

Evidence on E-Banking Customer Satisfaction in the China Commercial Bank Sector

Zhengwei Ma

China University of Petroleum (Beijing) /School of Business Administration, Beijing, China,
Email: mzw8632425@yahoo.com.cn

Jinkun Zhao

Harbin University/ Teaching Supervision Department, Harbin, China,
Email: zjk1998@126.com

Abstract—The goal of the study is to analyze factors of website quality that could influence e-banking customer satisfaction in the Chinese commercial banking industry. Moreover, the paper also tries to explain the relationship between website quality and customer satisfaction, and to find some major variables for keeping high level e-banking customer satisfaction. The data demonstrated that website quality have direct and significant effect to e-banking quality in the Chinese commercial banking industry. Besides this, the authors found that website quality is positively related to e-banking customer satisfaction. Finally, it is observed that efficiency, interactivity, security, information, ease of use and content are key factors to affect customer satisfaction in the e-banking service. After the validation of measurement scales, the hypothesis is contrasted through structural modeling. The authors validate the hypothesis and a measurement model. The paper proposes a model for analyzing empirically the link between website quality and e-banking customer satisfaction in Chinese e-banking industry.

Index Terms—website quality, customer satisfaction, e-banking

I. INTRODUCTION

In the present study, the creation of the measurement items went as follows. Initially, lists of items from existing instruments were compiled that would capture the five broad dimensions of web-site quality identified by Zeithaml et al. (2002): privacy/security, information quality, ease of use, graphic style and fulfillment. Where theory is less than well developed, it is beneficial to use both academic and practical perspectives (Hensley, 1999, p. 348). Therefore, using this base list of items, several iterative focus-group discussions were conducted with managers from several banks' online banking departments in an attempt to choose one item to adequately represent each of the main quality dimensions in e-banking. During these discussions, it was considered important, for the topic of website quality, to break the notion of quality into security, interactivity, efficiency, information, ease of use, content, accuracy, technology and design.

Considering the previous considerations, the paper is structured as follows: firstly, authors carry out a deep

review of the relevant literature concerning the variables included in the study; secondly, authors formalize the hypotheses; thirdly, authors explain the processes of data collection and measures validation; fourthly, authors present the results and conclusions of the study. Finally, authors mentioned potential future research.

II. LITERATURE REVIEW

In this section, authors review the relevant literature and the focus-group discussions with banks' managers, authors summarize the variables included in the study: website quality (security, interactivity, efficiency, information, ease of use, content, accuracy, technology and design) and customer satisfaction (number of complaints and overall service quality).

A. Website quality (WSQ)

Security is the freedom from danger, risks or doubts. It involves physical safety, financial security and confidentiality. It is one important dimension that may affect users' intention to adopt online banking services. Encryption technology is the most common feature at all bank sites to secure information privacy, supplemented by a combination of various unique identifiers, such as a password, mother's maiden name, a memorable date; in certain cases, a few minutes of inactivity will automatically log a user off the account. Besides, the "secure socket layer," a widely-used protocol for online credit card payments, is designed to provide a private and reliable channel between two communicating entities. Such a channel may also be ensured via the use of Java Applet that runs within the user's browser, the use of a personal identification number as well as an integrated digital signature and digital certificate associated with a smart card system (Hutchinson & Warren, 2003). A combination of smart cards and biometric recognition techniques using fingerprints offers a more secure and easier access control for computers than the password method. So, security is factor that should be taken account of when measuring website quality.

Interactivity is concerned with how an online banking website interacts with its visitors. It is defined as the facility for users and online banking websites to communicate directly with one another. In this sense,

interactivity denotes any action a user or a website takes while a user is visiting a website. Lowry et al (2006) asserted that the more interactive a website is, the more likely a user is to experience satisfaction. Two-way communication and active control of users are considered critical dimensions of interactivity, and they both play a key role in determining user satisfaction (Hoffman et al., 2000). Hoffman et al. (2000) underlined the importance of interactivity, which also determines website quality.

Furthermore, Zeithaml et al. (2002) reported a significant correlation between efficiency and e-banking quality. Downloading speeds and response time, in consumers' perception, are two crucial facts of e-banking efficiency. Downloading speed depends on the nature of the site from which information is downloaded, the computing hardware and method of connection used to download information (Jayawardhena & Foley, 2000).

