

11-2011

# On-line Banking Systems: Are they sustainable?

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**Abstract**:

Although the trend for on-line banking has increased in recent years, the customers have not shown enthusiastic participation in the past and in present. Since the sustainability of a bank supporting on-line-banking service depends on what capacity it can attract new customers, retain already existing customers and how well can it extend its services to the current and future customer base. This investigation is focused on examining if there is any significant difference among the factors namely the transactional security, information design, navigational design, visual design, web site trust, web site satisfaction and e-loyalty over sustainability of on-line banking for different banks in USA and in India. An already available questionnaire with 23 questions classified under seven different factors mentioned above was circulated among 91 and 93 participants from USA and India who had a good experience on on-line banking. The results of the survey were analyzed using MANOVA and ANOVA. Results from the survey indicated that transaction security in on-line banking system was a concern among on-line bankers in India. But none of the factors were significant for on-line bankers in USA.

**Keywords**: Transactional Security, Information design, Navigation design, Visual design, Web site trust, Web site satisfaction, e-loyalty.

## 1. Introduction

With the growth of the Internet and its capabilities the mode of service offered to the customers by the corporate has changed. The banking industries are one such corporate that provides on-line financial services to their customers. One other reason for the banking sector to move on-line is due to the unavoidable competitiveness in the marketplace, where many banks compete among themselves to offer on-line services with added value. In such a scenario it is very difficult for a traditional brick-and-mortar bank to sustain without moving on-line (Jun and Cai, 2001). The growth of Information Technology, in the past 15 years and in the coming years, has provided advantages by providing value added services, reduced operating and fixed cost while keeping services available round the clock.

The platforms through which these services are offered are called web sites. With the advent in the technology for developing web sites and the capabilities provided by the on-line services, more than 500 conventional banks in US are currently offering on-line financial services to their customers. These services include basic account management, credit card services, fund transfers, loans etc. No doubt, these value added services provides sustainability to banks but the value addition comes at a cost. The ever increasing demands and expectations of the customers for service quality and level of services have created a frustrating affair for the service providers and had often question the sustainability of banks. It is apparent that for the banks to sustain this competition they need to provide their customers with highest level of quality services (Jun and Cai, 2001). In doing so, it is

necessary for the banks to investigate on the factors that determine their sustainability in the context of service quality they provide and the customer satisfaction they archive. The terms customer satisfaction, service quality and sustainability are interrelated as improvement in service quality by a bank purchases it with more customer satisfaction, and satisfied customers show their loyalty by making them sustainable.

The next section briefs on the literature survey on the quality of web site, service quality and in particular to the service quality that leads to customer satisfaction and results in sustainability of any organization.

## 2. Literature Survey

### Quality of web sites

The literature survey is evident of considerable work done in the area of judging the quality of the web sites for a commercial banking service. Toms and Taves introduced a tool called TOPIC to rank the web sites and according to them the metrics that determines the reputation of the web sites are web site trust, authority, aboutness and revisit. The aboutness and revisit can be still grouped as e-loyalty (Toms and Taves, 2004). According to Webb and Webb service quality and the information quality are the key determinants of the quality of the web sites. According to them service quality incorporates various factors such as reliability, empathy and tangibility and the information quality incorporates navigability, relevant information, accuracy, security, usability and trustworthiness (Webb and Webb, 2004). Tsygankov identified namely 20 parameters to scrutinize the design features of the web site. The major parameters of concern included in his study were information quality, navigation quality, security features and presence of the general information like corporate image, business process and customer support (Tsygankov, 2004). Iwaarden and Wiele discusses about customer satisfaction in any commercial web sites and adds that the major factors that contribute towards customer satisfaction includes reliabilities of the offered service also referred as transactional issues and related security, responsiveness or willingness to help customers and provide prompt services, assurance and empathy (Iwaarden and Wiele, 2002). Chung and Paynter identified the factors that inhibit adoption of I-banking and concluded that factors such as security of the on-line transactions, response time of the services, technical problems behind services and availability of up-to date information are major inhibitors towards adoption of on-line banking (Chung and Paynter, 2002). Sutcliffe arrived with a three-phase model for evaluating the web sites which included attractiveness of the web sites, navigation features in the web sites and the transactional services provided by the web site. They concluded that usability is a tradeoff between increasing the user's motivation to encourage exploration and purchasing in e-commerce, and the costs of usability errors (Sutcliffe, 2002). Chan *et.al.* performed content analysis on the commercial web sites and recommended the presence of the 22 features including promotion (timely, custom and general), provisions (timely, custom and general) and processing (timely, custom and general), which will in turn make the web sites more prominent for providing e-Commerce services (Chan et.al.). Ravi tried to measure the quality of the web site and recommended the use of the construct such as technical issues (availability, navigational features,

