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Web-based Electronic Service Adoption Model (E-SAM)

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Abstract

This study examines the use of web-based electronic services. It aims to develop a web-based electronic service model (e-sam) and test its effectiveness and from it develop an understanding about user interaction with websites. In the process constructs are developed to measure user attributes in using web-based e-services. This paper reports a survey which captured 403 responses on user attributes towards a specific university website. This paper concludes by suggesting a conceptual framework for a web-based e-service adoption model (E-SAM).

Keywords

Web-based e-service, Electronic Services Adoption Model (E-SAM), user experience, user motivation, user investment, perceived usefulness, perceived ease of use, usage frequency.

1. INTRODUCTION- WHAT IS WEB-BASED E-SERVICE ADOPTION MODEL (E-SAM)

In this paper Web-based e-service refers to interactive services provided on the website. It can be in the form of information delivery on websites involving commercial and non-commercial transactions. Different websites offer services; some provide information, others are interactive and offer user to conduct commercial activity; whatever the purpose they offer one thing that is common, and that is they provide information. In this context a Web-based E-Service Model is a conceptual framework for understanding users attributes when using websites, including attributes such as user’s experience, user’s motivation, and user’s investment in using web-based e-services. The conceptual model developed in this paper attempts to map user-based factors in determining adoption and continuous use of e-services on websites. It provides consumers with opportunities that are cost efficient, available 24/7, lack geographic limitation, are interactive, and enable real time delivery of services.

Organizations driving towards web-based e-service delivery aim to providing quick and efficient service to a large customer base. Web-based e-services such as banking, airlines, car rental, management consulting, music, software and education are delivered online. Hewlett Packard, for
instance, is rapidly transforming their after-sales service to a web-based e-service business unit, providing consumers with the chance to interact in real time. There is a need for a web-based e-service adoption model (e-sam) to frame understanding of the issues involved so that a more generic model across web-based service industries can be provided. There have been various attempts at building models of consumer behaviour online (Berthon et al 1996; Hoffman and Novak 1995; Alba et al 1997; Malone et al 1997; Peterson et al 1997; Venkatesh 2000; Heijden 2000). As innovations in electronic service are rapidly emerging, it is as yet unknown how consumers are reacting and adjusting to this new web-based e-service function. The user adoption of web-based technology is unique in sense that it is changing at a rapid speed and often the user contextual factors affecting adoption are undergoing rapid changes. Though adoption process may provide information, it may not provide detail information on user-technology interface that is affecting the change process. Nevertheless, customer adoption and continuance are arguably a critical success factor in realizing the potential of web-based e-services and its future direction.

2. CONCEPTUAL FRAMEWORK

Current research on web-based e-services focus on understanding those factors that influence how successfully and rapidly users adopt web-based e-service. The Technology Acceptance Model (TAM) of Davis (1989, 1993) represents an important theoretical contribution toward understanding IS usage and IS acceptance behaviour (Davis, Bagozzi and Warshaw 1989). TAM has been applied in a variety of end-user studies on the world-wide-web (Heijden, 2000; Gefen and Straub, 2000; Venkatesh 2000; Wright and Granger, 2001). These studies investigate the application of TAM in conjunction with one or more factors (i.e., experience, motivation, and usage frequency).

The application of TAM to world-wide-web studies (e.g., Heijden, 2000; Steer et al. 2000) suggest that user acceptance of technology goes beyond the two constructs (i.e., perceived usefulness and perceived ease of use). Incorporation of other constructs to TAM may provide a broader framework to understand user acceptance or rejection of a technology. Though little quantitative research is available that provides insight into how the TAM constructs fit with the overall user perception of acceptance and rejection process, often whatever the finding, it is interpreted to align with TAM constructs. TAM has limitations of being employed beyond the workplace, and that the user task environment is not fully reflected (Moon and Kim 2001). Davis et al.’s (1996) measurement of perceived enjoyment does not reflect a comprehensive set of intrinsic motivation factors, such as perceived enjoyment or perceived fun as a research construct needs further theoretical validation (Venkatesh 2000). Davis (1989), himself argues that future technology acceptance research needs to address how other variables affect usefulness, ease of use, and user acceptance. This research proposes to extend the TAM concept to the Web-based Electronic Service environment.
3. INTEGRATING TAM WITH WEB-BASED E-SERVICES VARIABLES

Websites users are also computer users. It is anticipated that TAM provides a theoretical foundation, in explaining the user belief in using a technology, which can further be extended to understanding the use of web-based e-services.

