# MODELLING THE ANTECEDENTS OF INTERNET EFFECT: A STRUCTURAL EQUATION MODELLING (SEM) APPROACH

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**Abstract**
The usage of technologies within an organization has placed tremendous result in business process transition and increased benefits. The usage of technologies could also be applied in the academic setting in order to enhance universities and institutions' performance and accomplishment. However, research on the issue was scanty. Therefore, this study aimed to investigate the Internet Effect among academic community via empirical technique. Independent constructs were information seeking behavior, technology acceptance and internet practice meanwhile dependent construct of the study was the internet effect. The study adopted quantitative survey method and simple random sampling approach. Respondents were of 250 university academic staff members; which represented 80% of the response rate. Necessary reliability and validity analysis were performed and achieved. Results revealed model fitted the respondents after modification. The revised structural model demonstrated significant and positive direct relationships between all constructs of the study.
Keywords: Internet, information seeking behavior, Internet practice, Confirmatory Factor Analysis.

## Introduction

Internet technology has brought a radical change in humans' lifes; that was originally created as universal instrument of communication by academics and for academics. Over the last several years, information resources and usage via internet has increased considerably. Today, information is gathered easily, effectively and efficiently through the World Wide Web. Nevertheless, the emergence of the World Wide Web, regardless of the advantages, has brought new challenges and problems. The impact of internet is also experienced by the academics. In order to find the extension of internet effect on the academics, it is crucial to look at various factors that influenced the internet effects; which were the internet activity of academics, their infomation seeking behavior and technology acceptance. Academics generally have three aspects to their daily work: administration, teaching and research. This research concentrates on the latter two aspects, combined with an emphasis on the use of the Internet and electronic resources.

Although much research has been conducted on Internet adoption in business environments (e.g. Tan & Teo, 1998; Stanfield & Grant, 2003; Teo & Pian, 2004), only a small number of researchers have examined the adoption of the Internet within the academic environment. Formerly, educational institutions, specifically colleges and universities, are trying to take advantage on delivering course content over the Internet due to the slighter costs compared to delivering course over other medium (Karelis, 1999; Valentine, 2002). In previous research, Lundgren and Nantz (2003) revealed approximately 500,000 courses were available on the Internet in 2003. Nevertheless, prior to commencing a project of this nature, educational institutions need to understand factors that motivate and determine Internet usage among students and faculty members. This study intends to address this research gap through focusing on establishing the factors that influence Internet usage by faculty members in Malaysian university.

The Internet's impact on the use of other media is related to earlier research in media studies that examines the substitutability of the mass media or their ability to stimulate each other (Atkin, 2001; Robinson & Kestnbaum, 1999). Many commentators hypothesized that the Internet would displace TV or, at least, would reduce its dominance in the American household, much as TV viewing did to listening to the radio, reading magazines, or going to the movies. As Robinson & de Haan (2006) noted, according to a functional displacement hypothesis, one technology would displace another to the extent that the new technology could be used for similar functions as the old, while offering new opportunities or reduced costs (Carey & Moss, 1985).

Comparatively, less research was facilitated on the adoption, diffusion and impact of the Internet among educational setting. Therefore, this study made several contributions to the literature. Firstly, a detailed model that examined the antecedents of Internet effect, consisted of internet activity, internet practice and technology acceptance was presented. Such a model examining the entire chain would enable researchers to test the complete net that lead to theoretical extensions and enhancements (Devaraj & Kohli 2003, Zhu & Kraemer 2005). Without a doubt, the internet permeated professional life and is promoted as the future way of information transfer. Obviously, therefore, universities and academic institutions are deemed to be the forefronts on the applications of new technologies at present and in future.

## Literature review

Information seeking behavior (Wilson, 1999) is defined as "those activities a person may engage in when identifying their own needs for information, searching for such information in any way, and using or transferring that information". While technology acceptance is derived from information systems theory that modeled how users came to accept and used a technology. The model suggested that when users were presented with a new technology, a number of factors influenced their decision about how and when they would use it.

Compared to TV or the telephone, the Internet is a plastic technology, amenable to a wider range of uses. According to recent data from the Pew Internet and American Life project (Pew Internet & American Life Project, 2003), Americans used the Internet mostly to send electronic mail, using search engines, researching products and services before buying, and searching for information for hobbies and leisure activities. However, the range of use was very diverse, and included playing online games, listening to music, downloading pornography, developing and displaying photographs, gambling, taking a class, and seeking dates.

