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Usability Dimensions and their impact on Web-Based Transactional Systems Acceptance: an Empirical Examination

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Abstract: The article has two fold purpose; it proposes a revised technology acceptance model which includes usability dimensions and then tests revised model by measuring user acceptance of web-based transactional systems (WTS). Model was tested and validated through data obtained from 301 online users. The results suggest that the two important tenets, usefulness and ease of use have significant influence on intention to transact. Response time was found to have an effect on perceived usefulness. Accessibility and navigability had shown significant impact on perceived ease of use. Overall, results supported the proposed hypothetical model.

Keywords: Usability dimensions, Technology acceptance model, Perceived usefulness, perceived ease of use, Web-based Transactional Systems

1. INTRODUCTION

Internet, as a sophisticated tool, enables companies to carry out facilitate communication from anywhere in the world. Taking this fact into consideration, business firms around the globe have introduced web-based information systems to conduct business and facilitate customers to perform transaction online. According to Chou and Chou (2002) and Chandio (2013a), these web-based transactional systems offer several benefits to the business firms. For instance, they facilitate firms to establish a direct relationship with customers via electronic services. Second, through the use of internet-based systems, business firms can reach to new customers and increase their customer base. Third, firms can retain existing customers through online services, and finally, firms can increase their dominancy and retain it by exploiting potential advantages of such systems.

Despite the advantages that web-based transactional systems (WTS) offers to the business owners and their customers, it is observed (Salimon *et al.,* 2014) that these systems are not yet appropriately accepted and/or utilized by large numbers of customers (Wang *et al.,* 2016). To address these issues, researchers in the domain of information systems (IS) and human-computer interfacing (HCI) have built several models to understand users acceptance and usage behavior. As compared to other models, the technology acceptance model (TAM) (Davis, 1989) has been the most widely adopted model to understand users acceptance and usage behavior (Abbasi *et al.,* 2011, Chandio *et al.,* 2013a, Naqvi,*et al.,* 2016). The TAM **(Fig, 1)** posits that perceived usefulness (PU) and perceived ease of use (PEOU) are two variables that play vital role in users decision making process i.e. whether to accept an information system or reject it.

Past research applying TAM model in different contextual settings confirmed the robustness and validity of PU and PEOU (Marshall *et al.,* 2015; Chandio *et al,* 2017). However, some researchers criticized that the TAM model's main variables (PU and PEOU)did not provide a concrete feedback to the designers and developers (Wixom and Todd, 2005, Chandio, 2011). According Chandio *et al.,* 2013a, the TAM's variables PU and PEOU are abstract concepts and they lack explanation about important features of the system itself (e.g. usability characteristics/ dimensions). Despite the recognition of important role of usability dimensions in prior research (kaur *et al.,* 2016), there is not a single study found on web-based transactional systems examining the impact of usability dimensions on TAM's main variables (PU and PEOU) and transaction intention. To fill this gap, this article examines the role and effect of usability dimensions on PU, PEOU and intention to transact in web-based transactional systems context.

2. RESEARCH BACKGROUND

Model and Hypotheses, Technology Acceptance Model

The primary purpose behind the development of technology acceptance model (TAM) (see Figure 1) was to find and inspect factors that affect the acceptance and

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usage of newly developed information systems. Later on this model was applied at a large scale with several applications in various contextual settings (Abbasi *et al.,* 2011). As per TAM model, PU and PEOU are two important variables that determine individuals' intended behaviour (in this case intention to transact). Whereas, external variables (e.g. usability features) will have an impact on PU and PEOU. It is important to note that Davis (1989), founder of TAM, did not mention any specific external variables/factors in TAM model (Chandio *et al.,* 2013b).In TAM, PU is defined as "the degree to which a person believes that using a particular system would enhance his/her job performance", whereas, PEOU is "the degree to which a person believes that using a particular system would be free of efforts" (Davis, 1989).

