Assessing Web-based Electronic Services Adoption Model (E-SAM)

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Abstract

Web-based electronic service (e-service) end-user adoption and implementation requires an assessment of consumer contextual factors. This paper investigates factors which affect end-user experience and perception, motivation, support, control, and usage frequency in the online/offline user task environment and its affect on web-based e-service adoption and implementation. Understanding end-user's continuous usage behavior and developing web-based e-services to meet user specific requirement is the center of attention for web-based e-service providers. Integrating end-user situation specific personalization factors into web-based e-service tasks may enhance web-based e-service usability. The survey 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

Electronic Service Adoption Model (E-SAM), E-Services, User Experience, User Motivation, User Continued Use.

1. Introduction- Why develop a Web-based E-Service Adoption Model (E-SAM)

Consumer behaviour on the websites has been the subject of considerable research in the last few years, but understanding it is made difficult by the fact that the main entities involved, consumers and businesses, have been transformed (Koufaris 2002). In its present form e-service user adoption is faced with problems. Web-based e-services are not as frequently used as compared to traditional services. A recent study by Datamonitor, Inc. (2000) suggests that as much as $6.1 billion in potential Web sales were lost in 1999 due to inadequate e-service. The transformation process from traditional (i.e. offline) to online activity has been followed by changes in consumer

behaviour. Website users exhibit their knowledge of a traditional activity when interacting online. In terms of technology, characteristics such as users experience, motivation, and usage frequency of websites may be the primary criteria in conducting a web-based activity. Web-based e-services such as banking, airlines, car rental, real estate, management consulting, music, software, education are delivered on online. Hewlett Packard, for instance, is rapidly transforming their after-sales service to web-based e-service business unit, providing consumers with the chance to interact in real time. Organizations engaged in e-businesses like to meet e-customer demand (Forrest and Mizerski, 1996).

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 may be in the form of information delivery on websites involving commercial and non-commercial activities. 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. As innovations in electronic service are rapidly emerging, it is yet unknown how the consumers are reacting and adjusting to this new web-based e-service function. There is a need for a web-based e-service adoption model (E-SAM). In this context a Web-based E-Service Adoption 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 continued use 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. 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: The role of Perceived Ease of Use and Perceived Usefulness in Technology Acceptance Model (TAM).

Currently 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 investigated the application of TAM in conjunction with one or more factors (i.e., experience, motivation, and usage frequency).

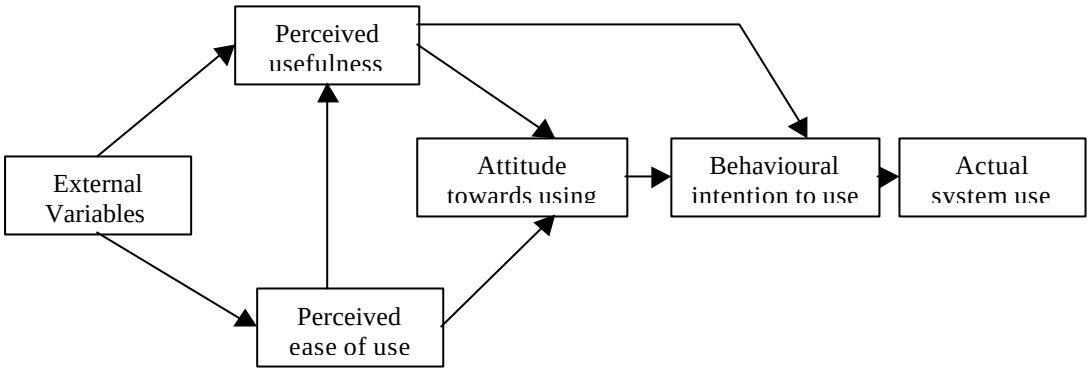

Figure1. The technology acceptance model (Davis. 1989)