Most site demonstrations are small snapshots, and some users have to download the program in order to view the demonstration. Most consumers fear that downloading in this manner may import unwanted viruses, not to mention wasting hard-disk space. Very often, slow during an e-interaction leads to a delay of service delivery and makes consumers unsure about whether or not the transaction is completed (Cai & Jun, 2003). In addition, Kwon and Chidambaram (2000), studying consumer perceptions of quality of e-banking services, concluded that comfort is one of five dimensions sufficiently representative of customers' perceived e-banking quality. Thus, efficiency should play a decisive role in measuring web-site quality.

Website quality is important because it enhances customer loyalty (Boyer & Hult, 2005), a key to the success of e-services (Reichheld & Scheffer, 2000). Zeithaml et al. (2002) and Parasuraman et al. (2005) provide excellent summaries of most of these studies, in which information quality is identified as one of the main dimensions of website quality. Among other results, Novak et al. (2000) found, through structural equation modeling, that information quality had a significant impact on website quality. In view of these findings, information should figure in when a researcher measures website quality.

Ease of use is defined as how easy it is for customers to use a website. All websites should be user-friendly, making it easy to search, navigate and use. Ease of use, as an important determinant of online banking quality, has been highly rated in website quality measurement and has been noted by some researchers (Dobholkar 1996; Zeithaml et al., 2002; Yang, 2001; Fassnacht & Koese, 2006). So, it should be taken account of when measuring website quality.

Ease of Use has been studied extensively in the context of IT adoption and diffusion (Davis et al., 1989), and it is one of the important measures for user satisfaction, system adoption, or IS success (Moore & Benbasat, 1991). In some studies, system quality has been represented by ease of use, which is defined as the degree to which a system is "user-friendly" (Doll & Torkzadeh, 1988). In the context of online banking,

consumers may access the websites based on how easy they are to use and how effective they are in helping them accomplish their tasks (Zeithaml et al., 2002).

Pikkarainen et al. (2004), and Jayawardhena and Foley (2000), claim that the content on an online-banking website will affect the website's acceptance among users. The term "content" denotes the design of the service. It creates value if such designs fit customers' needs and if it is clearly understood and updated. Content, needless to say, is a factor that will affect website quality in online banking services.

If online banking information is accurate, up-to-date, objective and authentic, it will be considered reliable. Madu and Madu (2002), as well as Xiao and Dasgupta (2002), found that accuracy of information played an important role in the formation of satisfaction. Accurate information is information that can be used effectively for a given purpose. In other words, accuracy gives website users the ability to use the information for their purposes. Therefore, many researchers (e.g., Anderson & Sullivan, 1993; Lee et al., 2002; Waite & Harisson, 2002) believed that it is essential that accurate information be introduced into online banking services and that accuracy is an important benchmark by which online banking users judge the website quality.

Zeithaml et al. (2000) state that e-service is a web service delivered through the Internet. In e-services, customers interact with or contact service providers through technologies. Customers have to rely entirely on information technologies in an e-service encounter (Zeithaml, 2000). An online banking service's deeds, effort or performance are mediated by information technologies. Zeithaml (2002) stated that some dimensions of SERVQUAL may be applied to e-service quality, but in e-service there are additional dimensions, many of which are specifically related to technologies. So, technologies are a factor that affects website quality.

In the virtual environment of e-service, for customers, a website is a main access to online banking and to a successful online process. Thus, a deficiency in website design can result in a negative impression of the website quality, resulting in customers exiting an online banking transaction. A website is a starting point for customers to gain confidence with the business (Li, 2009). Website design can influence customers' perceived image of a company. With good navigation and useful information on its website, a company may easily attract customers to its online banking services. Websites proprietors, thus, should provide appropriate information and multiple functions for their customers. So, clearly, design is an important aspect of website quality.

B. Customer Satisfaction (CS)

Lee et al. (2009) found that customer complaints had a direct effect on customer satisfaction. They reported that as one-dimensional attributes increased, the level of overall customer satisfaction also increased. Ahmed et al. (2003) discovered that major gains in customer satisfaction were likely to come from an alleviation of complaints. These researchers, overall, concur that the number of complaints is an index of customer satisfaction.

This is why, in the present study, the number of complaints were used to measure customer satisfaction.