As individuals gained more experience with the Internet, they increasingly used it for a wider variety of purposes. Subscribers got Internet access for one purpose, but then its use extended to many other areas of daily life. For example, parents may buy a computer for their children's school work find but then find that the household also uses it for e- mail, instant messaging, game playing, and online shopping (e.g., Kraut, Scherlis, Mukhopadhyay, Manning, & Kiesler, 1996).

Moreover, the potential uses of the Internet are expanding greatly as businesses and other organizations offer new content and services online. Although information sharing and communication were available from the early days (Leiner et al., 2002) the amount of information available, the topics covered, the numbers of potential online communication partners, and the services to support information acquisition and communication have all increased since the1970s, radically expanding the options open to users. Two popular yet recent additions include sophisticated search engines and instant messaging applications.

There is strong reason to think that different personal attributes and precipitating events will cause people to use the Internet for different purposes. For example, compared to adults, teenagers and young adults are much more likely to use the Internet for listening to music, for visiting chat rooms to meet new people, and for synchronous communication through instant messaging programs (Lenhart, Rainie, & Lewis, 2001).

Consistent with their broader role responsibilities, women are more likely than men to use the Internet for communication with friends and family (Boneva, Kraut, & Frohlich, 2001). Women, people who are ill and those who care for ill family members are especially likely to use the Internet as a course of health information (Kommers & Rainie, 2002). Extraverts are especially likely to use the Internet for social communication (Kraut et al.,2002).

There is also reason to expect that using the Internet for different purposes is likely to have differential effects on the users. McKenna (2006) argues, for example, that people who use the Internet to reveal aspects of their true selves get more benefit from its use than others. The parallels with television viewing, a much more constrained activity, is instructive. Watching dramatic violence on TV in childhood leads to more aggressive behavior in adulthood (Huesmann, Moise-Titus, Podolski, & Eron, 2003). How television is used, however, makes a difference. In addition to this influence on adult aggression, using television primarily for entertainment purposes (rather than for information) is associated with declines in civic engagement. On the other hand, watching the news on TV, even though it is filled with violence, seems to be associated with better social outcomes, including increased civic engagement (Putnam, 2000).

Very little research has attempted to demonstrate that specific uses of the Internet have identifiable consequences, and most of it is concentrated in the area of health (see Bass, 2003 for a recent review.) More generally, Kraut, Mukhopadhyay, Szczypula, Kiesler, and Scherlis (1999) distinguished between using the Internet for interpersonal communication and for acquiring information. While using the Internet for communication led to increased time spent online insubsequent periods, using the Internet for information-gathering purposes decreased time spent online in subsequent periods.

Weiser (2001) also differentiated using the Internet for social and information purposes. Based on cross-sectional data, he concluded that social uses of the Internet lead to reduced social integration, whereas greater use of the Internet for informational purposes was associated with increased social integration. While valid, the distinction between communication and informational uses of the Internet is crude. For example, communication with friends and family is likely to differ from communication with strangers online, both in terms of causes and of consequences.

Weiser's (2001) paradoxical conclusions that social uses of the Internet were associated with low social integration may reflect his construction of a social use scale that is dominated by communication with strangers.

Internet activities are composed of varied types of activities. Because varied activities might provide different situational effects on adolescence, they might result in different effects on violence. Heavy use of the Internet among adolescents might result in maladaptive internet behavior termed ''Internet addiction''. This has been defined to have six or more symptoms of nine criteria; those include preoccupation, uncontrolled impulse, usage more than intended, tolerance, withdrawal, impairment of control, excessive time and effort spent on the Internet, and impairment of decision-making ability, and impaired function based on a diagnostic interview. Recent studies have found that 19.8% of adolescents have Internet addiction and furthermore, it is associated with hostility.

