'RELIABILITY' OF ONLINE PAYMENT PROCESS – A STUDY OF END USER'S PSYCHOLOGY

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ABSTRACT

Reliability is an abstract term and often used in the stream of engineering as a performance measure. In behavioural science when we talk about reliability what does it actually mean? Which parameters can be used to measure the term reliability? What are the major dimensions of the term 'reliability'? A conceptual framework of the term 'reliability' has been designed using two phases. In first phase analyzing the literatures and interviewing frequent online shoppers, it was found that from end user's perspective e-payment process consists of four stages, each stage having some reliability component associated. In the second phase questionnaire consisting of nineteen questions was circulated to get data on customer perception about reliability of e-payment process. Five major factors were explored. The results show customers perceive rectification of errors in time and with least intervention from their end is the greatest influencer of reliability of e-payment process. Confidentiality of customers' personal and financial data is the next most important dimension of reliability of e-payment. Online shoppers perceive that a timely confirmation of their e-payment should be in process to add reliability to the system and a proper authentication technique can improve the overall reliability of the e-payment process.

Keywords : e-payment, reliability, confidentiality, authentication, confirmation, rectification

INTRODUCTION

Electronic commerce is the process of buying and selling or exchanging of products, services, and information via computer networks including the Internet (Voss, 2003). An online shop, e-shop, e-store, Internet shop, webshop, webstore, online store, or virtual store tries to create a similar situation of buying products or services at a bricks-and-mortar retailer or in a shopping mall. Many payment methods can be used for online purchases (Hsieh, 2001; Roberts, 2004a; Roberts, 2004b). Online payment is defined as an electronic payment made via a web browser for goods and services using credit or debit cards (Bitpipe, 2006). Online payment is considered more time-efficient and cost-efficient, convenient and flexible for customers and businesses (Sorkin, 2001; Yu, His, & Kuo, 2002).

Online shoppers commonly use credit card to make payments, however some systems enable users to create accounts and pay by alternative means, such as debit card, various types of electronic money, cheque, wire transfer/delivery on payment, postal money order, paypal etc. The financial part of a transaction might be processed in real time (for example, informing the consumer that their credit card was declined before they log off), or might be done later as part of the fulfillment of the process. For any digital payment system to succeed the criteria needs to be fulfilled are acceptability, anonymity, convertibility, efficiency, integration, scalability, security, reliability, usability.

Electronic payment is an online service which is invoked when a customer gets involved in online transaction. It is important for a business to know whether a service, when offered to its customers, meets customer expectations or not. Service quality measure came into prominence with world famous SERVQUAL model by Parasuraman et al. subsequently when various Internet based and mobile based services became popular, models like, e-SQ and e-SERVQUAL (Zeithaml et al, 2000), WebQual (Watson and Goodhue, 2000; Barnes and Vidgen, 2002), SITEQUAL (Yoo and Donthu, 2001), eTailQ (Wolfinbarger and Gilly, 2003), GIQUAL (Tsoukatos and Rand, 2007), BANKZOT etc. was introduced. All of these models were concerned with quality of online services. These researches pointed out security of payment (Szymanski and Hise, 2000; Bauer et al., 2005; Siu and Mou, 2005; Khan and Mahapatra, 2009; Gupta and Bansal, 2012; Ashwina and Kiran, 2012) and privacy (Khan and

Mahapatra,2009; Akinci et al., 2010; Gupta and Bansal, 2012; Salarzehi et al., 2012) of related information as one of the most important determinant of service quality of online services. Therefore electronic payment process became researcher's area of interest.

In some of the very early researches of service quality only reliability was identified as a significant dimension. Various researches on electronic service quality (Jun and Cai, 2001; Han and Beak, 2004; Khan and Mahapatra, 2009; Santouridis 2009; Salarzehi et al., 2012; Gupta and Bansal, 2012) revealed that reliability is one of the most important dimension. The service quality models also revealed that all the quality dimensions were correlated - one influencing other.