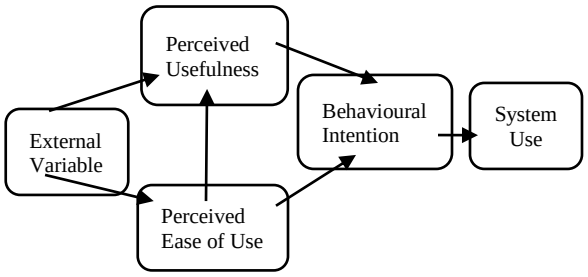

Fig.1. TAM Model

Usability

The most widely discussed concept in HCI literature is usability. According to Nielson (2002), users experience usability of a web-based system before performing any monetary transaction or continue using it. As usability plays a pivotal role in the online business success and consumer' satisfaction, Palmer (2002) recommends that system designers and developers should give proper attention to usability features throughout system implementation process. Based on the work of Hong et al. (2002), usability in this article is defined as how easily and how effectively a web-based transactional system can be used by the potential users

Past work reveals that current web-based transactional systems contain several usability design issues (Chau and Wong, 2010, Naqvi *et al,* 2016). The more commonly recognized usability issues in the past studies are, lacking of satisfactory quality of the contents, design trustworthiness, formatting discrepancies, navigation complications, disorientation, inappropriate level of interactivity and reliability, delay in response from the system, futile search abilities, and ambiguously described help functionalities. It is believed that the impact of usability on intention to transact on web-based transactional systems cannot be fully explained without thorough examining the influence of usability dimensions on PU and PEOU of web-based transactional systems.

Research Model and Proposed Hypotheses

In order to fully exploit the understanding regarding the acceptance of web-based transactional systems, and subsequently, their usage, this article proposes an integrated model of usability dimensions based on TAM as foundational model. The extended model, as depicted in **(Fig. 2),** hypothesizes that PU and PEOU will have an influence on intention to transact (ITT). Factors related to usability are drawn to have an impact on PU and PEOU. For example, interactivity (INT), response time (RT), and content (CN) are hypothesized to have an impact on PU. Whereas, accessibility (ACC) and navigation (NAV) are posited to influence PEOU. It is to note here that, although there were many usability dimensions identified in the literature, most of them were reported to have different names but similar operationalization and definitions. Consequently, we

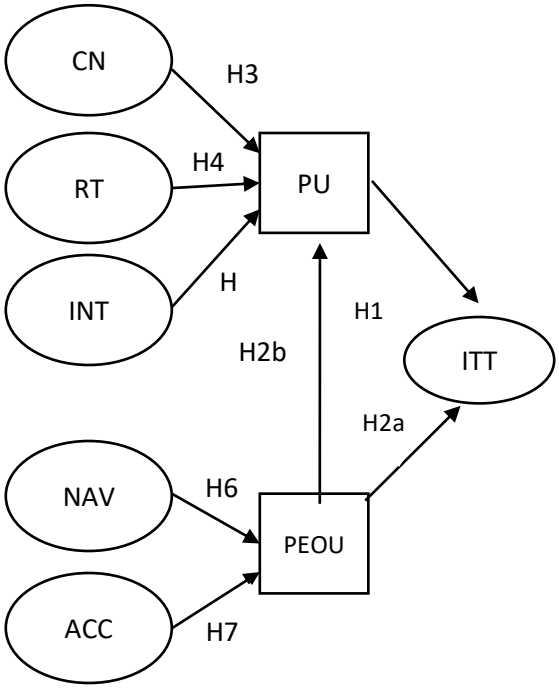

Fig.2. WTS acceptance model

adopted those dimensions in the model that were frequently reported in the past work (Plamer, 2002; Neilson, 2000).

This article proposes following research hypotheses:

H1:PU significantly influences ITT
H2a:PEOUsignificantly influences ITT
H2b:PEOU significantly influences PU
H3: Content significantly influences PU
H4: Response significantly influences PU
H5: Interactivity significantly influences PU
H6: Navigation significantly influences PEOU
H7: Accessibility significantly influences PEOU

3. RESULTS AND DISCUSSION

Instrument Reliability Test

The instrument was tested using reliability co-efficient as recommended by Nunnally (1978). This is conducted through examining the internal consistency of responses provided against the questionnaire items. This measure explains how closely the measurement items are related as a group. The most widely adopted reliability coefficient is Cronbach's alpha reliability co-efficient. As per recommendations (Hair *et al.,* 2006, Chandio *et al.,* 2013a), the reliability co-efficient (alpha) greater than 0.70 suggests adequate internal consistency. The results **(Table 1)** of reliability test suggest that all alpha estimates were greater than 0.70. This confirms the reliability of the instrument.