Kraut and his colleagues (1998) claimed that greater use of the Internet was associated with negative effects on individuals, such as a diminishing social circle, and increasing depression and loneliness. Also, many quantitative studies confirmed that loneliness was associated with increased Internet use (Kraut et al., 1998; Lavin, Marvin, McLarney, Nie & Erbring, 2000; Stoll, 1995; Turkle, 1996). Internet use may be beneficial when kept to normal levels, however high levels of internet use which interfere with daily life have been linked to a range of problems, including decreased psychosocial well-being, relationship breakdown (Widyanto & McMurran 2004; Yao-Guo, Lin-Yan & Feng-Lin 2006; Whitty & McLaughlin, 2007).

Previous studies have been inconclusive about the relation between Internet activity, internet practice, technology acceptance and internet effects especially in academic setting. Beside, a majority of studies were undertaken in the Western countries. However, less has been researched in countries of Asia-Pacific. In addition, all these studies have a number of weaknesses. They are based upon single institution survey and complete picture of academic adoption cannot therefore be analysed. In the present study, an attempt is made to cover important variables that might influence Internet effects among academics.

**Proposed Research Model**

This study used the Technology Acceptance Model (TAM) and value orientation framework as the guiding principles. TAM, as proposed by Davis (1989), was an information systems theory that models how users came to accept and used technology. The model suggested that when users were presented with a new technology, a number of factors influenced their decision about how and when they would use it. Dodds and Monroe (1985) developed the value-orientation framework, which assumed that the individual willingness to perform a certain behavior was directly influenced by their perceived value of behavior consequences.

The theoretical framework, presented in Figure 1, was developed to conclude the literature review discussion on Internet activity, Internet practice and technology acceptance as explained in the earlier section. In light of the argument in the literature review, hypothetical model was developed to realise the objective of this study. The objective of the research was to identify the relationship between the internet activity, internet practice and technology acceptance.
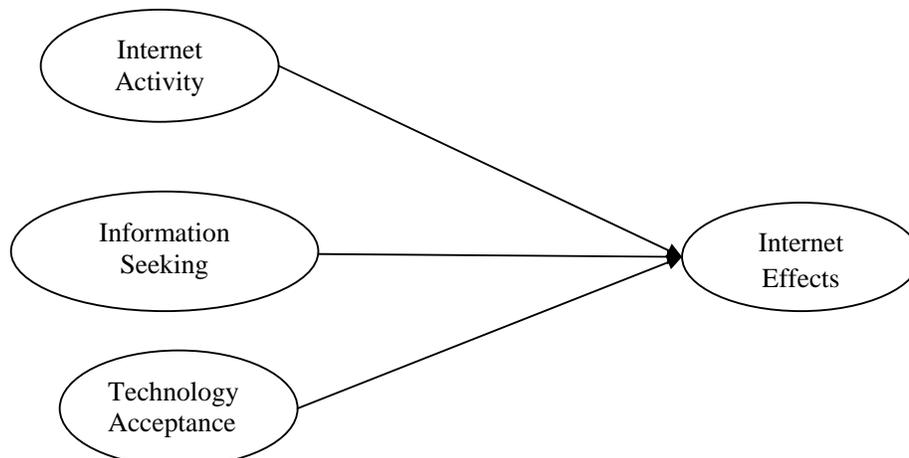


*Figure 1: Hypothesized Model*

## Method

According to Ipsos (2008), quantitative research was a study that aimed to quantify attitudes or behavioural patterns, measured their underlying variables, compared responses and highlighted correlation. It was achieved via facilitating survey method. Survey method often involved questioning sample populations that were representative, so that results could be extrapolated to the entire population studied.

In this study, the quantitative survey method was deemed more appropriate considering to its' incomparable ability to obtain exact information from respondents in time. The study applied a questionnaire-based survey design for data collection. This technique was deemed appropriate technique especially for scattered population since it consumed less amount of time and it was less costly. This method was also chosen due to its expediency when dealing with academics by the use of questionnaires. According to Creswell (1994), a survey design provided a quantitative or numeric description of some fraction of the population. It allowed the researcher to determine the values and relation of variables and constructs as well as provided responses that could be generalized to other members of the population studied and often to other similar population.

Other strengths of the survey were replication and its objective ways of comparing responses over different groups, times and places. It also allowed theoretical propositions to be tested in an objective fashion (Newsted, Huff, & Munro, 1988). Moreover, this method through questionnaires would reduce bias given that the researcher's opinion would not influence respondents to answer questions in a certain manner, since there were no verbal or visual clues to influence them. More important, quantitative surveys through questionnaires were easy to analyze. Data entry and tabulation for nearly all surveys could be easily performed via many computer software packages. Besides, questionnaires were also less intrusive than telephone or face to face surveys. When the respondent received the questionnaire, they were free to complete the questionnaire according to their time.