Service quality is defined as a long-term cognitive judgment (Cronin & Taylor, 1992; Gwynne et al., 2004) regarding an organization's "excellence or superiority" (Parasuraman et al., 1988, p. 15). Two main streams of research into the dimensions of service quality exist: the Nordic school, which tends to incorporate the process and outcome dimensions (Groenroos, 1984), and the North American school, which draws on SERVQUAL (Parasuraman et al., 1985, 1991). A customer-oriented quality strategy is critical to service firms as it drives customers' behavioral intention with, for instance, highly perceived service quality leading to repeat patronage and customer loyalty (Zeithaml et al., 2000; van Riel et al., 2003). Accordingly, substandard service quality will lead to negative word-of-mouth, which may result in a loss of sales and profits as the customers migrate to competitors (Zeithaml et al., 2000; Yang, 2004). These factors stress the importance of delivering high-level services, especially within an electronic environment, where customers can readily compare service firms and where switching costs are low (van Riel et al., 2001).

China Financial Certification Authority (CFCA) was established by 12 national banks in China. It is the authority agency to monitor online banking services in China. CFCA uses two indexes to measure quality of online banking: percentage of increase in the number of users and the frequency of online banking service use. These measurement criteria were adopted in the present study to verify the overall online banking quality.

III. CONSTRUCTS FOR THE PRESENT STUDY AND HYPOTHESIS

According to the possible connection between website quality and customer satisfaction in handling private data, a direct relationship might be established between the two concepts. And follow the prior study; one construct is addressed in the present study: website quality and customer satisfaction, all of which are elaborated in prior paragraphs. The relationships between these constructs, as embedded in the hypothesis, are now illustrated in Figure 1.

Taking into account the previous considerations, the relationship between website quality and customer satisfaction is evident in personal data handling and should be examined in greater detail. With the aim of testing this connection in the online banking customer satisfaction, the following hypothesis is proposed:

H1. There will be a positive relationship between web-site quality and customer satisfaction.

IV. DATA COLLECTION

The generation of the initial questionnaire was ascertained by experts and managers interviews at banks as well as through in-depth discussions with online banking users. Pre-tests of the initial 24-item questionnaire were carried out with 30 online users to improve the questionnaire. The resulting modified

11-item pool was presented to Chinese users of online banking in drop in survey. Respondents were asked to refer to their own online banking service (the one they use regularly) when answering the questionnaire. Non-random method of collecting the data (volunteer sampling) generated 198 fully usable questionnaires. The questionnaires of collection are non-random samples. So authors compared some of the survey results with available information about the population. The results are very similar and as a consequence, authors may conclude that our sample represents the profile of the average Chinese online banking users.

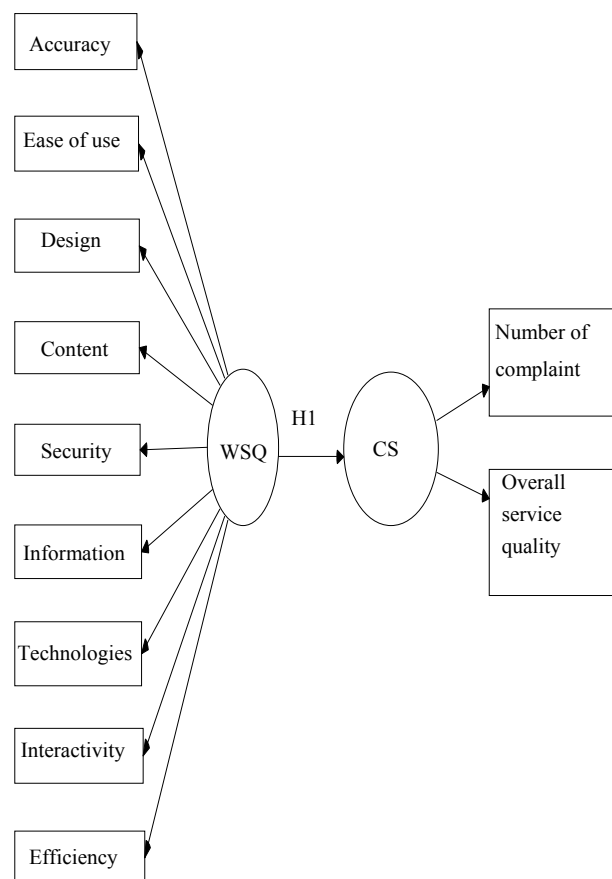


Figure 1. Research Factors and Hypotheses in the Present Study

V. MEASURES VALIDATION AND RESULTS

A. Exploratory Factor Analysis

An exploratory factor analysis using SPSS 17 was conducted on all the data. The rotated factor matrix, resulting from an Equamax rotated principal axis factor extraction of the independent variables using the 1.0 eigenvalue cut-off criterion (see table I), which indicates that eleven factors emerged and reports their factor loadings.