customization), content quality (clarity, concise and quality of information), content of the web site, physical appearance (design quality), specific content (information about the corporate, banks etc.) and perceived quality (technical adequacy, content quality, specific content and appearance). According to Ravi the factor analysis resulted in factors such as content quality loading on overall perceived quality and technical adequacy loading on user preciseness. He also found out that these loadings were very strong (Ravi, 2006).

**Service Quality and customer satisfaction**

The literature survey on service quality is evident of considerable work done in the past. The work by Jun and Cai focuses on Internet banking service quality and have identified a total of 17 dimensions of Internet Banking service quality and added that these dimensions can be classified in to three general categories namely the customer service quality (reliability, responsiveness, competence, courtesy, credibility, access, communication, understanding the customer, collaboration, and continuous improvement), banking service product quality (product variety or diverse features), and on-line systems quality (content, accuracy, ease of use, timeliness, aesthetics, and security) (Jun and Cai, 2001). The paper by Polatoglu and Ekin discusses about acceptance of the Internet banking (IB) services conducted in a Turkish bank where they tried to examine customer-related factors that affect the adoption of an innovation or a product (complexity and perceived risk) as well as organizational factors such as marketing effort. According to them IB not only reduces the operational costs of the bank but also leads to higher level of customer satisfaction and sustainability (Polatoglu and Ekin, 2001). According to Broekhuizen and Jager on-line shoppers attach more values to perceived control, in formativeness, ease of use, time/effort savings and merchandise quality (Broekhuizen and Jager, 2003). The work by Schaupp and Belanger tried to measure the level of satisfaction of the customers in on-line shopping and they emphasized on the need for an array of metrics for measuring the attitudes and feelings of the valuable existing on-line customers for success of e-Commerce. According to them the attributes for on-line customer satisfaction are privacy (technology factor like on-line security, encryption etc.), merchandising (product factors like merchandising, product value and product customization), convenience (shopping factor like convenience, trustworthiness and trust, and delivery time), trust, delivery, usability, product customization and product quality (Schaupp and Belanger, 2005). The work by Ayadi discusses about the technological and organizational preconditions as prerequisite factors in developing IB services. The technological preconditions are Information System (IS) capabilities, IS integration, multichannel managing capabilities and customer-channel relationship and the organizational preconditions are change management, Organizational flexibility, user implications and resistance to change (Ayadi, 2005). The work by Cyr and Bonanni investigats on examining how perception between the genders differ concerning transaction security, web site design, and how the experience of on-line shopping results in perceptions of web site trust, web site satisfaction and e-loyalty. According to them there is a significant difference in the perception of the web site design and web site satisfaction between the genders, but not for e-loyalty (Cyr and Bonanni, 2005).

## 3. Categories for evaluating sustainability of on-line-banking

Based on the literature survey we arrived at a conclusion that factors like the transaction security, design and presentation of the information in the web site, the navigational design of the web site, and visual design of the web site are important categories that are of concern to any customers doing on-line banking. Based on (Toms and Taves, 2004) we also decided to include the factors related to customer trust on the web site, and at the most the customer satisfaction towards the design quality of the web site and the service quality of the on-line financial services. The work by Cyr and Bonanni is similar to our work but with a different objective. They have tried to analyze how the perceptions between genders differ concerning various categories like transaction security, web site design, web site trust, satisfaction and e-loyalty. They formulated five hypotheses that tried to catch the perceptions of the genders towards the categories listed above. In order to reject or support their hypothesis they formulated a questionnaire (Appendix 1) with 23 questions under 7 factors and based on the questionnaire made a judgment either to accept or reject a particular hypothesis (Cyr and Bonanni, 2005). The questionnaire presented in (Cyr and Bonanni, 2005) was subjected to conjoint analysis and they found that all items in each factor loaded heavily on the respective factors. The Cronbach alphas was acceptable and was between 0.68 and 0.83 and the average variance extracted from each construct was greater than 0.5. Based on these three observations they feel that proposed constructs demonstrate convergent validity. In addition they have also performed the correlation matrix approach to evaluate the discriminant validity and conclude that there was lower correlation level with items from other dimensions than with items from the same construct. Based on these observations in (Cyr and Bonanni, 2005) we have decided to use their tool for our survey.