Reliability is an abstract term and often used in the stream of engineering as a performance measure. In behavioural science when we talk about reliability what does it actually mean? Which parameters can be used to measure the term reliability? What are the major dimensions of the term 'reliability'?

The objective of the research is to find answer to these questions in the context of e-payment process. Very limited number of literatures can be found on this topic. Therefore to determine the parameters of reliability a two-step method was followed - first, literature review and second, personal interviews with frequent online shoppers. According to the feedback of the online shoppers the electronic payment process was divided into four distinct stages. Most of the parameters associated with these

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four stages were also had a link to the past literatures. Additional parameters found in the literature were mapped against the four stages of e-payment process, as well as some parameter not present in the literature came out as a result of the interview process.

Once the parameters were fixed, to find answer to the last research question, data were collected from people who shop online frequently to get details regarding their perception of reliability of online payment process at different phases of online shopping.

This research contributes to the field of service quality, e-payment process and more specifically to reliability. This will help the practitioners to understand the customer perception of e-payment reliability and help them to improvise the payment system.

CONCEPTUAL FRAMEWORK

Reliability refers to the consistency of performance and dependability of companies (Parasuraman et al. 1985, 1988). Reliability comprises all features of an vendor's ability to perform the promised services timely, dependably, and accurately e.g., providing services at the promised time, provision of error-free services (Jun et al., 2004; Kuo et al., 2005; Van Iwaarden et al., 2003; Jun et al., 2003; Benlian et al., 2011). Li et al. (2002) defined reliability as the ability of e-mail and web-based systems to provide accurate information and perform the promised service. When a website contains guarantees criteria, it increases the company's overall reliability (Kaplan and Nieschwietz, 2003). A study on factors affecting consumers' perception of electronic payment by Ming-Yen et al. (2013) in Malaysia reveals that benefits, self-efficacy, and ease of use exert significant influences on consumers' perception towards e-payment. To study the impact of trust on e-payment channels at Saudi Arabia Saleh (2013) conducted a study which found out security and privacy are important factors that customers consider when using e-payment channels at the time of purchase.

Electronic payment (e-payment) is a service that has been defined as "the transfer of an electronic value of payment from a payer to a payee through an e-payment mechanism" (Kim et al., 2010). Service Reliability is an important consideration for any new service deployment. reliability of transactions on the Internet is important for customers (During the user interaction with the system, the user issues multiple tasks (or requests) at different time points for different services in the system. The user-perceived service reliability is the probability that all tasks in the user session are successfully completed (Wang and Trivedi, 2009). Neuman and Medvinsky (1996) opined that the reliability of e-payment operation system should be available online 24 hours a day without breaking down at any time. The American Institute of Certified Public Accountants, Inc. (AICPA) list five principles and criteria that they evaluate for trust services : security, availability, processing integrity, confidentiality, and privacy (AICPA, 2009). Service reliability depends on service availability of

various networks or computer systems (Keralapura,2004; Wilson, 1998; Meharia, 2012). service availability corresponds to the concept of service accessibility (Tortorella, 2005). System assurance is defined as reliability and security of trading system that leads to the safe and successful Internet transactions (Lee and turban 2001; Kim et al. 2005; Beldad et al. 2010). Reliability of the system has been linked with system performance under failures (Kulkarni, 1986). Unlike Meharia (2012), privacy and confidentiality parameters have been merged under dimension confidentiality in this research.

To further explore the construct of reliability in e-payment process semi structured interviews (Thompson et al., 1989) were conducted with frequent online shoppers. Most of them were a frequent online buyer and had a good experience in going through the process of e-payment. Based on the literature and interviews a framework was designed which extracts reliability element in each stage of e-payment. This framework depicted in figure 1 has been taken as the foundation of the conceptual model of reliability of e-payment. The four stages are as follows.

Availability : after selection of the item the shopping website redirects the user for making e-payment. Therefore for reliability in the availability refers to loading of the payment website, navigation from one page of authentication to the next and the durability of the communication link.

Authentication: Reliability in authentication phase depends on the number of password the online purchaser has to input for making an online payment, levels of authentication (minimum 2 level authentications), standardized method of authentication during different online transaction, easiness to follow the instructions while going through the authentication phase.