The data were tested using the SPSS 17 Exploratory Factor Analysis to evaluate the Cronbach alpha. The Cronbach alpha indicator is the most frequently used test for assessing reliability. Some scholars consider that it underestimates reliability (Smith et al., 1974). Consequently, the use of composite reliability has been suggested (Joreskog, 1971), using a cut-off value of

0.65 (Steenkamp and Geyskens, 2006). The results show the value for website quality's Cronbach alpha is 0.922, and the value for customer satisfaction's Cronbach alpha is 0.656. This is satisfactory. And all factor loadings were larger than 0.5, representing an acceptable significant level of internal validity. The factor loadings ranged from 0.632 to 0.940 for customer satisfaction, and from 0.804 to 0.861 for Website quality. All factor loadings were of an acceptable significant level, all 11 items were retained for further analysis (see table I).

Table I

Factor loadings (from SPSS exploratory Factor analysis)

Factors	Factor loading	Cronbach alpha	Variance explained (%)	Construct Reliability (CR)	AVE
CS		0.656	16.304	0.7016	0.5566
CS 1	0.940				
CS 2	0.632				
WSQ		0.959	59.758	0.9592	0.7232
WSQ 1	0.835				
WSQ 2	0.861				
WSQ 3	0.804				
WSQ 4	0.847				
WSQ 5	0.859				
WSQ 6	0.853				
WSQ 7	0.812				
WSQ 8	0.815				
WSQ 9	0.835				

Used SPSS Principal Axis Factoring extraction with Equamax rotation method

B. Confirmatory Factor Analysis

Authors developed a structural equations model (SEM), which the objective of testing is the proposed hypothesis (Figure 2). Authors observed that the hypothesis was supported at the 0.01 level and, in a similar way. Model fit was acceptable (Chi-square = 103.13, 43 df, $p < 0.001$, normed Chi-Square = 2.398). From calculating, the author got structural equations model (SEM) model fit indexes, and listed these indexes in the coming paragraphs.

The GFI (goodness of fit index) was devised by Jöreskog and Sörbom (1984) for ML and Uls estimation, and generalized to other estimation criteria

by Tanaka and Huba (1985). The GFI is given by

$$GFI = 1 - \frac{\hat{F}}{\hat{F}_b} \quad (1)$$

where $\hat{F}$ is the minimum value of the discrepancy function and $\hat{F}_b$ is obtained by evaluating F with $\Sigma^{(g)} = 0$, $g = 1, 2, \dots, G$. An exception has to be made for maximum likelihood estimation, since $(D2)$ is not defined for $\Sigma^{(g)} = 0$. For the purpose of computing GFI in the case of maximum likelihood estimation, $f(\Sigma^{(g)}; S^{(g)})$ is calculated as:

$$f(\Sigma^{(g)}; S^{(g)}) = \frac{1}{2} \text{tr} [K^{(g)-1} (S^{(g)} - \Sigma^{(g)})]^2 \quad (2)$$

with $K^{(g)} = \Sigma^{(g)}(\hat{\gamma}_{ML})$, where $\hat{\gamma}_{ML}$ is the maximum likelihood estimate of γ . From used the formula (1) and (2), the author calculated the Model's GFI is 0.908.

The Bentler-Bonett (1980) normed fit index (NFI), or Δ_1 in the notation of Bollen (1989b) can be written

$$NFI = \Delta_1 = 1 - \frac{\hat{C}}{\hat{C}_b} = 1 - \frac{\hat{F}}{\hat{F}_b} \quad (3)$$

Where $\hat{C} = n\hat{F}$ is the minimum discrepancy of the model being evaluated and $\hat{C}_b = n\hat{F}_b$ is the minimum discrepancy of the baseline model. From used the formula (3), the author calculated the Model's NFI is 0.946.

