the Government of His Majesty is very determined with its e-Government program. The success of e-Government cannot be determined or gauged without studying the techno-literacy of the senior executives both in public as well as private sector.

The present study was undertaken in Oct-Nov 2002 to determine the extent of senior government executives' use of the Internet with the following specific objectives:

(a) What are the major factors that influence senior government executives' use of the Internet?

(b) Which of the attitudinal factors influence the actual use of the Internet either directly or indirectly?

(c) Is there a parsimonious model to predict senior government executives' use of the Internet?

2.   Prior Studies on Technology Acceptance Models

The Internet use among business settings is an attractive area for several researchers comparative to the other segments of the users. A variety of factors were studied that have influenced the limited use. The success of the Internet use however, is a multi-dimensional issue that requires the cooperation and commitment from all participants within an organization. The research on the Internet in fact is the extension of previous researches on technology diffusion, IT adoption and utilization. The studies were undertaken to develop various models. MIS researchers have used different models over the last two decades as a base for studying the information systems acceptance, adoption and usage.

In earlier work, Triandis (1971) argued that behavior is determined by what people would like to do (attitudes) what they think they should do (social norms) what they have usually done (habits) and by the expected consequences of their behavior. He suggested that attitudes involve cognitive, affective, and behavioral components. The cognitive component of attitudes involves belief. Thus attitudes involve what people believe (cognitive), feel (affective), and how they behave (behavioral) toward an object that can be a computer at early stage and later on can be substituted for information technology. The Triandis theory has provided a base for conducting attitudinal studies.

However, researchers in the later stages have proposed several other models based upon innovation diffusion theory (Rogers, 1995), the Theory of Reasoned Action (TRA) purported by Ajzen & Fishbein (1980), and the Technology Acceptance Model (TAM) by Davis (1989). Of these models the TAM has most widely used model to predict computer-usage behavior with generally providing determinants of technology acceptance that would help explaining user behavior towards the information technology usage. TAM has also been shown to demonstrate good predictive validity (Szajna, 1994). However, one of the constraints that were not undertaken by the TAM was the ignorance of external factors whereas later researches have provided us with several of external variables that have an influence on the usage behavior (Pijpers *et al.* 2001). Agarwal and Prasad, (1997) have further suggested that external variables are the only channels for influencing behavior as the intermediate and dependant variables in TAM are hypothesized to be an internal psychological process. TAM asserts that actual usage of a system is determined by behavioral intentions to use and this in turn is related to the attitude towards using the system. Davis (1989) further asserted that influence of external behavior is mediated through user belief and attitude. Belief are related to an action whereas, attitude is purely affective and relates to positive and negative feelings about performing the behavior. The belief segments that determine the attitude are perceived ease of use (PEOU) and perceived usefulness (PU).

TAM has been widely studied in Information Systems research as an explanation of the use of IS across information systems types and nationalities and found significant cross-cultural difference (Gefen and Straub, 1997). In a recent review, Saga and Zmud, (1993) identified twenty empirical studies that aimed at exploring the factors that determine IT acceptance. Among these twenty studies, TAM originally proposed by Davis (1989) is arguably one of the most cited. Table 1 provides us with some details of empirical studies based on TAM. In fact, all these studies have focused primarily on the TAM model in predicting the user intentions towards information technology.

The literature tends to fall into a number of categories in the business setting. Most of the past studies focused on the business managers' and business owners' attitudes toward technology in relation to its adoption and utilization. Some researchers have studied on the small business owners' dominating role in Information Technology implementation (Cragg and King, 1993; Doukidis *et al.* 1994; Julien and Raymond, 1994; Thong and Yap, 1995). Cragg and King (1993) suggested that owners' positive attitude toward IT affects the quality of IT implementation. Raymond (1988) studied the attitude and IT usage pattern of the managers with and without formal computer education or training and found that managers' attitudes and behaviour simply change as they acquire more computer experience. O'Brien and Wilde (1996) studied 268 Australian managers' perception and attitudes toward use of IT to examine the direct application and importance of IT and noticed favourable shift in attitude as an outcome of management training program. A report from 21st century project entitled "Reinventing the CEO" goes beyond insight and understanding as the sole issue for the managers and declares that direct use of IT would be an important focus for senior management in the future. Researchers like Jawahar and Elango (2001) studied the effects of attitudes, goal setting and self-efficacy on the end-user performance and found that these variables contribute significantly in enhancing end users' belief and use of Information Technology.