The objective of this paper is to study whether the factors such as transaction security, Information design, Navigation design, Visual design, Web site trust, Web site satisfaction and e-loyalty are significant for sustainable on-line banking. This paper in short tries to see if the service quality, Information quality, and customer satisfaction are significant for the banks to sustain in this competitive and worsened economic condition.

The section 4 deals with method followed for conducting the survey, the capacity of the participants and some demographic information about those participants. The section 5 briefs the hypothesis developed for our study and section 6 briefs on the results of the survey.

## 4. Method and Capacity of the participants

The questionnaire selected from (Cyr and Bonanni, 2005) included 23 questions and was handed over to the participants without categorizing the questions under the 7 factors. This was done to eradicate the bias that would be developed during the survey if the participants were aware of the 7 major categories and in turn we feared that if the participants were aware of the objectives of our study, they would try to falsify data so as to sway result away from the expected results. The figure 1 below shows the 7 different factors classified under 3 major categories. The methodology followed in our research includes both the qualitative method and the quantitative method. The participants were asked to rate the following

questions based on the likart's scale ranging from 1 to 5. The 1 means less likely and 5 means more likely. The questions in the questionnaire grouped under the seven different categories are given in Appendix 1.

The questionnaire was circulated among 91 participants and 93 participants in USA and India. The sample of participants selected both female and male members, there were in total 41 females and 50 males from USA and 37 females and 56 males from India. The participants involved in our study were from different age groups and most of the participants were students from University of Nebraska at Omaha (UNO) in US and Rajiv Gandhi Indian Institute of Management, Shillong (RGIIM, Shillong) in India. These participants were either in the under graduate level at UNO, graduate level or faculties at UNO and RGIIM. The demographic information inferred from the survey for different samples are provided in a table 1 and table 2 for US and India respectively:

Figure 1: List of factors and Categories

| Categories | Factors |
|---|---|
| Service Quality | • Transaction security<br>• Web site trust |
| Information Quality | • Navigation design<br>• Visual design<br>• Information design |
| Customer Satisfaction | • Web site satisfaction<br>• e-loyalty |

Table 1: Demographic Information for sample from US

| Serial No. | Categories | Frequency | |
|---|---|---|---|
| 1 | Gender | Male | 50 |
| | | Female | 41 |
| 2 | Age | 18-25 | 40 |
| | | 25-35 | 31 |
| | | 35-50 | 19 |
| | | 50-60 | 1 |
| | | 60+ | 0 |
| 3 | Head of household | Yes | 36 |
| | | No | 55 |
| 4 | Household income | < 50K | 51 |

| | | | |
|---|---|---|---|
| | | 50K-75K | 34 |
| | | 75K-100K | 4 |
| | | > 100K | 2 |
| 5 | Education | Some Undergraduate | 39 |
| | | Graduate | 37 |
| | | Masters | 10 |
| | | Doctorate | 5 |
| 6 | Type of internet connection | Dial-up | 15 |
| | | Broadband | 76 |
| 7 | No. of computers at home | 1 | 45 |
| | | 2 | 24 |
| | | 3 | 14 |
| | | 4+ | 8 |

Table 2: Demographic Information for sample from India

| **Serial No.** | **Categories** | **Frequency** | |
|---|---|---|---|
| 1 | Gender | Male | 56 |
| | | Female | 37 |
| 2 | Age | 18-25 | 51 |
| | | 25-35 | 28 |
| | | 35-50 | 14 |
| | | 50-60 | 0 |
| | | 60+ | 0 |
| 3 | Head of household | Yes | 0 |
| | | No | 93 |
| 4 | Household income | < 50K (Rupees) | 22 |

| | | | |
|---|---|---|---|
| | | 50K-75K (Rupees) | 9 |
| | | 75K-100K (Rupees) | 17 |
| | | > 100K (Rupees) | 45 |
| 5 | Education | Some Undergraduate | 14 |
| | | Graduate | 21 |
| | | Masters | 58 |
| | | Doctorate | 0 |
| 6 | Type of internet connection | Dial-up | 6 |
| | | Broadband | 87 |
| 7 | No. of computers at home | 1 | 39 |
| | | 2 | 30 |
| | | 3 | 16 |
| | | 4+ | 8 |

The name of the banks included in our study is not mentioned in this paper keeping in the interest of the banks. Indeed, we have used a different name to represent the banks namely Bank A, Bank B, Bank C and Bank O for other banks that were not of interest to us. We selected participants participating with different banks in different amounts. The table 3 below accounts for the sample size across different banks of interest in USA and India.