The comparative fit index (CFI; Bentler, 1990) is given by

$$CFI = 1 - \frac{\max(\hat{C} - d, 0)}{\max(\hat{C}_b - d_b, 0)} = 1 - \frac{NCP}{NCP_b} \quad (4)$$

where $\hat{C}$, d , and NCP are the discrepancy, the degrees of freedom and the noncentrality parameter estimate for the model being evaluated, and $\hat{C}_b$, d_b and NCP_b are the discrepancy, the degrees of freedom and the noncentrality parameter estimate for the baseline model. From used the formula (4), the author calculated the Model for the study's CFI is 0.968.

F_0 incorporates no penalty for model complexity and will tend to favor models with many parameters. In comparing two nested models, F_0 will never favor the simpler model. Steiger and Lind (1980) suggested compensating for the effect of model complexity by dividing F_0 by the number of degrees of freedom for testing the model. Taking the square root of the resulting ratio gives the population "root mean square error of approximation", called RMS by Steiger and Lind, and RMSEA by Browne and Cudeck (1993).

$$\text{Population RMSEA} = \sqrt{\frac{F_0}{d}} \quad (5)$$

$$\text{Estimated RMSEA} = \sqrt{\frac{\hat{F}_0}{d}} \quad (6)$$

The results show that the RMSEA index is 0.084.

Overall, our model exhibited a reasonable fit with the data collected. We assessed the model fit using other common fit indices: goodness-of-fit index (GFI), normed fit index (NFI), comparative fit index (CFI), root mean square error of approximation (RMSEA). The model

exhibited a fit value exceeding or close to the commonly recommended threshold for the respective indices, the commonly suggested values are listed in table II.

TABLE II
Fit statistics of final model

Fit statistic	Suggested	Obtained
Chi-square		103.130
Df		43
Chi-square significance	P < or = 0.05	0.000
Chi-square/df	< 5	2.398
GFI	> 0.90	0.908
NFI	> 0.90	0.946
CFI	> 0.90	0.968
RMSEA	< 0.1	0.084

It was also notable that this model has allowed authors to explain at a very high level the website quality in customer satisfaction of online banking service. Besides, according to the standardized estimates, authors may say that customer satisfaction is clearly and positively influenced by website quality in handling personal data ($\beta=0.73$) in Figure 2. And authors found that efficiency, interactivity, securities, information, ease of use and content have larger effect than other three factors for customer satisfaction ($\beta>0.85$) in Figure 2.

C. Construct Reliability Analysis

The construct reliability of the latent variables is an evaluation standard for the inner quality in a structural equation model (Jung, 2004). If the construct reliability is higher than 0.7, the inner quality of the model is considered acceptable (Kline, 1998). The author will use the model standardized regression weights to calculate the Construct reliability, presented as ρ_c . Construct reliability of customer satisfaction and website quality were calculated at a suggested lower limit of 0.70 with equation (1). The results show in the Table I.

$$\rho_{c1} = \left[\frac{(\sum \lambda_1)^2}{(\sum \lambda_1)^2 + \sum \theta_1} \right] \quad (7)$$

Another index, similar to construct reliability, is "average variance extracted (AVE)," presented as ρ_v . This index can explain how much variance explained in the latent variable comes from the observed variables.