Till date, a considerable number of these prior studies had focused the managers' attitudes and various contributing factors towards PC, IT implementation. Few studies, however, have addressed the behavioural and attitudinal factors influencing the Internet usage (Teo *et al.* 1998; Teo *et al.* 1999; Chueng *et al.* 2000; Pijpers *et al.* 2001). Unfortunately scant information is available for senior executives' use of the Internet. As pointed earlier, senior executives constitute a separate category in IT acceptance and use. It is therefore important to find out the answer that whether or not result of these studies are generally applied to the Internet usage. No prior studies up to our knowledge have exclusively targeted the senior government executives' use of the Internet.

Table 1 Empirical studies testing TAM

Researchers	Year	Technology features studied
Davis	1989	E-mail and graphic software Chart Master
Davis *et al.*	1989	Word Processor & Text-editor
Thompson *et al.*	1991	PC
Mathieson	1991	Spreadsheet
Sproull	1991	E-mail
Rice and Aydin	1991	E-mail
Adams *et al.*	1992	Voice-mail and WP
Lu & Gustafson	1994	Computerized Support System
Markus	1994	E-mail
Straub *et al.*	1995	Voice-mail
Chin and Gopal	1995	Group Support System
Igbaria *et al.*	1995	Computer Usage

Szajna	1996	Data-base management system
Straub *et al.*	1997	A Cross-cultural studies of e-mail use
Gefen & Straub	1997	Perception & use of E-mail
Lou *et al.*	2000	Groupware acceptance
Yang & Choi	2001	Office-automation and Internet use
Chau	2001	Microsoft Office (SEM approach)
Veiga *et al.*	2001	IT acceptance
Pijpers *et al.*	2001	Executive Information Systems (SEM)
Seyal *et al.*	2002[a]	Academic Use of the Internet (SEM)
Seyal *et al.*	2002[b]	Student Use of the Internet (SEM)

The studies cited above have also identified a variety of factors that affect the users' attitudes of Internet among work-settings. Some of the frequently reported factors such as computer exposure include ownership of a PC, PC experience and task characteristics. PC experience was given considerable attention from some authors in addition to two attitudinal factors PU and PEOU.

Although the review of the literature has provided a base for the choice of the variables to be included in this study, however, final selection of the variables are in fact based upon several others Brunei-based studies in IS/IT (Seyal *et al.* 2000, 2001, 2002 [a,b]). Grounded in a well-established theoretical background, this study used a heterogeneous sample of the population of senior government executives working into different ministries. The selection of the variables is inline with the objectives to test a parsimonious predictive model with multidimensional, multi-items constructs. By testing all the factors together in one model, we are able to investigate their relative contributions to the senior executive use of the Internet. This model can be generalized to other inter-organizational information technology usage.

3. Research Model

On the basis of existing literature and of several informal discussions with the members of technical directorate and top administration of educational establishments during the early stage of research design, a normative model was developed. This model provides the basis of research.