3.1. USERS EXPERIENCE

User’s interaction with new technology has been accompanied by unknown obstacles resulting in rejection process. Such obstacles focus the user attention to the downside of technology usage. Capturing such obstacles at the time of their occurrence is a challenge. Web-based e-services are believed to be quick and the period of time users spend in the task is significantly small. Often it is difficult to capture the factors behind rejection due to insufficient information about user interface activity. It is a complex process to pin point why the user opts to adopt or reject an activity on the world-wide-web. It is known that the user interacts in isolation (i.e., it is one-to-one) with the mediated environment on the world-wide-web (e.g. Hoffman and Novak 1995, Rust and Lemon 2001). In this respect there has been a thrust in making ease-of-use websites. The users assessment of websites is likely influenced not only by how easy the sites are to use, but also how effective they are in helping to accomplish the task (Hoffman and Novak 1995; Zeithaml et al 2000). Though websites of different kind (travel, music, software) have been embraced worldwide, their effective continuous usage is lacking. There are high user dropout rates and what makes long term process of continuous usage remains unknown (Hoffman and Novak 1995; D’Ambra and Rice 2001). In this process users develop their own website experience in conducting the activity. It is proposed that such experiences are formed on the basis of user perception (i.e. being successful or unsuccessful in the task, how easy or difficult the task). Mick and Fournier (1998) focus on user’s reactions to technology and suggest that technology may trigger positive and negative feelings simultaneously. Other research involving both qualitative and empirical components demonstrates that user’s propensity to embrace new technologies (i.e., their technology readiness) depends on the relative dominance of positive and negative feelings in their overall technology beliefs (Parasuraman 2000). Web-based task requires availability of information, user support, self-service and control on the website. Support may be in form of frequently asked question published on the site, it may also be in form of live chat, or it may in the form of telephone support. Self-service denoted the level of service and users servicing themselves without outside help. Control offers flexibility to users in the form that they can conduct the task easily. Users develop a unique self-experience in navigating the website. Accordingly it can be hypothesized that:

H1: The higher the Perceived Usefulness and Perceived Ease of Use within the website, the more likely E-Service will be used.

H2: The higher the User Experience in control, self-service, and support within the website, the more likely E-Services will be used.
3.2. USER MOTIVATION

Prior studies suggest that user motivation is also an important component in the adoption / rejection of a technology (Hoffman and Novak 1995; Venkatesh 2000). There are two main categories of motivation: extrinsic and intrinsic (Vallerand 1997). Extrinsic motivation drives the user to perform behaviour to achieve specific objectives (Deci and Ryan 1987), while intrinsic motivation relates to user perception of pleasure and satisfaction from performing the behaviour (Vallerand 1997). Though TAM has not explicitly included or excluded the motivation component, studies suggest it to be included in the perceived usefulness and perceived ease of use construct (e.g. Venkatesh 2000). Hoffman and Novak (1995) included the motivational characteristics in developing a user process model of network navigation in hypermedia. User motivation in the web-based environment requires careful understanding into what constitutes user usage behaviour. It is believed that usage behaviour may be driving motivation to use web-based e-services. In a web-based environment there may be number of unknown factors that shape user motivation to use an e-service on the website. Interestingly, the focus on user motivation remains dominant (Hoffman and Novak 1995). Whether it is the intrinsic or extrinsic motivation that drives user behaviour in the web-interface process is unknown. The level of motivation the user exercises may also shape the perception towards the web-based task. If the user had a negative experience (hence low motivation) it’s more likely to be reflected in the future visits to the website. Accordingly it can be hypothesized that:

H3: The higher the User Motivation within the website, the more likely E-Services will be used.