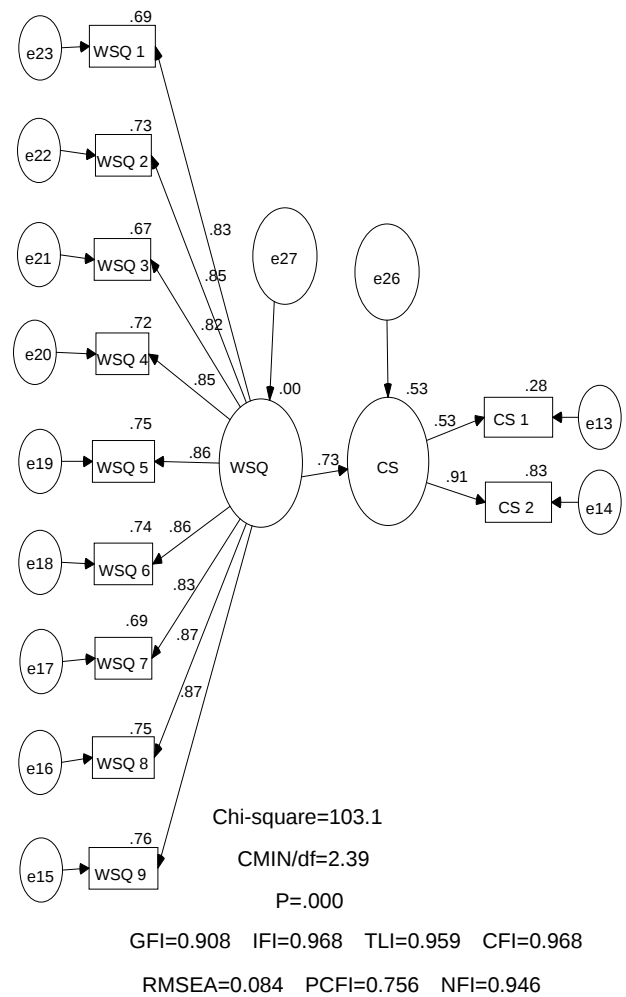


Figure 2. The structural equation model

The higher the average variance extracted, the better the observed variables could explain the latent variable. Generally speaking, the model's inner quality is considered good when the average variance extracted is higher than 0.5 (Jung, 2004). The average variance extracted from customer satisfaction and website quality were calculated at a suggested lower limit of 0.50 with equation (2). The results show in the Table I.

$$\rho_{v1} = \left[\frac{(\sum \lambda_1^2)}{((\sum \lambda_1^2) + \sum \theta_1)} \right] \quad (8)$$

VI. DISCUSSION

The results of this study provide support for our SEM. This hypothesis was supported in our findings. The positive influence is website quality to customer satisfaction. Review the results, online-banking customer satisfaction cannot be described as one fact construct. Instead, it represents a multi-factor construct that is composed of website quality judgments with regard to the service categories. Regarding the individual factors of the construct on website quality, the results indicate interactivity (0.87) and efficiency (0.87) have an added significant effect on customer satisfaction. And the

results also indicate that design (0.82) has slightly significant effect on customer satisfaction.

In conclusion, these results provide several key insights into the determinants of online banking customer satisfaction. First, interactivity and efficiency are major determinants of customer's intentions to use online banking service. Second, security and information are significant secondary determinants of customer's Intention. Finally, this study provides validated measurement scales for each factor. The empirical results strongly support the understanding of website quality as integral solutions.

Based on our findings, management can establish a sequential priority to improve website quality in online banking service. The sequential priority depends on the influence to customer satisfaction. For example, when limited resources become the barrier to improve all of nine factors, banks can improve efficiency and interactivity to be first; Security and information to be second; put ease of use and content to be third one, and accuracy, technology and design to be last.

VII. LIMITATION

There are several limitations to the present study. First, the sample was China-focused, with all of the respondents residing in China. The participants in this survey may have possessed attributes and behaviors that differed from those in other parts of the world. Second, the sample was restricted to the consumers of banks and may have possessed attributes and behaviors that differ from those of consumers in other business sectors. Next, as mentioned earlier, in the data collection section, since it was impossible to send follow-up surveys, no attempts were made to ascertain the existence of non-response bias by comparing responses to the first-wave surveys with those to a second wave.

VIII. FUTURE STUDY

Future research may follow up the present study in a number of ways. First, the present study focuses on service quality and customer satisfaction as perceived by consumers who have conducted online transactions. However, a mass of individuals primarily utilize the Internet as information sources and have never conducted commercial transactions over it. These consumers may have some unique perspectives regarding online service quality. Thus, future studies should employ a more generalized service-quality scale which taps perceptions from both groups. Second, as the e-commerce field becomes increasingly mature, consumers will develop distinct expectations for the quality of online services. Accordingly, more and more industry-wide service standards will be set up and implemented. Thus, future studies may utilize the expectation-disconfirmation paradigm to measure existing and new dimensions of online service quality and customer satisfaction.