The normative model as depicted in Figure 1 relates independent (externals) and dependent variables with the intervening or intermediate (perceived ease of use, perceived usefulness and attitude) variables. The relationship as shown in the model is associative rather than casual in nature. In this study, the senior government executive actual use of the Internet is the dependent variable, while the normative model ties together four constructs having ten externals (independent variables), divided over four different categories. Justification for inclusion of each independent variable and to set up hypotheses in the model is presented in Table 2.
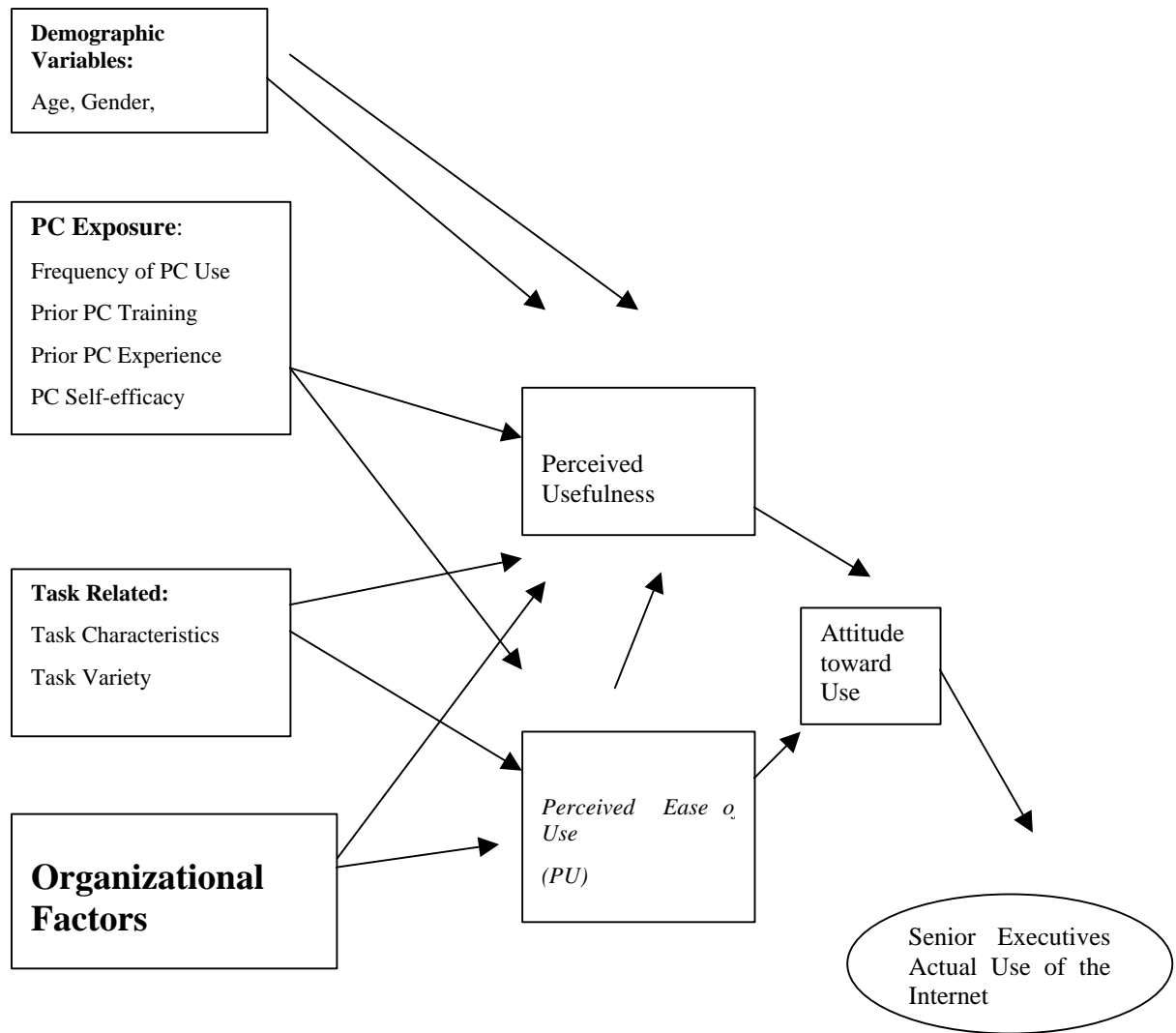
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┌─────────────────────┐
│ Demographic         │
│ Variables:          │
│                     │
│ Age, Gender,        │
└─────────────────────┘

┌─────────────────────┐
│ PC Exposure:        │
│ Frequency of PC Use │           ┌──────────────────┐
│ Prior PC Training   │           │ Perceived        │
│ Prior PC Experience │           │ Usefulness       │
│ PC Self-efficacy    │           └──────────────────┘
└─────────────────────┘
                                              ┌──────────────┐
┌─────────────────────┐                       │ Attitude     │
│ Task Related:       │                       │ toward       │
│ Task Characteristics│                       │ Use          │
│ Task Variety        │                       └──────────────┘
└─────────────────────┘           ┌──────────────────┐
                                  │ Perceived   Ease o│
┌─────────────────────┐           │ Use              │
│ Organizational      │           │ (PU)             │
│ Factors             │           └──────────────────┘
└─────────────────────┘
                                         ╭────────────────────╮
                                        │ Senior   Executives  │
                                        │ Actual  Use  of  the │
                                        │ Internet             │
                                         ╰────────────────────╯
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Figure 1 Theoretical Research Model (Extension of TAM)

Table 2 Summary of hypotheses (adapted after Pijpers et al. 2001)