Confirmation : Reliability in the confirmation phase refers to the procedure that ensures the online transaction has failed or successful - it can be through message in mobile, an alert on the screen or an e-mail describing the fate of the online transaction. The confirmation should come within a permissible time limit and there should not be any link failure before the confirmation reaches to the online shopper.

*Rectification : R*ectification phase becomes reliable if problems are effectively handled i.e., proper solution is provided within minimum time and without much interference with the end-user.

Confidentiality : Confidentiality refers to the degree to which the website is safe and customer information is protected. This dimension holds an important position in online purchase decision. Customers perceive significant risks in the virtual environment of e-service if there are possibilities of improper use of their financial and personal data.

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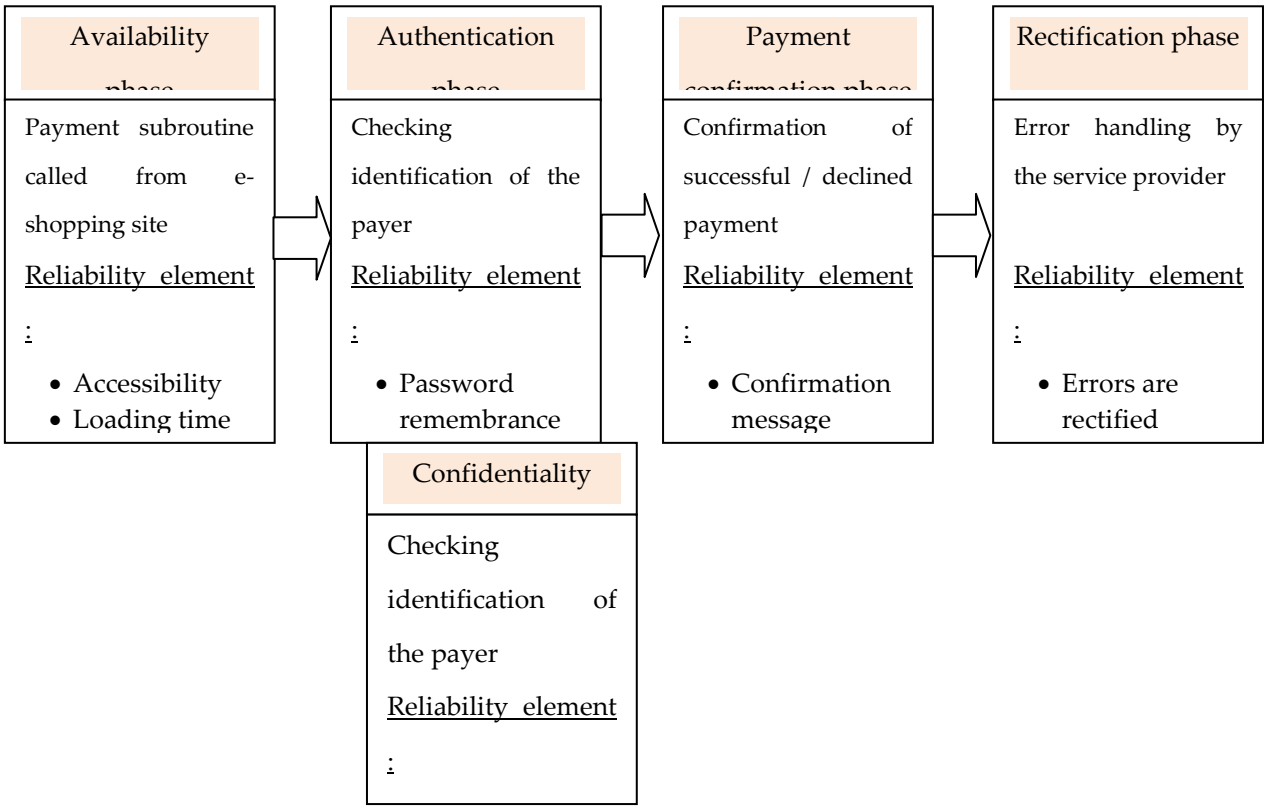