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REFERENCES

- [1] Ahmed, I., Gul, S., Hayat, U., & Qasim, M. (2001). Service quality, service features and customer complaint handling as the major determinants of customer satisfaction in banking sector: A case study of National Bank of Pakistan. Retrieved January 14, 2001, from www.wbiconpro.com/5%5B1%5D.ISHFA.pdf.
- [2] Anderson, J. and Gerbing, D. (1988), "Structural modeling in practice: a review and recommended two-step approach", *Psychological Bulletin*, Vol. 103 No. 3, pp. 411-23.
- [3] Bauer, H. H., & Hammerschmidt, M. (2002, October). Financial portals in the internet. Paper presented at the WSEAS Conference on E-Commerce, Janeiro, Brazil.
- [4] Bentler, P.M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107, 238-246.
- [5] Bentler, P.M. & Bonett, D.G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88, 588-606.
- [6] Bollen, K.A. (1989b). A new incremental fit index for general structural equation models. *Sociological Methods and Research*, 17, 303-316.
- [7] Boyer, K., & Hult, G. (2005). Extending the supply chain: Integrating operations and marketing in the online grocery industry. *Journal of Operations Management*, Vol. 23 No. 6, pp. 642-61.
- [8] Browne, M.W. & Cudeck, R. (1993). Alternative ways of assessing model fit. In Bollen, K.A. & Long, J.S. [Eds.] *Testing structural equation models*. Newbury Park, CA: Sage, 136-162.
- [9] Cai, S., & Jun, M. (2003). Internet users' perceptions of online service quality: A comparison of online buyers and information searchers. *Managing Service Quality*, Vol. 13 No. 6, pp. 504-19.
- [10] Casalo, L.V., Flavian, C., & Guinaliu, M. (2007). The role of security, privacy, usability and reputation in the development of online banking. *Online Information Review*, Vol. 31 No. 5, pp. 583-603.
- [11] Cronbach, L.J. (1970), *Essentials of Psychological Testing*, Harper and Row, New York, NY.
- [12] Cronin, J. J., & Taylor, S. A. (1992). Measuring Service Quality: A reexamination and extension. *Journal of Marketing*, Vol. 56 No. 7, pp. 55-68.
- [13] Dabholkar, P. A. (1996). Consumer evaluations of new technology-based self-service options: An investigation of alternative models of service quality. *International Journal of Research in Marketing*, Vol. 13 No. 1, pp. 29-52.
- [14] Davis, R. D. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly*, Vol. 13 No. 1, pp. 319-339.
- [15] Doll, W. J., & Torkzadeh, G. (1988). The measurement of end-user computing satisfaction, *MIS Quarterly*, Vol. 12 No. 2, pp. 259-274.
- [16] Fassnacht, M., & Koese, I. (2006). Quality of electronic services: Conceptualizing and testing a hierarchical model. *Journal of Service Research*, Vol. 9 No. 1, pp. 19-31.
- [17] Hair, J.F. Jr., Anderson, R.E., Tatham, R.L. and Black, W.C. (1998), *Multivariate Data Analysis*, Prentice-Hall, Englewood Cliffs, NJ.
- [18] Hutchinson, D., & Warren, M. (2003). Security for internet banking: A framework. *Logistic Information*