3.3. USE

User’s visits to websites may also have an influence on the usage frequency. How easy the website is to use, may relate user’s attitude towards the task. If the task relates to user getting more experience it will be reflected in the usage. Users may experience high level of flow in conducting the task. The easy navigation features, better control, self-service, good support on the website facilitates the usage process. Heijden (2000) suggests that ease of use does not seem to directly influence website usage, but does indirectly through usefulness and perceived entertainment value. The construct of entertainment, fun characteristics, have been found to be an effective evaluator of usage, it is still not clear whether those characteristics are website-driven or user-drive. The entertainment or fun context on a website may have a different affect among different user groups. (i.e. a teenager will have a different influence in comparison to mature age user). Hoffman and Novak (1995) argue that attracting users to a website and generating repeated visits to be one of the main challenges. In the information-based service driven web-based environment it is often forgotten that user’s purpose of visit is the primary reason for visiting the website. If that purpose is not met, the user’s perception of revisiting diminishes, and the user looks for alternative ways. It is to be noted that the web-based process takes place within a very short time and often the user’s perceptions is based on activity conducted with in that time. Moore and Benbasat (1991) report that mandatory use of Information Technology has a positive impact on usage and that in situations of mandated use other factors tend to have less ability to explain the adoption and use. Accordingly it can be hypothesized that:

H4: The higher the Usage Frequency (i.e., revisits to the website); the more likely E-Service will be adopted and continuously used.
3.4. INVESTMENT

Virtual organisations are trying to shape user behaviour on the websites by offering services for free, at a discount, or at a very competitive price. Much of the activity is driven by online retailers competing with others. Chen et al (2002) investigate online consumer behaviour by applying the TAM and innovation diffusion theory. The study focuses on predicting user behaviour; it ignores other characteristics such as user investment in time and money shopping online. Kivijärvi and Saarinen (1995) investigate investment in information systems from the organisational context. Though the study looked into the IS investment as a cost, it is argued that such cost reflect on the investment side. Other studies (Iqbaria and Tan 1997; Stratopoulos and Dehning 2000; Campbell 2002) also look into organisation’s IT investment. Very little attention was given to the users of such technology in terms of their time and money invested. This research proposes that users make investments (in time and money) in using web-based e-services. Websites offering free services (such as search engines, online newspapers, magazines, online discount stores) are gradually becoming popular among users, whereas other fee charging websites are not amongst the popular ones. It is suggested that users invest their time and money on web-based e-services; and if such investment are high (or on increase) they will be replaced with alternatives which were less expensive or available free. This trend has been observed at music download websites, such as Napster offering free download of music making it impossible for other online music retailers to charge a fee. It is thought that users look for the best bargains. Users are alert and smarter and keep a watch on their spending online. Whether this relates in terms of their time spend or money invested, there is keen interest to monitor their own activity. Accordingly it can be hypothesized that:

H5: The higher the Investment in web-based e-service, less likely it will be used; that is users will search for less expensive alternatives.

4. RESEARCH METHOD

Staff and Students of the University of Australia (not the real name) participated in an online survey. The survey investigated user’s perception towards the university website. The users were asked to complete all questions. A pilot survey of 50 participants was conducted. The authors programmed the website such that if the form was incomplete, and the user clicked on the submit button, they were alerted to complete the section. This provided the advantage of not receiving incomplete responses, and as a result all 403 responses received over a three week period were all complete. The user’s also had the option of not participating. All data collected was received online and transferred to Excel files, and later to the SPSS software package for analysis. Whenever a participant completed the survey the authors were alerted by an automatic email with the response. The complete process was aimed at eliminating (or at its best reducing) paper work and exercising data quality and reliability. Initially it was identified that the responses were quick and the participant’s enthusiasm towards the survey was high, at a later stage this was identified to be diminishing and the number of responses received with in a day and week started reducing. It should be noted that the reason for this may be due to the survey coincided during the examination period and students were paying more attention towards their studies. The instrument derives two of its constructs (Perceived usefulness and Perceived ease of use) from TAM (Davis 1989, 1993). An initial test batch of 50 responses was analysed to ensure construct
validity. Note that a previous case study of “Implementing Web-based Electronic Services” (Sandhu and Corbitt 2002) had been used to gather the constructs, evaluate them and build into the survey.