Constructs	**No**	**Prior Relationship Tested**	**Source of selection**
A. Demographics			
Age	HA1	*Negative*	*Pijpers et al. 2001*
Gender	HA2	Men more positive	Gefen & Straub, 1997; Igbaria et al. 1995; Pijpers et al. 2001
B. PC Exposure			
PC know how	HB1	Positive	Igbaria et al. 1995
Frequency of PC use	HB2	Positive	Igbaria et al. 1995; Igbaria & Chakraborti, 1990
PC Training	HB3	Negative Positive	Seyal et al. 2000, Igbaria and Chakraborti, 1990;
PC experience	HB4	Positive	Igbaria & Chakraborti, 1990; Igbaria, 1992;
PC Self-efficacy	HB5	Positive	Igbaria and Iivari, 1995, Compeau and Higgins, 1995
C. Task-Related			
Task characteristics	HC1	Positive Negative	Kwon & Zmud, 1987; Yverbaum, 1988 Igbaria et al. 1995 Seyal et al. 2002 ($_{a, b}$)
Task Variety	HC2	Positive	Ghani, 1992; Goodhue & Thompson, 1995
D. Organizational Factors	HD1	Positive	Pijpers et al. 2001
Organizational type	HD2	Positive	Julien and Raymond, 1994; Cragg and King, 1993
Organizational Support	HD3	Positive	O'Brien and Wilde, 1996, Teo et al 1999
E. Intervening Variables			
Perceived Ease of Use	HE1	Positive with PU	Goodwin, 1981; Igbaria et al. 1992
Perceived Ease of Use	HE2	Positive with attitude to use	Davis et al. 1989; Bajaj & Nidumolu, 1998; Pijpers et al. 2001
Perceived Usefulness	HE3	Positive with attitude to use	Thompson et al. 1991; Igbaria & Torasker, 1994; Pijpers et al. 2001
Attitude towards use	*HE4*	Positive with actual use	Bajaj & Nidumolu, 1998

The prior literature is full of studies that have used TAM and related it to numerous external variables. Interestingly no consistency has been noticed in making choice of external variables. Pijpers *et al.* (2001) have used twenty-seven variables and grouped them into individual, organizational task related and characteristics of the IT resources and attitudinal

variables that measure PU, PEOU and affective attitudes segment. As mentioned earlier, the selection of external variables for the present study is exclusively based upon the prior research in Brunei Darussalam (Seyal *et al.* 2002 [a b]).

4.   Research Methodology

4.1   Design of Instrument

The inclusion of the various multi-items, multi-dimensional constructs in all five parts of the instrument is based upon existing constructs taken from previous researches. Table 3 provides the detail of items measured, source of various constructs adopted, with their mean and corrected-item totals. It is commonly believed that use of the Internet is a multi-dimensional construct that measures the various types of the Internet use. As such to determine the use of the Internet is one of the objectives of this study. Therefore Table 4 provides the detail of various types of usage along with their mean and standard deviation. Multiple-act indicators measure the dependent variable, the use of the Internet. Likewise computer experience, the Internet use was measured as overall indexes of total number of categories the respondents reported the use. Constructs measuring PU and PEOU intervening variables asks the respondents for twenty-six statements adapted from Davis (1989).

Table 3 Operationalization of various Constructs and Variance Explained.

Constructs	Items measured	Source	Variance Explained (<.50)
PC Experience	6	Igbaria & Chakraborti, (1990)	.64
PC Self-efficacy	6	Compeau & Higgins, (1995)	.65
Task Characteristics	6	Igbaria et al. (1995) modified	.58
Task Variety	7	Goodhue & Thompson, (1995) modified	.67
Organizational Support	4	Igbaria and Chakraborti, (1990)	.64
Perceived Usefulness	5	Davis (1989)	.58
Perceived Ease of Use	4	Davis (1989)	.57
Attitude	4	Harrison and Rainer, (1992)	.62
Internet Use	8	Teo et al. (1998)	.60

4.2   Population and Sample size

There are ten main ministries under the Brunei Government. The target population was the senior governmental executives of these ministries. We excluded ministers, deputy ministers and permanent secretaries. We included Head of Sections, Head of Departments, Divisions and officiating Head of functional organizations in our survey. By using the telephonic directory under the random search about two hundred and twenty senior officers were selected for the survey and were hand delivered the questionnaire. Out of these we received one hundred and twenty questionnaires. Twenty were dropped out due to response errors and one hundred were retained for further test the model. The response rate of 50% is sufficient to draw a logical conclusion.