In considering these advantages, therefore, this study chose quantitative research via survey method where questionnaires were distributed to the sample of population.

## Sampling

The population from which the sample was drawn consisted of all academics, belonging to College of Arts and Sciences, College of Business and College of Law and Government at the University Utara Malaysia.

## Instrumentation

Responses to the questions were in close-ended forms for ease of analysis. However, provision was made for some brief expressions where necessary. The responses were presented in a five point Semantic Differential Scale format for uniformity. The self administered questionnaire was subjected to a pilot study to ensure proper interpretation of instructions and questions by the respondents (Baxter & Babbie, 2004; Creswell, 1994).

## Description of Instrument

The questionnaire comprised of two distinct parts. Part A consisted of 12 items seeking demographic information of the respondents. Each item was accompanied by multiple choice responses. Specifically, the items sought information on the respondent's personal data, computer possession, computer usage, and internet subscription. Part B was further sub-grouped into four each focusing on one variable be it independent and dependent.

The Internet activity in part B was measured by using instrument proposed by Reddick, Boucher dan Groseillers (2005). Meanwhile information seeking behavior was measured by instrument developed by D'Ambra dan Wilson (2004). Technology acceptance was measured via Moore and Benbasat (1991) instrument. Internet effects were measured via instrument proposed by Davis (1989).

Reliability of the instrument was performed via the internal consistency measures which were the inter-item consistency reliability a.k.a Cronbach's coefficient Alpha test. As indicated in Table 1, all constructs exhibited high alpha values greater than 0.85; indicating significantly higher than the threshold values of 0.80 (Nunnally & Bernstein 1994). These values indicated all the constructs exhibited a high internal consistency with their corresponding measurements indicators.

Next, congruent or construct validity of the measurement model was achieved and proven through exploratory factor analysis, convergent validity analysis and discriminant validity analysis. These analyses were performed in order to prove measurement model fit prior confirmatory factor analysis of the hypothesized structural model.

These analyses were preformed to ensure satisfactory specification of measurement model that was a compulsory prerequisite for testing substantive hypotheses.

Table 1: Inter-item Consistency Reliability

| Variables | Alpha Value |
|---|---|
| 1.Internet Activity | .82 |
| 2. Information seeking behavior | .85 |
| 3.Technology Acceptance | .80 |
| 4. Internet Effect | .85 |

A factor analysis with varimax rotation was done to validate whether the respondents perceived the two constructs to be distinct. The results showed a three factor solution with eigenvalues greater than 1.0 and the total variance explained was 62.26% of the total variance. KMO measure of sampling adequacy was 0.819 indicating sufficient intercorrelations while the Bartlett's Test of Sphericity was significant ($\chi 2$=2771.627, p< 0.01). The criteria used by Igbaria et al. (1995) to identify and interpret factors were: each item should load 0.50 or greater on one factor and 0.35 or lower on the other factor.

## Data Analysis
### Personal Characteristics of respondents

Data was gathered through questionnaire in April 2011 at a large university located in north Malaysia. Out of 250 distributed questionnaires, 200 were returned and were used for statistical analysis with the return rate at 80%. Appropriate data screening and data cleaning were performed.

As recommended by Tabachnick and Fidell (2007); appropriate data screening and data cleaning were necessary in order to enhance end result through proper data screening process. This process involved assessing data in a few phases which were i) the accuracy of data input, ii) missing values treatment, iii) checking on normality and univariate and multivariate outliers and iv) statistical assumptions for multivariate analysis such as linearity, multicollinearity, heteroscedasticity and singularity.

After data screening and data cleaning, only 185 questionnaires remained. Table 1 summarizes sample demographics viewing at the characteristics of respondents such as gender, age, marital status, computer possession, computer usage and internet subscription.

Based on the results, female respondents outnumber male respondents by 64.9% against 35.1%. Most respondents were married (65.9%), at ages between 25-39 years. Other interesting information was on the possession of computer among lecturers in this university. Most lecturers in this university owned at least 1 personal computer at 91.9% with high computer usage at 98.9%. 75.7% of these lecturers subscribed to the Internet.