Figure 1: *Reliability parameters involved in the phases of e-payment process*

THE STUDY

Quantitative data used to extract the dimensionality of a process-based reliability model were collected by means of a structured questionnaire. Respondents judged the performance of nineteen reliability attributes on a five-point Likert-type scale anchored by 1="strongly disagree" and 5="strongly agree". All of the questions were positively formed. Convenience sampling method was followed in this stage. Responses were collected from customers at various shopping malls in city of Bangalore, India. They were asked to recall a recently used online shopping experience. Only the users of online shopping were chosen to assure that participants had sufficient online shopping experience so that all aspects of reliability of making online payment could be evaluated. Among the 345 distributed questionnaires, 278 were fully usable. In order to assess the Table 1 summarizes the basic demographic characteristics of the sample.

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Variable	Percentage
Age in years	
< 20	5
20-40	60
41-60	35
Sex	
Male	64
Female	36
Frequency of online purchase	
1 or less times in six months	20
5 to 8 times in six months	65
5 or more times a month	15

Table 1: *Demographics of the sample*

The validation of the reliability scale was done both through exploratory and confirmatory factor analysis and reliability analysis as per the guidelines provided by Churchill (1987) and Gerbing and Anderson (1988). This method of construct validation has been widely established in the literature (Baumgartner and Homburg, 1996).

To verify the construct validity of the measure factor analysis was used in which all the factors loaded highly (0.5 and above) on a single factor ensuring the uni-dimensionality of the scale. About all the subscales had alpha values greater than 0.6 which accounts for internal consistency of the scale constructs (Donio et al., 2006; Nunnally & Bernstein, 1994; Peterson, 1994). Table 2 depicts the alpha values, eigen values and factor loading for different constructs measuring the reliability of e-payment procedure in online shopping.

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Dimension items	Item label	Mean	Eigen value	Factor loadings	Cronbach alpha	Variance explained
Availability			2.58		.817	64.60
1. online shopping site can be accessed anytime anywhere	PAVL1	3.35		.748		
2. time to load the page for making e-payment	PAVL2	3.08		.832		
3. time to navigate from one page to another while making payment	PAVL3	3.12		.776		
4. link remains stable in between transaction	PAVL4	3.06		.854		
Authentication			3.15		.911	78.91
1. easy to follow the instructions while the online shopping site authenticates	PATHN1	3.32		.829		
2. need not to remember too many passwords	PATHN2	2.93		.873		
3. easy to follow different authentication method for different payment options	PATHN3	2.78		.937		
4. site provides several levels of authentication	PATHN4	2.83		.910		
Confidentiality			2.01		.754	67.09
1. Personal information are not used for promotional activities	PCNFD1	2.68		.824		
2. Privacy of personal information is retained	PCNFD2	2.65		.851		
3. Confidentiality of financial information (like credit card no, A/C no) is retained	PCNFD3	2.55		.781		
Confirmation			2.5		.817	64.75
1. Always receive payment confirmation after transaction	PCFRM1	2.96		.753		
2. It takes no time to receive payment confirmation after transaction	PCFRM2	2.98		.810		
3. Link never fails before receiving payment confirmation	PCFRM3	3.01		.823		
4. Products/ service delivered after receipt of confirmed payment	PCFRM4	3.13		.821		
Rectification			2.38		.445	59.70
1. transaction problem (if any) is rectified	PRCT1	3.21		.778		
2. It takes no time to rectify the transaction related problems	PRCT2	3.23		.743		
3. shopping site need not to be contacted for rectification of transaction related problems	PRCT3	3.13		.830		
4. needs no effort from my side to rectify transaction related problems	PRCT4	3.16		.737		

Table 2 : *Reliability and construct validity of measures of reliability of e-payment*

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In accordance to the results shown in table 2 no modification were needed in the structure of the construct. Therefore the research continued with five reliability constructs of e-payments.

In the next step the data were subjected to confirmatory factor analysis using AMOS 17.0 to test the model fit and the unidimesionality of the scale items. Maximum likelihood method has been used.