Table 4 Internet Use

Items	Mean	Std.Dev
To gather research material	3.50	1.20
To gather information about various international agencies (ASEAN, APEC...)	3.15	1.14
To perform some keynote address/training workshops activities	2.76	1.13
To enhance general knowledge	3.27	1.14
To keep informed of interesting developments	3.60	1.08
To keep abreast of exhibitions/trade shows and conferences	2.69	1.08
To subscribe to scholarly users group	2.26	1.09
For recreational use	2.91	1.13

4.3   Instrument validation and reliability

There are several types of validity measure that include the face validity and construct validity. Campbell and Fiske (1959) proposed two types of construct validity: convergent and discriminant validity. In order to establish face validity, an initial version of the instrument was pre-tested using several executives selected randomly from two teaching institutions located in close proximity of the authors' work place. The participants were asked to comment on the format and appropriateness of questions, and to suggest any items that they believed should be included in the instrument. In view of their suggestions, several amendments were incorporated into the instrument that has greatly improved clarity. The derived instrument was then tested for reliability. In line with our research model, as mentioned earlier, part of the instrument that measures the intervening variables PU and PEOU consists of twenty six items is adapted after Davis (1989) The original version was used to test e-mail and a graphic software Chart-master, however, all the items were reworded for this study. These statements were passed through purification and elimination as proposed by Churchill, (1979). Six items were taken away because of their lowest

corrected-item correlation (< .40). Then the remaining twenty items were tested for exploratory factor analysis that has resulted for 2-factors solution (PU and PEOU) as provided in Table-5.

Table-5 Varimax rotated factor loading and eigenvalues with variance explained

Items No	Items description	Factor 1	Factor 2
Att-1	I would find the Internet easy to use	.69	
Att-2	Use of Internet gives me a great control over my job	.80	
Att-4	It would be easy for me to become skilful while using the Internet	.73	
Att-11	My interaction with the Internet would be clear and understandable	.82	
Att-12	I would find the Internet useful in my career.		.72
Att-13	The Internet supports critical aspects of my job.		.73
Att-14	Use of the Internet allows more to accomplish more work than would otherwise be possible		.72
Att-23	Use of the Internet makes it easier to do my job		.84
Att-24	Overall I find the Internet useful in my job		.81
	Eigenvalue	**14.51**	**1.68**
	% of variance	**58%**	**15%**

Note: Factor 1 refers to perceived ease of use and Factor 2 refers to perceived usefulness.

Both factors explain 67% of the variance. The Kaiser Meyer-Olkin measure of sampling adequacy of .85 suggests that data is suitable for factor analysis. Factor analysis has further revealed the construct validity as such all the items have highest factor loading (.50 or above) and load on two factors. The factorial validity further supports construct validity. The derived instrument was then tested for discriminant validity. There are several approaches to apply discriminant validity. The term refers to the extent to which a concept differs from others (Campell and Fiske, 1959). One way of determining this for a construct to see if it correlates with other constructs is less than its Cronbach alpha coefficient (Gaski and Nevin, 1985). Bajaj and Nidumolu, (1998) has used the same technique in one of their attitudinal-based study. Table 6 reflects the comparison of the Cronbach alphas with the correlations and found to be true.

Table 6 Correlation between the various constructs

Constructs	Mean	Std Dev	Internal reliability (.70 or above)	1	2	3	4	5	6	7	8
1. PC Experience	2.12	1.06	.89	1.00							
2. PC Self-efficacy	2.92	1.04	.89	-.244*	1.00						
3. Task Characteristics	2.69	.98	.85	-.455**	.273**	1.00					
4. Task Variety	3.36	1.11	.83	.455**	.248*	**.712****	1.00				
5.Organizational Support	1.73	.88	.81	.098	.112	.111	.164	1.00			

6.Perceived Usefulness	3.69	.92	.93	.296**	.185	-.298**	-.357**	-.201	1.00		
7.Perceived Ease of Use	3.79	.85	.85	.211*	.073	-.355**	-.369**	-.065	**.677****	1.00	
8.Attitude	3.80	.86	.80	.218*	.118	-.273*	-.339**	-.160	**.684****	**.683****	1.00
9.Internet Use	3.01	1.12	.90	.410**	-.242*	**-.721****	**-.757****	-.122	.319**	.325**	.298**

*Significance .** (p<.0.01) * (p<0.05)*

5.   Analysis & Results

100 questionnaires received were analyzed to test the research model in Fig 1 by using SPSS for descriptive analysis.