Table 3: Sample size distribution across different banks in USA and India

| | | | | | |
|---|---|---|---|---|---|
| **1.** | **Sample Size** | **91** | **1.** | **Sample Size** | **93** |
| **2.** | **Bank Code** | **Size** | **2.** | **Bank Code** | **Size** |
| | **Bank A** | **31** | | **Bank A** | **30** |
| | **Bank B** | **15** | | **Bank B** | **21** |
| | **Bank C** | **37** | | **Bank C** | **26** |
| | **Other Banks (O)** | **8** | | **Other Banks (O)** | **16** |

## 5. Hypothesis and data analysis

Our study tried to see if there were any significant difference between the service quality, information quality and customer satisfaction offered by web site among different banks. The assumptions are listed below in table 4:

Table 4: Hypothesis based on the 3 categories and 7 factors

| |
|---|
| $H_0$1: For each individual dependent variable the score are the same across the banks. |
| $H_a$1: For each individual dependent variable the score are not the same across the banks. |
| $H_0$2: All the dependent variables are the same across all the banks. |
| $H_a$2: Not all the dependent variables are the same across all the banks. |

The $H_0$1 and $H_a$1 tries to determine if the individual dependent variables (factors) are significant across the different banks considered in this study. We plan to perform a one-way ANOVA to reject or not reject the $H_0$1. The $H_0$2 and $H_a$2 then takes all the factors together to see if any one of the factor is significant across the banks considered in this study. We plan to perform MANOVA to reject or not reject the $H_0$2. The independent variable for ANOVA and MANOVA is the different banks (choice of one bank over the other) considered in this study. Before performing ANOVA/MANOVA the normality assumptions across both the sample size were verified using both Box's test for equality of covariance matrices and Levene's test of equality of error variance. The Box's test of equality of covariance matrices with p-value of 0.056 (USA) and 0.064 (India) for both the sample size indicated that the samples follow a normal distribution. Based on the p-value we concluded that the covariance is not constant. The Levene's test for equality of error variances for each of the dependent variables for both the sample sets indicated a p-value greater than 0.5 thus suggesting that the variance is constant for each of the dependent variable. The assumptions for normality and analysis of variance are all recorded at a significance level of 0.05. Table 5 and table 6 records the result of ANOVA and MANOVA for US and India respectively.

Table 5: ANOVA and MANOVA analysis for USA sample set

| Dependent variable | p-value | Result |
|---|---|---|
| Transaction Security | 0.609 | Do not reject null hypothesis |
| Information design | 0.505 | Do not reject null hypothesis |
| Navigation design | 0.213 | Do not reject null hypothesis |
| Visual design | 0.781 | Do not reject null hypothesis |
| Web site trust | 0.494 | Do not reject null hypothesis |
| Web site satisfaction | 0.563 | Do not reject null hypothesis |
| E-loyalty | 0.442 | Do not reject null hypothesis |

| Dependent variable | P-value | Result |
|---|---|---|
| All dependent variables put together | 0.895 | Do not reject null hypothesis |

Table 6: ANOVA and MANOVA analysis for India sample set

| Dependent variable | P-value | Result |
|---|---|---|
| Transaction Security | **0.003** | **Reject null hypothesis** |
| Information design | 0.780 | Do not reject null hypothesis |
| Navigation design | 0.955 | Do not reject null hypothesis |
| Visual design | 0.315 | Do not reject null hypothesis |
| Web site trust | 0.339 | Do not reject null hypothesis |
| Web site satisfaction | 0.061 | Do not reject null hypothesis |
| E-loyalty | 0.632 | Do not reject null hypothesis |

| Bank | Turkey HSD | | 95% Confidence Interval | |
|---|---|---|---|---|
| | P-value | Result | Lower | Upper |
| A and O | 0.003 | Reject null hypothesis | 0.2404 | 1.4774 |
| C and O | 0.005 | Reject null hypothesis | 0.1966 | 1.4663 |
| | | | | |

| Dependent variable | P-value | Result |
|---|---|---|
| All dependent variables put together | 0.026 | **Reject null hypothesis** |