Dimension items	Factor loadings CFA	CRR	AVE
Availability		.818	.534
PAVL1	0.576		
PAVL2	0.793		
PAVL3	0.630		
PAVL4	0.861		
Authentication		.908	.717
PATHN1	0.686		
PATHN2	0.780		
PATHN3	0.974		
PATHN4	0.913		
Confidentiality		.758	.513
PCNFD1	0.700		
PCNFD2	0.802		
PCNFD3	0.639		
Confirmation		.818	.532
PCFRM1	0.632		
PCFRM2	0.705		
PCFRM3	0.768		
PCFRM4	0.802		
Rectification		.776	.467
PRCT1	0.676		
PRCT2	0.635		
PRCT3	0.793		
PRCT4	0.617		

Table 3: *Average variance extracted and composite reliability of the reliability construct*

Next, the extracted dimensions were tested for their reliability and validity one by one by means of confirmatory factor analyses (CFA) with AMOS 17. The local fit indices indicator reliability, average variance extracted (AVE) were employed to evaluate each dimension (Baumgartner and Homburg, 1996; Churchill, 1987). The corresponding measures suggest a good fit of the extracted five dimensions of the reliability scale that are defined as: availability, authentication, confidentiality, confirmation and rectification.

The fit statistics propose a superior degree of reliability and convergent validity of all scale dimensions. In order to examine whether all identified dimensions actually refer to a superordinate construct of overall reliability, a second-order CFA was conducted using all extracted five reliability dimensions ($\chi 2$ =275; df=147).

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3.1 Convergent validity

Convergent validity of a scale measure is used to assess whether the individual scale items are related or not. It refers to the degree to which the two measures designed to measure the same construct are related (Netemeyer et al., 2003). To examine the convergent validity the factor loadings and average variance extracted were examined as suggested by Fornell and Larcker (1981). With a very few exception, most of the indicators in this study have factor loadings ranging from 0.5 to 0.9 which is in line with Bagozzi and Yi (1988). The average variance extracted for each factor is more than 0.5, which is acceptable.

3.2 Assessing the fitness of the model

Each of the five first-order dimensions has a significantly large ($p<0.001$) and positive loading on the second-order factor, ranging from 0.35 to 0.62. Furthermore, all correlations between the five constructs are significant at $p<0.001$, indicating that the five scales converge on a common underlying construct (Lages et al., 2005). This suggests that the higher order model accounts for the data well. The global fit indices of the higher order measurement model shown in table 4 propose an excellent model fit. It shows GFI (goodness-of-fit) = 0.911, AGFI (adjusted goodness-of-fit)=0.885, CFI(comparative fit index)=0.945, NFI(normed fit index)=0.889 and RMSEA (root mean square error of approximation) = 0.056 which indicates the unidimensionality of the factors (Gerbing and Anderson, 1988; Lu et al., 2007). Table 4 depicts the values of goodness-of-fit indices for reliability of e-payment.

Fit indexes	Recommended Value	Observed Value
Chi-square/ df	<=3.0	1.872
GFI	>=0.90	0.911
AGFI	>=0.80	0.885
RMR	<=0.05	.032
CFI	>=0.90	0.945
NFI	>=0.90	0.889
RFI	Close to 0.90	.871
TLI	Close to 0.90	.936
RMSEA	<=0.05	0.056

Table 4: *Confirmatory factor analysis goodness-of-fit indices*

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3.3 Discriminant validity

Discriminant validity provides the information about whether the scores from a measure of a construct are unique rather than contaminated by other constructs (Schwab, 2005). To assess the discriminant validity of the constructs the AVE of each construct was compared to their corresponding inter construct squared correlation as recommended by Fornell and Larcker (1981). Discriminant validity is given when the shared variance among any two constructs (i.e., the square of their intercorrelation) is less than the AVE of each construct. Table 5 shows the AVE exceeds the squared correlations with the all the factors.