Table 7 Background profile of the Senior Executives

	(%)
Type of Ministries/Organizations	
Ministry of Education	16
Ministry of Development	8
Ministry of Communication	8
Ministry of Sport Youth & Culture	8
Ministry of Religious Affairs	8
Ministry of Health	8
Ministry of Finance	8
Ministry of Industry & Prim. Resources	14
Ministry of Foreign Affairs	14
Ministry of Defense	8
Gender	
Male	72
Female	28
Age	
Between 30-40	24
Between 41-50	56
Above50	20
Organizational Positions	
Head of Sections	25
Head of Departments	20
Head of Divisions	16
Deputy Head/Head of Organizations	31
No Answers	8
Internet facility	
Yes	92
No	4

No answer	4
Location of Internet facility	
At home	21
At office	15
Both	64
PC Use (frequency)	
Less than a year	6
Between 1 – 5years	20
Between 5 – 10 years	35
More than 10 years	33
Never Use	6
PC Ownership	
Own one	93
Does not own	7
PC Knowledge	
Novice	32
Mature	52
Expert	16
PC Training	
Once in a year	24
Twice in a year	3
Once in Two years	24
Never had	43
More than twice in a year	6
How Important Internet	
Indispensable	11
Very Important	44
Marginal	38
Slightly Unimportant	6
Unimportant	1

SEPATH, SEM program from STATISTICA 6.0 statistical software was used to test the relationship and to further test the parsimony of the structural model. Table 7 reflects the background profile of the senior governmental officers.

Structural equation model (SEM) estimates a series of separate but interdependent multiple regression equations (Stelzl, 1986). Many researchers (Joreskog and Sorborn, 1983; Kelloway, 1998) proposed a two-stage process: (1) to estimate the measurement model and (2) to investigate the structural model.

5.1   Measurement Model

Theoretically, in a measurement model an investigation into the structure between items and constructs is carried out. Normally a multi-trait, multi-dimensional approach is adopted. Initial screening indicated that some of the external variables are not normally distributed and are skewed. By testing the measurement model we therefore test the reliability and validity of the instrument.

5.2   Structural Model

Stelzl (1986) and Lee and Hersberger (1990) have proposed rules for generating equivalent model. In general, this involves altering the pattern of relationships or paths within the original model so as to produce an alternative model. As mentioned, single stage analysis was conducted for various sub-models (1-3). The result has indicated that the uncontrollable variables selected for the study had no significance at all. At the outset, demographic variables gender, age and departmental position were trimmed off. The reason for this trimming is due to the pre-determined responses that could possibly affect the model parsimony. Further, external variables PC ownership, PC use and PC knowledge were taken out. As such all these variables are either based upon dichotomous or categorical scale and the initial data analysis has revealed that these variables are very much skewed. The PC knowledge and PC use are self-reported items with possibility of response errors. So we have excluded them from our first measurement model. The first model was therefore tested for the remaining external variables with the intervening variables Perceived Usefulness and Perceived Ease of Use. Unfortunately this model has very little parsimony.

Table 8.   Comparison of goodness-of-fit measures

Goodness-of-fit measure	*Recommended value **	Model 1	Model 2	Model 3
Chi-square/degree of freedom	≤ 3.0	10.7	8.7	2.1
Goodness-of-fit index (GFI)	$\geq .90$	.54	.56	.75
Adjusted goodness-of-fit-index (AGFI)	$\geq .90$	.47	.49	.70
Normed fit index (NFI)	$\geq .90$	.45	.44	.70
Not-normed fiit index (NNFI)	$\geq .90$	.61	.57	.74
Comparative fit index (CFI)	$\geq .90$	.63	.59	.75
Root Mean square approx (RMSEA)	.005	.02	.17	.01

R²		.17	.27	.40

(*Recommended values are adapted after Kelloway, 1998)