5. ANALYSIS AND RESULTS

The primary technique for testing the hypotheses in this study was Factor Analysis to test the patterns within the constructs. For scale assessment, a combination confirmatory factor analysis and reliability analysis was used. Confirmatory factor analysis was used to assess construct validity for the variables considered in this research. Follow-up reliability analysis was used to further assess the stability of the scales used. Cronbach’s Alpha (1971) was used to assess scale reliability. This analysis helped further establish the validity and reliability of the scales used in the context of this study.

The data were first analysed using PCA Factor Analysis to establish convergent and discriminant validity. The factor analysis showed fourteen orthogonal factors with eigenvalues above 1.0, together accounting for 66.869% of the variation, with item communality ranging between .535 and .818. The results of the factor analysis after a VARIMAX rotation are presented in Table 1. Loadings above .40 are shown in boldface. Overall, the factor analysis shows a simple pattern with high convergent and discriminant validity. All constructs (factors) that merged from the factor analysis showed high Cronbach’s (except for support), establishing the reliability of the instrument. Experience had a Cronbach of .7213, control (+) .6742, control (-) .7788, self-service .7016, support .5404, motivation .7299, investment .7401, usage frequency .6403, perceived usefulness .9131, perceived ease of use .8765.

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1 PEOU</th>
<th>Factor 2 PU</th>
<th>Factor 3 MO</th>
<th>Factor 4 IN</th>
<th>Factor 5 EX</th>
<th>Factor 6 UF</th>
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<tbody>
<tr>
<td>PEOU</td>
<td>.713</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEOU</td>
<td>.726</td>
<td>.729</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>PEOU</td>
<td>.630</td>
<td>.825</td>
<td>.545</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEOU</td>
<td>.722</td>
<td>.829</td>
<td></td>
<td>.682</td>
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<tr>
<td>PEOU</td>
<td>.764</td>
<td></td>
<td>.546</td>
<td></td>
<td>.647</td>
<td></td>
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<tr>
<td>PU 1</td>
<td>.729</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.825</td>
</tr>
<tr>
<td>PU 2</td>
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<td></td>
<td></td>
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<tr>
<td>PU 3</td>
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<td></td>
<td>.456</td>
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<tr>
<td>PU 4</td>
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<td>.456</td>
<td></td>
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<td>.659</td>
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<tr>
<td>PU 5</td>
<td>.751</td>
<td>.743</td>
<td></td>
<td></td>
<td></td>
<td>.406</td>
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<tr>
<td>PU 6</td>
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<td>.682</td>
<td>.647</td>
<td>.6403</td>
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<td>.689</td>
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</tbody>
</table>

7th Pacific Asia Conference on Information Systems, 10-13 July 2003, Adelaide, South Australia
Table 1. Factor Analysis and Descriptive Statistics

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<th>Component Number</th>
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<tr>
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<tr>
<td>2</td>
<td>5.89</td>
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<tr>
<td>3</td>
<td>5.27</td>
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<td>6</td>
<td>4.60</td>
</tr>
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<td>7</td>
<td>4.08</td>
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</table>

6. DISCUSSION AND IMPLICATIONS

The evidence from Factor Analysis strongly supported the TAM construct (i.e. perceived ease of use and perceived usefulness). The consistent pattern suggests that a measurement scale has high validity and reliability. It can also be suggested that usage frequency for web-based e-services likely to increase if the users experience a higher perceived usefulness and perceived ease of use within the website. The Factor loaded from .630 to .837. Such features enhance user’s ability with higher flexibility within the website (H1).

It may be proposed that user experience affects the usage pattern for web-based e-services. Better control features, self-service ability, and a good support, with in the website is likely to increase the usage frequency. The Factor loaded from .406 to .689. It is interesting to note (see Table 1) that usage frequency and experience load high on Factor 1 and 2, which can further enhance Perceived Ease of Use (PEOU) and Perceived Usefulness (H2).