- Management, Vol. 16 No. 1, pp. 64-73.
- [19] Jayawardhena, C., & Foley, P. (2000). Changes in the banking sector: The case of internet banking in the UK. *Internet Research: Electronic Networking Applications and Policy*, Vol. 10 No. 1, pp. 13-30.
- [20] Jooreskog, K. G. (1971). Simultaneous factor analysis in several populations. *Psychometrika*, Vol. 36 No. 1, pp. 409-426.
- [21] Jöreskog, K.G. & Sörbom, D. (1984). LISREL-VI user's guide (3rd ed.). Mooresville, IN: Scientific Software.
- [22] Kline, R. B. (1998). Principles and practice of structural equation modeling. New York: The Guilford Press.
- [23] Kwon, H.S. & Chidambaram, L. (2000, January). A test of the technology acceptance model: the case of cellular telephone adoption. Paper presented at the third Hawaiian International Conference on System Sciences.
- [24] Li, H., &Suomi R. (2007, September). Evaluating electronic service quality: A transaction process based evaluation model. Paper presented at the European Conference on Information Management and Evaluation.
- [25] Lowry, P. B., Spaulding, T., Wells, T., Moody, G., Moffit, K., &Madariaga, S. (2006, January). A theoretical model and empirical results linking website interactivity and usability satisfaction. Paper presented at the 39th Hawaii International Conference on System Sciences, Hawaii.
- [26] Madu, C. N., & Madu, A. A. (2002). Dimensions of e-quality. *International Journal of Quality & Reliability Management*, Vol. 19 No. 3, pp. 246-58.
- [27] Moore, G. C., &Benbasat, I. (1991).Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, Vol. 2 No. 3, pp. 192-222.
- [28] Novak, T., Hoffman, D., & Yung, Y. (2000). Measuring the customer experience in online environments: a structural modeling approach. *Marketing Science*, Vol. 19 No. 1, pp. 22-42.
- [29] Nurosis, M. (1993), *Statistical Data Analysis*, SPSS Inc., Chicago, IL.
- [30] Parasuraman, A., &Zinkhan, G. (2002). Marketing to and serving customers through the internet: An overview and research agenda. *Journal of the Academy of Marketing Science*, Vol. 30 No. 4, pp. 286-295.
- [31] Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985).A conceptual model of service quality and its implications for future research. *Journal of Marketing*, Vol. 49 No. 3, pp. 121-134.
- [32] Parasuraman, A., Berry, L. L., &Zeithaml, V. A. (1991). Refinement and reassessment of the SERVQUAL scale. *Journal of Retailing*, Vol. 67 No. 4, pp. 420-450.
- [33] Patricio, L., Fisk, R., & Cunha, J. (2003). Improving satisfaction with bank service offerings: Measuring the contribution of each delivery channel. *Managing Service Quality*, Vol. 13 No. 6, pp. 471-482.
- [34] Pikkarainen, T., Pikkarainen, K., Karjaluoto, H., &Pahnila, S. (2004). Consumer acceptance of online banking: An extension of the technology acceptance model. *Internet Research*, Vol. 14 No. 3, pp. 224-235.
- [35] Prentice-Hall, Englewood Cliffs, NJ. Hensley, R. (1999). A review of operations management studies using scale development techniques. *Journal of Operations Management*, Vol. 17 No. 3, pp. 343-58.
- [36] Reichheld, F., &Schefter, P. (2000). E-loyalty: Your secret weapon on the web. *Harvard Business Review*, Vol. 78 No. 4, pp. 105-114.
- [37] Smith, K.W. (1974), "On estimating the reliability of composite indexes through factor analysis", *Sociological Methods & Research*, Vol. 2, pp. 485-510.
- [38] Steenkamp, J.B.E.M. and Geyskens, I. (2006), "How country characteristics affect the perceivedvalue of a website", *Journal of Marketing*, Vol. 70 No. 3, pp. 136-50.
- [39] Steiger, J.H. & Lind, J.C. (1980, May 30, 1980). Statistically-based tests for the number of common factors. Paper presented at the Annual Spring Meeting of the Psychometric Society, Iowa City.
- [40] Tanaka, J.S. & Huba, G.J. (1985). A fit index for covariance structure models under arbitrary GLS estimation. *British Journal of Mathematical and Statistical Psychology*, 38, 197-201.
- [41] Van-Riel, A. C. R., Liljander, V., & Jurriens, P. (2001). Exploring consumer evaluations of eservices: A portal site. *International Journal of Service Industry Management*, Vol. 12 No. 4, pp. 359-377.
- [42] Waite, K., & Harrison, T. (2002).Consumer expectations of online information provided by bank websites. *Journal of Financial Services Marketing*, Vol. 6 No. 4, pp. 09-322.
- [43] Yang, Z. (2001, August). Consumer perceptions of service quality in Internet based electronic commerce. Paper presented at the EMAC Conference, Bergen,Norway.
- [44] Zeithaml, V., Parasuraman, A., &Malhotra, A. (2002). Service quality delivery through web sites: A critical review of extant knowledge. *Journal of the Academy of Marketing Science*, Vol. 30 No. 4, pp. 362-375.
- [45] Zeithaml, V. A. (2000). Service quality, profitability and the economic worth of customers: What we know and what we need to learn. *Journal of the Academy of Marketing Science*, Vol. 28 No. 1, pp. 67-85.



Zhengwei Ma is an instructor of Finance and management in the school of Business Administration of China University of Petroleum (Beijing). He obtained his bachelor's degree in Canada. And he obtained his master's and PhD degrees in USA. He acquired his doctor degree from Northwestern Polytechnic University in California, USA. Dr. Ma's research interests are in Finance and management. He participated in three foundation research programs, and published 15 papers in last three years.



Jinkun Zhao is an instructor of Economic and Management of Harbin University. He also is a staff in Department of Teaching Supervision in Harbin University. He obtained his bachelor's degree from Qiqihar University. And He obtained his master's degree from Harbin Institute of Technology. Jinkun Zhao's research interests are in enterprise management, education and teaching quality control. He participated in three foundation research programs in past three years, and published 10 papers in these three years.

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