In model 2 all the external variables such as PC exposure, PC training, Task related and organizational support, were tested to determine the executives' use of the Internet without the intervening variables. This model has very little support as evident from the Table 8. It further explains the 27% of the total variations toward the use of the Internet. While assessing the parsimony of the model Falk and Miller, (1992) criteria were considered that suggests that loadings on paths between latent variables and manifest variables should be 0.55. The PC exposure and organizational support do not meet the criteria so they were dropped out from the model. After trimming the significant path analysis between exogenous constructs (PC training, Task variety and PC self-efficacy) were studied. Table 9 below shows that a number of external variables had a significant effect on PU and PEOU and attitude. As hypothesized, PU and PEOU determines attitude toward use jointly whereas, for this study only PEOU determine the attitude. Although most of the prior research in TAM exhibit roughly equivalent influence on the acceptance and use of an information technology, however, in our case the path coefficients between PU and attitude is not very attractive although the associated p-value is significant, yet it is not a significant predictor of attitude. In other words, the PEOU mainly determines attitude. Ease of use is perceived by the executives to be related to the functionality of the Internet--i.e. Its' user friendliness support and interact with use of technology. This in turn reflects a distinct pattern of executive's use of the Internet. Finally, attitude had a positive relationship with the use of the Internet and from Table 9 seems to be very strong. This model had a better predictive power as compared to two others with about 40% of the total variance is explained. Moreover its chi-square/degree of freedom ratio is close to the recommended value as indicated in Table 8.

Table 9. Estimates of the parameters of structural equation model 3

Path		**Path Coefficient**			
From	***To***				
	Perceived Usefulness	*Perceived Ease of Use*	*Attitude*	*Use of the Internet*	
PC Training	.212 (p>.05)	*Not Significant*			
PC Self-efficacy	.234 (p<.01)	.237 (p<.05)			
Task Variety	.372 (p<.01)	.227 (p<.05)			
Perceived Ease of Use			1.97*		
Attitude				.804 (p<.01)	

(* Significant at p<.01)

6.   Discussion

The study has also identified the current level of use of the Internet among executives and produced interesting findings. About 50% of the executives have found the Internet facility very useful. Out of them 15% are using the facility at work and 64% are using at both places. There is a strong need that institutional resources be enhanced subsequently to support the increasing demand. However, of these executives, 66% are only using the Internet for sending and receiving the e-mails.

The main objective of this study was to identify the significant factors influencing senior executives' use of the Internet and to test a model for better parsimony. This was achieved through structural equation modeling. To our best knowledge no previous study has ever targeted the senior government executives of the ministries with the use of the Internet and the application of robust theoretical model. In this study the research model was used to identify key factors and relationships likely to influence the acceptance and use of the Internet. The result partially supports the theory that the link between the two beliefs and attitudes as well as between attitudes and actual use is strong. The study has also concluded that external variables influence usage behavior but the belief construct do not fully mediate this influence as the some of the external variables have strong paths coefficients for PU and some others have strong path coefficient for PEOU.

In the study we have used at the outset a set of uncontrollable variables such as, gender, age, organizational positions and the ownership of PC were excluded in our structural model as being very much skewed. Whereas, other external variables such as, PC experience, PC training, PC self-efficacy task characteristics, task variety and organizational support are taken as controllable variables. The controllable as well as the intervening variables (PU and PEOU) are important because we believe that these have an impact on belief and behavior to further encourage the use.

The result shows that PC training is significantly linked to the PU and not significant with PEOU. This makes sense that as such PC training increases the executives' competency in the use of PC, ease of use does not matter at all at that level. The findings are inline with Igbaria & Chakraborti, (1990) and Seyal *et al.* (2000). Task variety plays a significant role in influencing belief toward the use of the Internet. Task variety provides an additional dimension of the executives both of the belief components: PU and PEOU. It is further supported by strong path coefficient for PU. The findings support the preposition that an individual who performs a great variety of tasks by using the Internet will become personally involved with the technology that enhances the further use. The findings are in line with several prior studies (Goodhue and Thompson, 1995; Harris, 1999).

Organizational support is in fact available to only 30% of the executives. Actually two ministries, the Ministry of Education and the Ministry of Foreign Affairs, at present provide an impressive support program for their executives. This aspect of organizational support needs to be further examined by the relevant authorities. 80% of the executives agreed to unlimited access of the Internet at work place and 70% agreed to free Internet access from home via

server at work. This also needs to be further explored because setting up of service provider may be very cost-effective. As more organizational support is expected it will in turn enhance the use at later stages. Our findings do not fully supports Pijpers *et al*. (2001) who have found that organizational support enhances the actual use but not the belief part.