The pattern consisting user motivation (see Factor 3) aligns with Perceived Usefulness (Factor 2). The Factor loaded from .545 to .682. It may be related to the users finding higher level motivation when the Perceived Usefulness with in websites is found to be high. Usage frequency may increase when users experience higher level of motivation in conducting the task. Higher motivation may account to the predicability for revisits to the websites (H3).

It is anticipated that the usage and the usage frequency may be affected by the number of visits to the websites. If the number of visits is few, the usage will be low and vice versa. The Factor loaded from .411 to .712. The cross-loading of usage frequency in Factor 1 and 2, suggest that it may be inclined to affect the PEOU and PU (recall TAM model in figure 1; PEOU and PU
influenced attitude towards using). Such patterns suggest the scale to be multi-dimensional and sensitive within the factors (H4).

User Investment in web-based e-services proclaimed to affect the usage. It scored high on all the four items (see Factor 4). The Factor loaded from .456 to .825. The evidence suggests that the higher the user investment in web-based e-services, the less likely it will be used; or the usage start diminishing after some time. The users will search for alternatives, and may think of replacement. This is not to say that free or less expensive services are likely to be retained. If such services tend to absorb a lot of time, even though they might be free or discounted they are liable for replacement with the ones not absorbing large amount of time in conducting the task. As a result, users may monitor their own activities relating to time and money invested in using web-based e-services. This scale has shown to have a high level of internal consistency (H5).

This research tested the usage of web-based e-services in relation to factors such as users experience, motivation, usage frequency, and investment. The TAM factors displayed a consistent pattern (Factor 1 and Factor 2). Motivation and Investment were strongly alongside TAM constructs indicating a pattern existed for further extension of TAM. User’s experience and usage frequency (Factor 5 and 6) pointed towards user’s experience and usage pattern; interestingly it also showed a pattern loading on Factor 1 and 2. These cross loading indicate a tendency of penetration among other factors. A sharp drop in scree plot (see figure 2) suggests that all survey items loaded sufficiently. It was of interest to the researchers to extract the components from the steep and the shallow slope on the scree plot. A closer look at CO2 and CO4 (Factor 1, see Table 1) reveal the negative values (-.492 and -.493) for these constructs were based on the items that were negatively framed to measure users control characteristics. A reverse coding in SPSS software later corrected these values to be positive and compare two sets of data for variance. The scree-plot matrix (see figure 3) indicated the high density between factors and factor clusters were highly concentrated indicating a closer relationship.

It is suggested to use the findings of this paper with caution. This stage of the research no generalisation can be made as to how different e-services are used. The evidence suggests that there is scope for further extension of TAM to adapt to the web-based e-service environment.

Figure 4: Conceptual framework for Web-based E-Services Adoption Model (E-SAM).

Placed in this context, the results may help to further the research and to clarify and examine a proposed electronic service adoption model (E-SAM see figure 4).

Since this research focused on other factors alongside TAM, it doesn’t propose to alter the TAM constructs, which has shown a high reliability and validity, and which also provides the
theoretical base for establishing E-SAM. This is a deviation from other similar studies (e.g. Adams et al. 1992; Chin and Gopal 1993; Chin and Todd 1995; Davis 1993; Davis and Venkatesh 1996; Gefen and Straub 1997; Hendrickson et al. 1993; Iqbaria et al. 1997; Mathieson 1991; Segars and Grover 1993; Subramanian 1994; Szajna 1994, 1996; Taylor and Todd 1995; Venkatesh 1999; Venkatesh and Davis 1996; Venkatesh and Morris 2000) that focussed on improving or extending the TAM constructs. Rather, this research proposes to keep the TAM construct intact without much further modifications. The reason behind this approach is based on understanding and investigation of TAM being sufficiently explored for construct reliability and validity. The aim and interest of the researchers are to investigate how well (at least) other factors can be aligned with TAM and to provide relationship with the TAM. The researchers focus attention on baseline factors that have previously been ignored or not paid much attention. This research will step ahead and investigate the relativeness and propensity of such factors within E-SAM (see figure 4). It is also of interest to know whether such factors have any influential role in determining the affect of TAM constructs or on other proposed factors. E-SAM can be differentiated on the basis that it aims to capture the wider aspect of the user-technology interaction and acceptance process.

References