**Table 2: Sample Demographics**

|  | F | % |
|---|---|---|
| Gender | | |
| i) Male | 65 | 35.1 |
| ii) Female | 120 | 64.9 |
| Marriage Status | | |
| i) Single | 58 | 31.4 |
| ii) Married | 122 | 65.9 |
| iii) Others | 5 | 2.7 |
| Age | | |
| i) Under 20 years | - | - |
| ii) 20-24 years | 19 | 10.3 |
| iii) 25-29 years | 49 | 26.5 |
| iv) 30-39 years | 70 | 37.8 |
| v) 40-55 years | 36 | 19.5 |
| vi) 55 years and above | 11 | 5.9 |
| Computer Possession | | |
| i) Yes | 170 | 91.9 |
| ii) No | 15 | 8.1 |
| Computer Usage | | |
| i) Yes | 183 | 98.9 |
| ii) No | 2 | 1.1 |
| Internet Subscription | | |
| i) Yes | 140 | 75.7 |
| ii) No | 45 | 24.3 |

Table 3 presents the intercorrelation matrix between the main variables of this study. As can be seen Internet activity, information seeking behavior and technology acceptance enjoyment were significantly positive related to both the Internet usage measures; especially the correlation between technology acceptance and internet effects.

**Table 3 : Intercorrelation Metric**

| Variable | Mean | S.D | 2 | 3 | 4 |
|---|---|---|---|---|---|
| 1. Internet Activity | 3.04 | .663 | .18** | .39** | .35** |
| 2. Information Seeking Behavior | 3.97 | 1.48 | | .20** | .22** |
| 3. Technology Acceptance | 4.14 | .441 | | | .67** |
| 4. Internet Effects | 3.71 | .326 | | | |

**p<.01, *p<.05

**Structural Equation Modelling**

This section presents the assessment of hypothesised structural model focusing on the influence of information seeking behavior, Internet activity and technology acceptance on Internet effect.

The proposed structural model for this study was tested through structural equation modeling (SEM). This test required a hypothesis-driven assessment of the structural relationships between the latent constructs themselves. This test was essential and necessary to achieve the most meaningful and parsimonious model of the research. According to Hair, Black, Babin, Anderson and Tatham (2010), SEM was a model analysis technique encompassing methods such as covariance structure analysis, latent variable analysis, confirmatory factor analysis, path analysis, and linear structural relation analysis. SEM was also particularly useful in this study because it enabled the estimation of "a series of separate, but interdependent, multiple regression equations simultaneously" in a specified structural model (Hair et al., 2006). Therefore, SEM is the most suitable analysis to estimate the strength of casual relationship of these constructs.

Bagozzi and Yi (1988) suggested a set of fit indices used to examine the structural model. Goodness of fit indices was utilized to assess the sufficiency of the hypothesized structural model. Should the result contradict where the initial theoretical model did not fit observed data, then an alternative structural model would be suggested. Any modifications of the structural model was based on theory rather than empirically driven. The goodness of fit test was used to compare the fit of hypothesized and modified models focusing on the most fitting model. Tests such as chi square fit, GFI, AGFI, TLI, RMSEA were common in testing the goodness of fit of the model. Nevertheless, generally, most researchers prefer the TLI, CFI, SRMR and RMSEA for one time analysis and different indexes should the modification has been made (Hu & Bentler, 1999; Bagozzi and Yi, 1998; Yu, 2002). The final measurement model with all its fit indices revealed that, each construct was aptly identified with minimum of three and maximum of six indicators (Bryne, 2010; Hair et al., 2010), meaning that none of the construct in the study is under identified.