The PC self-efficacy was found to have a positive effect on both of the belief components: PU and PEOU. Our findings support the early work of Igbaria and Iivari, (1995) who introduced computer self-efficacy as a factor affecting PU, PEOU and IT usage. The findings are in contrast with Chau (2001) who concluded that computer self-efficacy has a relatively small effect on PU and no significant effect on PEOU. Findings also do not support Pijpers *et al*. (2001) that self-efficacy influences PEOU perception rather than emphasizing the function of the IT tool.

To reinforce PC self-efficacy, Torkzadeh *et al. (*1999) emphasized the importance of refreshment workshops or seminars so that executives become more knowledge-based. Any measure to improve senior government executives; self-efficacy would be instrumental in this respect e.g. Ministers/Deputy ministers of each ministry could argue every senior executives to use available IT resources. We should bear in mind that senior executives' self-efficacy could not be improved overnight. It should be a continuous process within ministries.

In addition, findings partially support the theory that the link between the two beliefs and attitudes as well as between attitude and actual use is strong. The findings of this study confirm the affect of perceived ease of use to predict the attitude rather than perceived usefulness as reflected in Table 9. This is in contrast with several prior studies that found PEOU had no significant effects on intention to use the technology (Davis, 1989; Igbaria *et al*. 1995;). This is a new finding that emerged from the study of Bruneian senior executives' distinct pattern of the Internet usage. Nature of senior executives' job do not demand working with the Internet and they only consider the Internet use as a support tool If the technology is easy to use, it will be easily adopted. As such, PEOU encourage at the more novice to try the technology features and utilities that require wide participation more useful at the early stage. Unlike most of the previous studies, our study found that perceived ease of use had the greater direct affects on intention to use. This further leads to develop the favorable senior executives' attitude that eventually predicts their use of the Internet in the various ministries of His Majesty's Government in Brunei.

As such, none of the re-specified models presents an ideal situation of the acceptance criteria as laid down by Kelloway, (1998). We should take precautions to accept the results. Overall, model 3 has better parsimony compared to the others with relatively better R^2 As stated by Chin & Todd (1995), we should not purely rely on model fit criterion; instead, closer attention should be paid to the predictiveness of the model and on the path coefficients. Standardized paths should be at least .20 and ideally above .30 in order to be considered as meaningful. Fortunately, our model 3 meets this criterion and can therefore be used to deduct the meaningful deductions.

7.   Conclusion

The study has fulfilled both of the objectives of the research. We found that 50% of the senior executives are using the Internet facility. However, 66% are using the Internet for sending and receiving e-mails. This study has found a significant contribution of three external variables: PC training, PC self-efficacy and Task variety. All these variables are under direct control of the top management. Top management should therefore develop a policy on training, improving self-efficacy and adding variety to the task for these senior executives to support the every day work.

The study further provides support for the core TAM model as an adequate and parsimonious model. TAM assumes that the influence of external variables on use of the Internet is channeled through two belief segments that have impact on attitude to predict the use of the technology. This study has partially supported the TAM core model. Under the three structural equation models tested for this study, only the third one with better parsimony have further suggested that external variables, PC training, task variety and PC self-efficacy, channelize the two beliefs segment PU and PEOU and only PEOU directly affect the attitude and that in turn predict the senior executives' use of the Internet. These external variables are under the direct control of the administration and top management of the surveyed ministries. So any attempt to either improve or enhance use of the Internet such as more usage for professional purposes should optimize these key controllable variables. The top-level executives must consider these factors so that they can serve the needs of the senior executives and to increase organizational efficiency. This further indicates that senior executive considers ease of use as one of the fundamental belief compared to usefulness belief. By providing them with on-job training or peer group support they will start benefiting from the usefulness of the Internet from other aspects including variety of tasks. This will further gear up the inter-organizational use of the Internet.

The study similar to several others studies is not free from weaknesses. Several limitations of this study qualify the findings and suggest directions for future research. Most of the items are self-reported that are liable to response-biasness. These response errors can be minimized by some initial workshops and by educating the senior executives and to provide some training on the research design and research objectives. The study lacks direction in assessing the problems faced by the senior executives at the organizational level and research design could be further improved by adding more items.

Based upon the results, we therefore recommend another study based upon more variables of the senior executives with increased sample size by adding more items measuring personality, social and cultural aspects and of perceived fun/enjoyment related. This will definitely provide a better insight of the senior government executives' use of the Internet.

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