Table 1 Constructs Reliability

S. No	Construct	Construct Reliability (Cronbach's alpha)
1	Intention to Transact	0.922
2	Perceived usefulness	0.911
3	Perceived ease of use	0.934
4	Navigation	0.815
5	Response time	0.910
6	Accessibility	0.899
7	Interactivity	0.946

Structural Equation Modelling

Structural equation modeling (SEM) one of the most widely applied and important tool in the domain of data analysis. The main reason of SEM's popularity is that it enables researchers to concurrently test and analyze the complex models with set of dependent and independent variables. There are two main steps in SEM. The measurement model and the Structural model specification. In the measurement model, the researcher examines how fine the data fitted to the analyzed model using multiple fit indexes (Hair *et al.,* 2006, Abbasi *et al.,* 2011). In addition, measurement model also helps to test the convergent and discriminant validity. The results of measurement model fit indices are shown in **(Table 2).** All the estimates fulfil the required criteria; thus suggesting that model fits the data well.

Table 2. Measurement Model Fit values

	AGFI	GFI	CFI	NFI	RMSEA
Criteria	≥0.90	>=0.90	≥0.90	≥0.90	<0.05
Obtained	0.921	0.911	0.932	0.916	0.025

Note: **AGFI** – Adjusted goodness of fit index**; GFI** = Goodness of fit index; **CFI** = Comparative fit index**; NFI** = Normated fit index; **RMSEA** = Root mean square error of approximation

Fornell and Larcker's (1981) criterion was applied to inspect the convergent validity of the model developed in this research. As per their suggestions the average variance extracted (AVE) of each construct should be greater than or equal to 0.5 (see Table 3 bold values). All the AVE are above 0.5, thus confirming convergent validity. Discriminant validity was also confirmed in this study, as the AVE of each concept (variable) was above than the threshold value of corresponding squared inter-construct correlation, as shown in **(Table 3).**

Table 3. Discriminant Validity

	NAV	RT	CN	AC	INT	PEOU	PU	ITT
NAV	**0.732**							
RT	0.241	**0.639**						
CN	0.243	0.219	**0.850**					
AC	0.075	0.042	0.131	**0.536**				
INT	0.281	0.201	0.205	0.117	**0.853**			
PEOU	0.226	0.148	0.285	0.209	0.260	**0.720**		
PU	0.233	0.224	0.391	0.115	0.404	0.277	**0.854**	
ITT	0.239	0.197	0.338	0.109	0.406	0.311	0.490	**0.881**

Note: Bold values are AVE; off diagonal values are squared inter-construct correlations.

The second step in SEM is structural model, which is used to test the hypotheses proposed in the study. The results **(Table 4)** suggest that out of 8 hypotheses, 6 are significant, whereas 2 are insignificant. PU and PEOU are strong predictors of intention to transact. Similarly, response time had shown significant impact on PU. In addition, accessibility and navigation were found significant determinants of POEU.

Table 4 Hypotheses Testing Results

S. No	Hypothesis	C.R Value	Supported
1	H1: PU → ITT	9.852	Yes***
2	H2a: PEOU → ITT	4.771	Yes***
3	H2b: PEOU → PU	4.241	Yes***
4	H3: INT → PU	1.89	No
5	H4: CN → PU	-0.099	NO
6	H5: RT →PU	3.542	Yes***
7	H6: AC → PEOU	6.071	Yes***
8	H7: NAV → PEOU	5.201	Yes***

*** p<0.001; ** p<0.01; *p<0.05

4. CONCLUSION

Primary purpose of this article was to examine the impact of usability dimensions on PU, PEOU and intention to transact in web-based transactional systems context. Our study found that PU and PEOU were significant determinant of intention to transact. In addition, usability dimensions, such as response time had shown influence on the PU. Similarly, navigation and accessibility were found to have a strong influence on PEOU. These results will not only help business owners in their policy decisions, but also guide the designers to focus on specific usability dimensions during implementation process.

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