TAM focuses on two constructs: perceived usefulness (PU) and perceived ease of use (PEOU). The former would enhance the end-user job performance, while the latter would be easy to use. These two instruments of TAM shown to have success in past IS studies in explaining the user acceptance of technology. Recent studies suggest the TAM model also applies to adoption of e-commerce and to the Internet technology (Gefen 1997). To further enhance the model Venkatesh (2000) suggests using an adjustment-based theoretical model, including control, intrinsic motivation, and emotion as variables within the ease of use dimension of TAM construct. Venkatesh (2000) argued that there are multiple factors not directly related to the user-system interaction that are more important to TAM; these are control, intrinsic motivation, and emotion. Similarly, Steer et al (2000) used TAM in web-based environment to study user's usage behaviour. It was suggested that a broader range of complex factors was needed to assess influence on adoption behaviour. Morris and Turner (2001) suggest that until the quality of experience scale is related to a relevant measure of IT use, the utility of the construct cannot be determined. It may be argued that quality of experience scale is a variable that may not stay constant in user specific situation on the websites. Davis (1989), himself argues that future technology acceptance research needs to address how other variables affect usefulness, ease of use, and user acceptance. Though there exists a large body of literature in understanding the technology adoption process very little of this research focuses on web-based e-service adoption. Emerging insights into web-based user interface focus on the most favourable user perspectives, yet there is little investigation available to understand adoption and usage of web-based e-services.

3. Exploring the dimension of TAM for Web-based E-Services

3.1. Users Experience

User's interaction with new technology has been accompanied by unknown obstacles resulting in technology rejection process. Such obstacles focus the user attention on the downside of technology usage. Capturing such obstacles at the time of their occurrence on websites 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 the 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.

A number of researchers have suggested that flow is a useful construct for describing our interactions with computers (Csikszentmihalyi 2000; Ghani, Supnick, and Rooney 1991; Trevino and Webster 1992; Webster, Trevino, and Ryan 1993; Hoffman and Novak 1995). Flow has been described as the "process of optimal experience" (Csikszentmihalyi 1977; Csikszentmihalyi and LeFevre 1989) achieved when a sufficiently motivated user perceives a balance between his or her skills and the challenges of the interaction, together with focused attention. In essence it can be suggested the user perception of flow on the website may be based on the level of user experience.

The website activities offer challenges and skills that lead user in achieving the task. It may be in terms of website location, task completion, information search, website navigation, and any other activity that facilitates user's involvement in interface process. Control (C0) offers flexibility to users in the form that they can conduct the task easily. The user's interaction skills keep getting better every time a website is visited. This develops into a learning process which the users keeps practising and improving on. Flow formalises and extends a sense of playfulness (Csikszentmihalyi 1977; Bowman 1982: Csikszentmihalyi and LeFevre 1989; Miller 1973) that is incorporated within the web activity. Websites offering higher levels of flow are shown to have higher retention of users, perceived sense of control over the website interactions, focus their attention, and find it cognitively enjoying (Webster et al 1993). It has been observed that users, when successful in a task on website, feel confident in using for other tasks (Ruyter et al 2001). Accordingly it can be hypothesized that:

H1: *Higher the **(H3) Perceived Usefulness** and **(H4) Perceived Ease of Use** (Davis 1989; 1993) within the website, the more likely E-Service will be used (Sandhu and Corbitt 2002).*

H2: *Higher the **(H1) User Experience** in control, self-service, and support within the website, the more likely E-Services will be used (Sandhu and Corbitt 2002).*

3.2. Users Motivation

Prior studies suggest that user motivation is also an important component in 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 in to perform behaviour to achieve specific objectives (Deci and Ryan 1985), while the 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 include 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 in user usage behaviour. It is believed that the usage behaviour may be driving the motivation to use the 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. Often it is intriguing to know why

some users complete the web-based process while others drop out. Interestingly, the focus on user motivation in technology usage remains dominant (Hoffman and Novak 1995; Venkatesh 2000). 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: *Higher the **(H2) User Motivation** within the website, the more likely E-Services will be used (Csikszentmihalyi 1977; Webster et al 1993; Hoffman and Novak 199; Sandhu and Corbitt 2002)*

3.3. Usage Frequency

User's visits to the website may also have an influence on the usage frequency. In terms of how easy the website is to use, may relate users attitude towards the task. If the task relates to user getting more experienced it will be reflected on 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 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) argued that attracting user's to a website and generating repeated visits to be one of the main challenges. In the information based service driven web-based environment often it is forgotten that user's purpose of visit is the primary reason to 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: *Higher the **(H4) Usage Frequency** (i.e., revisits to the website); the more likely E-Service will be adopted and continuously used (Moore and Benbasat 1991; Adams et al 1992; Sandhu and Corbitt 2002).*