Construct			Inter construct squared correlation
Availability	<-->	Authentication	0.040
Availability	<-->	Confidentiality	0.033
Availability	<-->	Confirmation	0.041
Availability	<-->	Rectification	0.052
Authentication	<-->	Confidentiality	0.166
Authentication	<-->	Confirmation	0.031
Authentication	<-->	Rectification	0.084
Confidentiality	<-->	Confirmation	0.054
Confidentiality	<-->	Rectification	0.136
Confirmation	<-->	Rectification	0.223

Table 5 : *Inter construct squared correlations of measures of reliability of e-payment*

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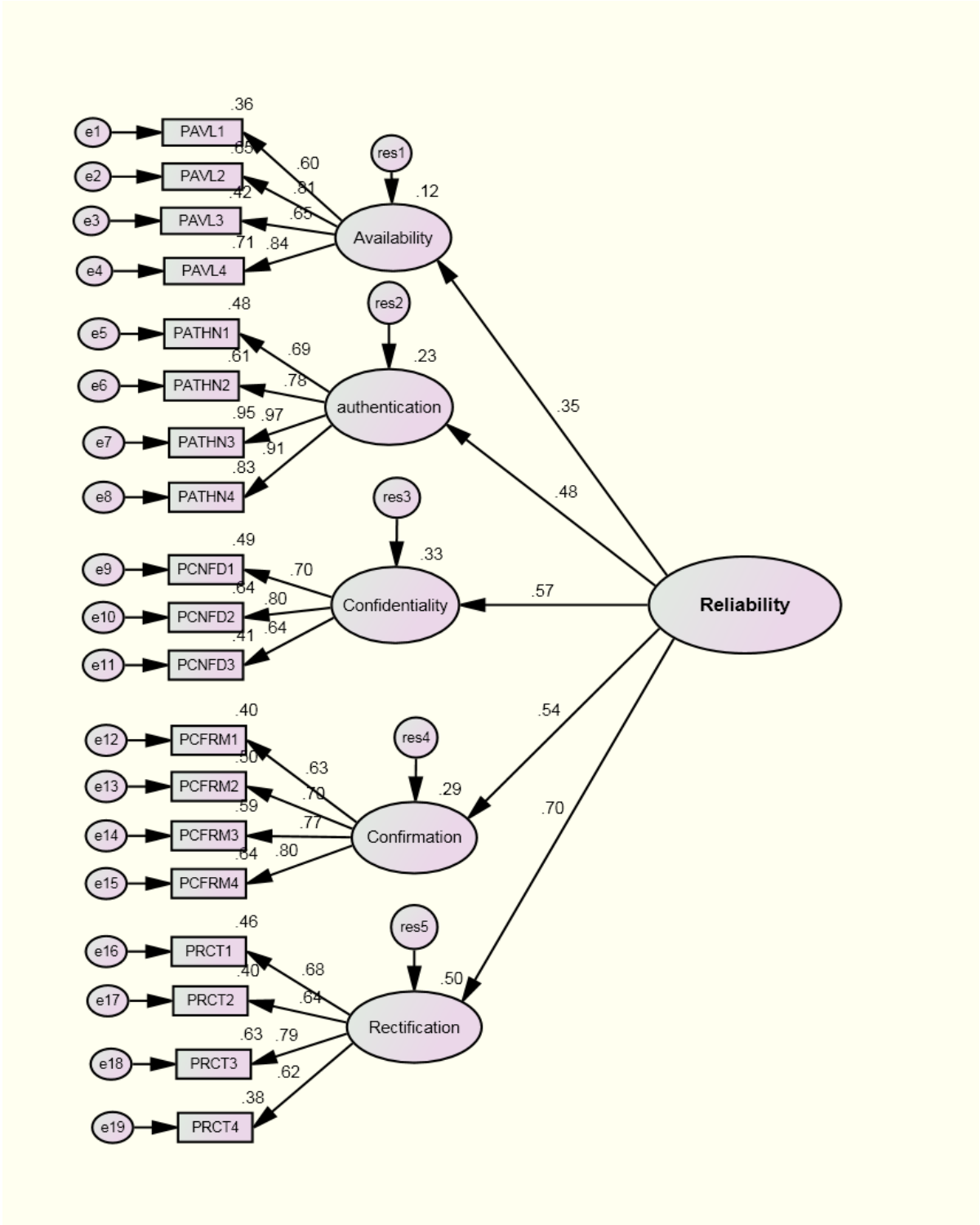