Based on the results, the hypothesized structural model achieved goodness of fit requirement once after modification had been made as shown in Figure 2. After modification, the results of the chi square statistics and other fit indices indicated that the modified model adequately fitted the data. The fit indices such as the chi-square statistics ($x^2$/df= 1.570, $x^2$ = 379.88 and df = 242), comparative fit index

(CFI), Tucker-Lewis index (TLI) and goodness of fit index (GFI) of .926, .915 and .825 respectively supported the model. Goodness of fit index (GFI) however, did not support the model with slightly less than 0.90 of .825. Meanwhile, RMSEA and SRMR value confirmed that the structural model had adequately fitted the data with value of 0.064 and 0.0703 respectively. The SRMR value was in accordance with Garson (2008) where the desired cut-off values agreed at the levels of .05, .08, and .10. Hu and Bentler (1998) preferred the value ≤ .08 for model fit. Based on the Goodness-of-Fit measure values or indices, the modified structural model had achieved five acceptable values; thus the model was considered statistically fitted the data. Subsequently, the result revealed that 88% of variance for Internet Effect was explained by its relationship with all other variables of interest in this study which were Internet Activity, Information Seeking and Technology Acceptance.
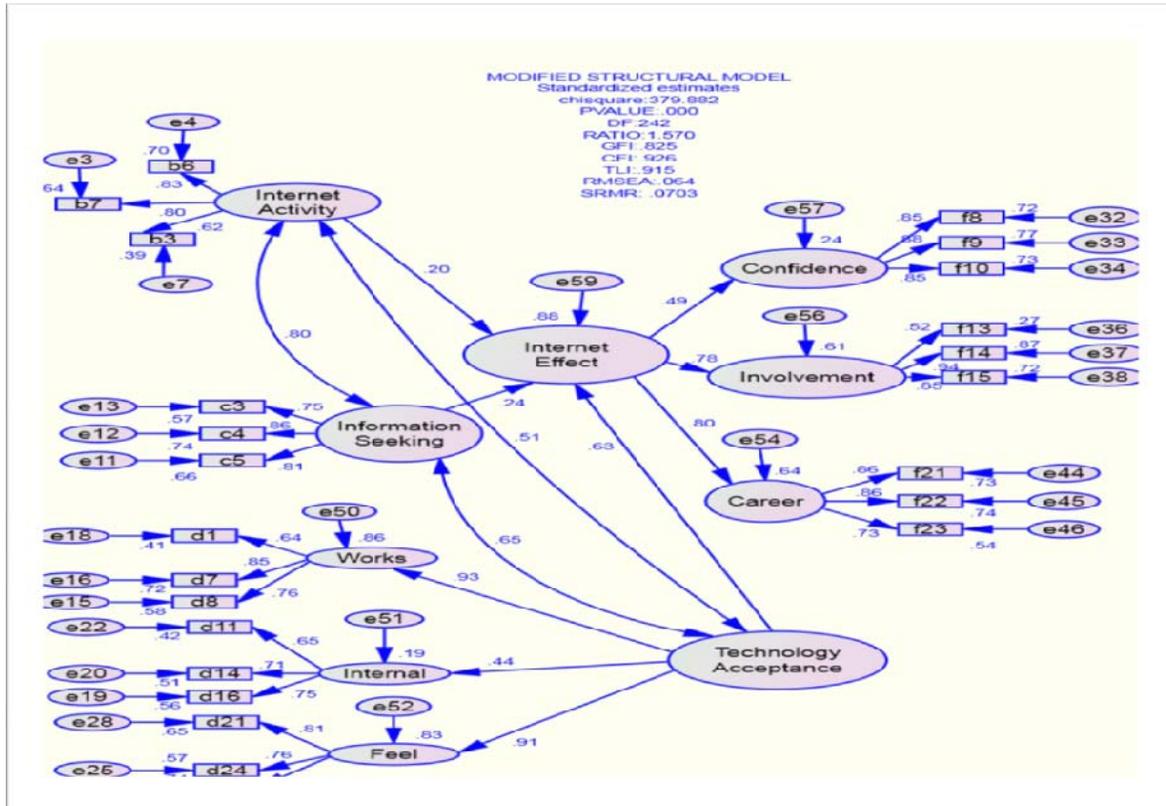


Figure 2:  Modified Structural Model

**Discussion**

The results on demographic indicated the importance of personal computer and internet in a lecturer's personal and profesional life. This has been revealed through the numbers of lecturers who owned at least one personal computer and numbers of lecturer who owned internet access. Although this research revealed the importance of personal computer and internet to the lecturers in only one public university, this finding may indicate similarity with lecturers in other public universities in Malaysia. Nevertheless, limited research was made on the usage of Internet amongst public university lecturers. Thus, in order to promote greater usage of the Internet amongst academician, there is a significant need to address issues of what will promote and what will hinder greater use of Internet.