3.4. Users 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 to compete with other competitors, usually the affect of such promotions on users if any are not investigated. Chen et al (2002) investigated online consumer behaviour by applying the TAM and innovation diffusion theory. The study focussed on predicting user behaviour, it ignored other characteristics such as user investment in time and money shopping online. Kivijärvi and

Saarinen (1995) investigated 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 looked into organisations 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 the 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 website, where Napster offered 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: *Higher the **(H5) Investment** in web-based e-service, less likely it will be used; that is users will search for less expensive alternatives (Sandhu and Corbitt 2002).*

4. Research Method

Staff and Students of the University of Australia[1] participated in an online survey. The survey investigated user's perception towards the university website. The users were asked to complete all questions. 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 and were all complete. The user's also had the option of not participating. Collected data 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. The primary technique for testing the hypotheses in this study was Factor Analysis to test the pattern 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.

[1] not the real name

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.

5. Analysis and Results

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. 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.

Item	Factor 1 PEOU	Factor 2 PU	Factor 3 MO	Factor 4 IN	Factor 5 EX	Factor 6 UF
PEOU	**.713**	.222	.113	-4.197E-02	8.866E-02	-2.258E-02
PEOU	**.726**	.142	4.510E-02	4.963E-03	8.433E-02	5.274E-02
PEOU	**.630**	.216	.171	-1.389E-02	-6.485E-02	-.194
PEOU	**.722**	.234	.111	7.716E-02	.123	4.832E-02
PEOU	**.764**	.258	4.780E-02	-1.176E-02	8.528E-02	-6.227E-02
PU 1	.372	**.729**	9.965E-02	.135	8.407E-02	5.006E-02
PU 2	.171	**.825**	.145	.101	.120	5.120E-03
PU 3	.220	**.837**	.122	9.749E-02	5.723E-02	-2.899E-03
PU 4	.162	**.829**	.125	5.822E-02	8.658E-02	2.589E-02
PU 5	.233	**.751**	.156	.110	8.514E-02	-6.238E-02
PU 6	.173	**.708**	.107	4.287E-03	.116	1.977E-02
MO 1	.328	.326	**.545**	.190	.147	-.123
MO 2	.316	.156	.348	5.156E-03	.546	5.633E-02
MO 3	.124	.131	**.682**	4.134E-02	.196	.206
MO 4	.159	.297	**.682**	-4.905E-02	8.158E-02	3.132E-02
MO 5	.112	.200	**.647**	.148	-.152	2.460E-02

IN 1	.129	8.579E-02	2.132E-02	**.825**	2.422E-02	-6.026E-02
IN 2	-2.437E-02	.209	8.840E-02	**.718**	-.105	.131
IN 3	6.774E-02	.262	.151	**.456**	-8.203E-02	8.392E-02
IN 4	4.928E-03	8.686E-02	2.946E-02	**.743**	.175	5.191E-02
EX 1	.401	.196	2.823E-02	4.567E-02	**.659**	-1.866E-02
EX 2	.415	.234	.215	-4.228E-03	**.406**	-5.243E-02
EX 3	2.415E-02	.121	-5.311E-02	1.604E-02	**.689**	-2.658E-02
EX 4	.278	.111	1.304E-02	1.564E-03	5.630E-02	3.875E-02
EX 5	**.566**	5.525E-02	.104	3.262E-02	5.637E-03	-.173
UF 1	**.780**	.229	5.611E-02	5.235E-02	.151	1.175E-02
UF 2	.258	.595	8.657E-02	6.730E-02	5.044E-02	1.891E-02
UF 3	.203	5.725E-02	7.428E-03	.100	6.731E-02	1.644E-02
UF 4	-.114	.139	4.306E-02	.185	1.911E-03	.293
UF 5	.185	.275	-2.076E-03	7.965E-02	.114	.378
UF 6	**.527**	**.432**	5.341E-02	-2.324E-03	.140	-5.001E-02
UF 7	7.568E-02	4.834E-02	-7.740E-03	3.068E-02	4.861E-02	**.411**
UF 8	-.139	-4.053E-02	-7.929E-02	.152	-5.967E-02	**.608**
UF 9	-.154	-1.934E-02	.194	-1.253E-02	-1.178E-02	**.712**
UF 10	.276	.265	.120	6.023E-02	.256	3.290E-02
UF 11	.384	.175	.181	9.044E-02	**.463**	-8.436E-03
UF 12	9.649E-02	.131	.131	3.049E-02	2.021E-02	-4.199E-02
CO 1	**.600**	.141	6.793E-02	-3.361E-03	.194	7.911E-02
CO 2	**-.492**	-.141	-4.945E-03	5.697E-02	-.364	5.706E-02
CO 3	**.549**	.140	.106	9.615E-02	.226	-5.290E-02
CO 4	**-.493**	-.178	3.316E-02	1.196E-03	-.235	8.367E-02

Note- E denotes scientific notation. A numeric variable whose values are displayed with an imbedded E and a signed power-of-ten exponent.