Figure 3 : Measurement model for reliability of e-payment

DISCUSSION AND CONCLUSION

Reliability is an abstract term. According to the engineering definition, reliability means the probability that a system will accurately perform its specified task under stated environmental

conditions. The purpose of the study was to develop a framework of reliability of e-payment to know what affects reliability while transacting over electronic medium.

e-payment process was analysed and found to be consisting of four main stages. From the analysis it has been found that reliability of e-payment is associated with availability of the payment website, proper authentication while making e-payment, confirmation of the fate of e-payment transaction and rectification of errors if it occurs. Apart from these four dimensions, reliability is also ensured by maintaining the confidentiality of the financial and personal data of the shopper.

The four constructs availability, authentication, confirmation and rectification constitutes of four variables each while the construct confidentiality consists of three variables. First each and every constructs were factor analysed. Five distinct dimensions came out of the analysis without any significant cross loading. All factor loadings were greater than 0.7. The reliability analysis of the constructs has also in acceptable range.

In the next stage confirmatory factor analysis was applied to the data. Availability of the website, authentication, confidentiality, confirmation and rectification - all these converged to the latent construct reliability ensuring that they all are contributing in determining reliability of the e-payment process. The scale suggests that error rectification has the highest weightage in determining the reliability of the e-payment process. Time to rectify the transaction related problem has the highest importance in this dimension. It indicates that if the identified errors are rectified properly taking minimum time that will make the e-payment system more reliable. Confidentiality of financial and personal data of the user is the second most important factor in determining reliability. Analysis of customer perception shows that privacy of personal information is the most important factor in determining confidentiality which in turn determines reliability. Online shoppers perceive that a timely confirmation of their e-payment should be in process to make the system more reliable. Proper authentication technique ensures the overall reliability of the e-payment process. Customers perceive that the proper authentication checks should be in place and the authentication process should be easy to follow. Though availability of the e-payment website has a significant impact on determining reliability of e-payment process but this is the factor which has least weightage. The major determining factor within availability is the network link which is responsible for loading time of the e-payment site and time taken to navigate from one page to another.

The results indicate that the online shoppers have matured and the technology has also been well adopted as the customers are giving more weightage for rectification and less for availability as availability of the e-payment site is taken for granted.

LIMITATION OF THE STUDY

Reliability is an important dimension in the research of service quality. Reliability has been identified as one of the major dimension in the researches of e-service quality also. Reliability of e-service encompasses the aspects related to the usage of the whole website. This research has analysed the reliability perception regarding e-payment only. Therefore it deals with the transactional part of the e-service only. Analyzing reliability of e-service as a whole including the transactional and the non-transactional part may indicate some other important dimensions.

The demographic factors can be significant predictors in assessing reliability of e-payment. Factors such as age and educational level can be considered as significant determinants reliability. Separate analysis has not been done these demographics.

Through more critical analysis of the e-payment process some new phases can be identified where reliability parameters plays an important role.

The sample has been taken from Bangalore area only. Taking samples from other metro cities like Delhi, Mumbai can give different result.

In emerging economies like India usage of Internet using mobile media and other than mobile media is quite high though compared to this usage of e-commerce is quite low. In such a situation, alanysis on what the non-e-commerce users of Internet perceive about reliability of e-payment could be useful information for web service providers.

SCOPE FOR FURTHER RESEARCH

Reliability is an important dimension that determines service quality. In various phases of the service process parameters are checked for accuracy to ensure reliability of the system. Not much work has been done on this specific construct of service quality scale. Analyzing the online shoppers' perception it can be seen that reliability is influenced by many other constructs of service quality like system availability, confidentiality etc. Therefore improvement in the areas like availability, confidentiality will have a considerable impact on the reliability of the e-payment system. This leaves an immense scope of work in the area of reliability.

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