Extensive usage of Internet, the evolution and its social impact is hard to predict. However, current scenario revealed that the Internet might become as the future household's "information superhighway" to libraries and schools, its virtual shopping mall, or the centre of home entertainment.  Moreover, nowadays, the Internet has been the alternative choice of basic interpersonal communication technology in home, like the telephone.  Viewing at the popularity of both the World Wide Web and electronic mail suggest both might be happening. The dominating style of use could have large ramifications for society.

The Internet as an information and entertainment technology would affect education, government, publishing, the retail industry, banking, broadcast services, and health care delivery. The Internet as a communications technology would probably have more subtle and personal effects—on people's connections to friends, family, and their geographic communities, on the social system of informal support and help, and on the functioning of groups and teams. We can only anticipate the social impact of the Internet if we understand how people are using it.

Internet activity, internet practice and technology acceptance received support as predictors of Internet effect as revealed in the findings. This suggests that the model is appropriate to explain the internet usage intentions among academics. Technology acceptance was found to have a strong relationship with Internet effect compared to Internet activity and Internet practice. The magnitude of the relationships reported here are consistent with previous tests of TAM as a predictor of internet technology criteria in the context of Asian users (Moon and Kim, 2001; Oh *et al.*, 2003). However, the present results were not as strong as those found in studies that used other types of technology as criteria and Western samples (Mathieson, 1991; Taylor and Todd, 1995).

The model appeared to effectively predict internet usage among the academician in Malaysia. To encourage internet use from a behavioral perspective, educational administrators might focus on creating ease of use and internet usefulness perceptions, creating social

expectations regarding usage, and improving staffs' sense of their ability to use the internet. Previous literature may provide guidance in developing these perceptions, beliefs, and attitudes.

According to the disclosed results, there was a significant but weak relationship between the internet activity and internet effect as well as the information seeking and the internet effect; indicating contradicting findings to previous Western research but similar to Asian research. This probably due to similarity in Asian culture where like most other Asian nations, Malaysia is working overtime to catch with the developed world, with an extensive Internet to-do list. This list includes building up the necessary communication networks, infrastructural support for access, setting up the legal framework, and most importantly promoting the use of Internet amongst its populace.

The weak relationship between the internet activity and the internet effect as well as between the information seeking and the internet effect would probably due to easy accessibility and lack of proper planning of seeking for information. Since the internet is easily accessible, the respondents were not in hurry to use the internet because they know that the internet would be easily accessible 24/7. Moreover, the respondents were lack of proper planning of information seeking. Their way of information seeking was spontaneous and unplanned. Meanwhile their level of technology acceptance would be high indicating the importance of understanding and acquiring appropriate knowledge and skill in technology in order to enhance the internet effect. Technology acceptance dimensions inclusive of three which were the nature of work, the perception of internal control and internet affection.

The present findings suggest that existing theoretical work in the form of TAM and TPB are applicable for understanding the behavioral aspects of faculties' internet usage in Malaysia. The models may provide a conceptual foundation for creating conditions for the user acceptance needed to fully participate in a global information society.

**Limitation of study and suggestion for future research**
Our study presents a cross-sectional analysis of Internet effect. Therefore we cannot establish the causality of arguments. A more rigorous test of our model will involve longitudinal data collection. Future research can undertake a longitudinal study and examine antecedents of Internet effect over a long period of time. Such studies can help support notions of causality and also provide insights into the process of Internet use and Internet effect, an important aspect that cannot be captured in cross-sectional surveys.

In order to enhance the research objectivity, it is recommended that probability sampling technique should be employed for future research. Since the study had omitted few dimensions in each exogenous variable, therefore a comprehensive model of Internet effect will be required for future research. In addition, finding and identifying new mediating variables between Internet usage and Internet activity, information seeking behavior and technology acceptance will be needed for a more positive explanation of Internet usage behaviors.

**Conclusion**
The Internet became common in Malaysia higher education institution. It is used for a wide range of purposes, including communication, information, entertainment, and commerce. There was controversy about the effects that widespread diffusion of the Internet was having on the lives of its users. This paper used survey to examine the relationship between Internet activity, Internet practice and technology acceptance and Internet usage. The result of the study further strengthened the application of technology acceptance model and value orientation framework to explain the antecedents of Internet effects.

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