Table1. Factor Analysis and Descriptive Statistics

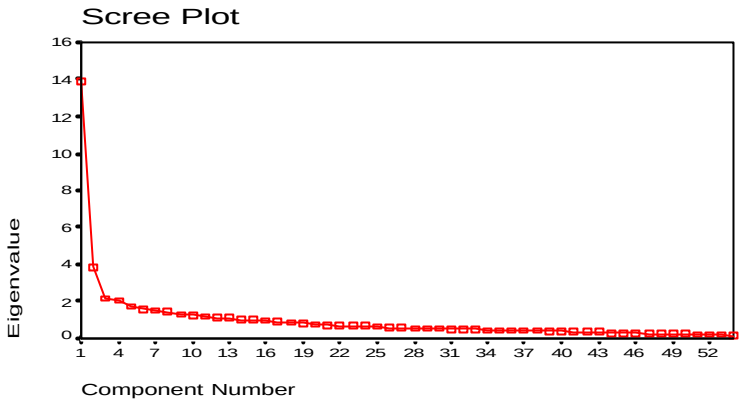

Figure 2: Scree Plot

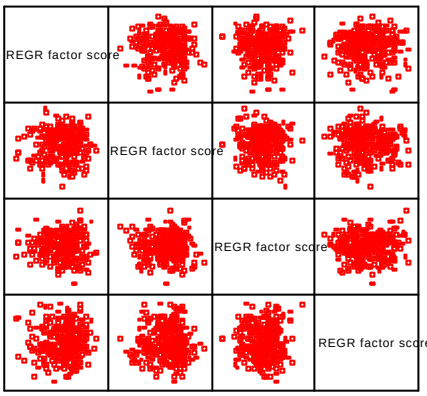

Figure 3: Scree Plot Matrix of Component Score

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. 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. 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); 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 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 evidence suggests that higher the user investment in web-based e-services, 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 rallied 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 notable 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 (Factor1, see Table 1) revealed the negative values 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. 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. The evidence suggests that there is scope for further extension of TAM to adapt to the web-based e-service environment. 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). The Electronic Service Adoption Model (E-SAM) attempts to map user based factors emanating in the web-based environment.

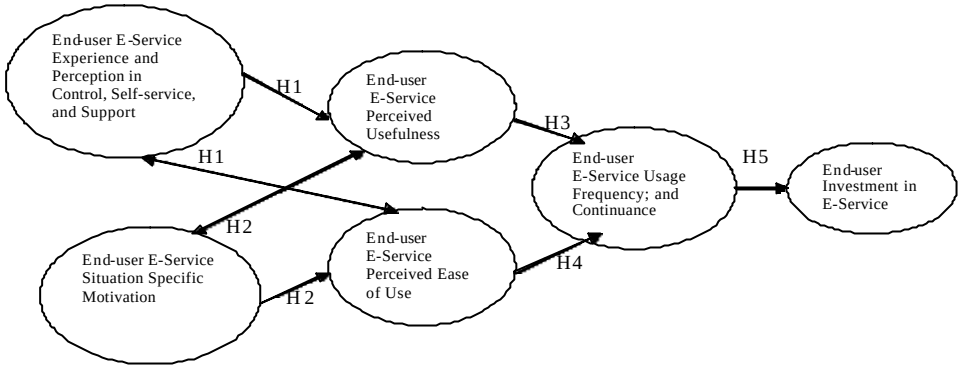

Figure 4: Conceptual framework for Web-based E-Services Adoption Model (E-SAM).

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 Todd 1995; Davis 1993; Davis and Venkatesh 1996; Gefen and Straub 1997; Iqbaria et al.1997; Mathieson 1991; Segars and Grover 1993; Szajna 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 closely like to 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.

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