## 6. Discussion

The post survey analysis was to initially conduct ANOVA and MANOVA on the dependent variables namely the Transactional Security, Information design, navigational design, visual design, web site trust, web site satisfaction and e-loyalty over the independent variables, the different banks (i.e. on the choice of one bank over another) under considerations. For the USA sample set ANOVA results indicated a p-value of greater than 0.05 for all the dependent variables suggesting that none of the variables are significant and there is no evidence that the choice for banking with any particular bank are affected by any of the dependent variables. The MANOVA analysis using the Wilk's Lambda method with the p-value of 0.895, suggests the same thing as confirmed by ANOVA. In the sample set obtained from India we noticed that MANOVA resulted in rejecting the null hypothesis with p-value of 0.026 suggesting that at least one of the dependent variable is significant towards determining the choice of a particular bank over another. To determine which dependent variable is significant we conducted ANOVA and found that transaction security (p-value of 0.003) was significant. The Turkey HSD post-hoc test was performed between the means of bank A, B, C and O to see if there is any significant difference between their means. It was observed that the means of bank A and bank O differs and means of bank C and bank O differs. For all other combinations (A and B, A and C, B and C, B and O) the means do not differ. The p-values and 95% confidence interval values for significant group (bank) means are recorded in table 6. The results here strengthen our belief that in India transaction security is still a factor for people to engage in on-line banking (*i.e.* will result in customer satisfaction) and transaction security is a factor that will determine how much sustainable a bank is over its competitors. The results of the MANOVA and ANOVA are obtained using SPSS and are provided in detail in table 5 and table 6.

When we say transaction security is a significant concern among banks in India we are zeroing down on on-line transaction security issues. Any on-line transaction performed through a bank web site undergoes various threats. To make matter worst on-line transaction is mediated through Internet which is a public network. Transactions on public network are not free from attacks leading to disclosure of customers privacy information to any illegitimate person. This is a bleach of confidentiality. It is also possible that any illegitimate person could get access to information that he is not supposed to hold, also known as authentication bleach. In addition to that security concerns such as man-in-the-middle attack, unavailability of web-site in the midst of the transaction leading to transaction remaining incomplete, and in a worst case a bank employee involving in a fraud makes a customer loose his trust in an operation initiated by the bank to improve banking practices with the aim of reducing cost and enrich customer satisfaction. We believe that banks in US have addressed to all these security concerns during the design of their web sites and through the years of operation have made people believe that whenever they are

performing any transaction (Account management to money transfer) they are under the safe hands. In addition they have also made information regarding their security policies available to the public. In the event of any security bleaches the banks in US have ensured their customers with the faith that the bank takes the entire liability. In contrast, banks in India have failed to provide their customers with enough information on their security policies and liability issues. One more reason for concern in transaction security through on-line banking in India is that people in India have less information about how new security policies and technologies have ensured that vulnerabilities are deferred completely. It is therefore that the banks and educational institutions in India have to educate people about how technological advances in security and new policies are making them safe against different vulnerabilities. Banks in India should also communicate their policies for liability to their customers clearly and have to win their trust and faith in them. It is our belief that once customers learn more about security and liability policies of their banks they are banking with then they would feel more satisfied and continue banking with them thus making them sustainable.

## 7. Future Research

Since this was a pilot study we considered a small sample size across both the countries. Our future work will try to survey with a sample size greater than 300-400 participants across both the countries to see if the conclusions we arrived are the same. In this study the sample sizes were not calibrates according to the population distribution across both countries. For example In India the population is 2-2.5 folds greater than in USA, and so is the number of on-line banking customers.

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## Appendix 1

Questionnaire used to gather data

**Conducted by Ph.D. students in IT from PKI, UNO**
**Research Advisor: Dr. Lotfi Najjar**

Please circle only one of the options for each question below.

Gender : Male Female
Age: 18-25 25-35 35-50 50-60 60+
Head of Household: Yes No
Family Income: < 50K 50K – 75K 75K-100K > 100K
Education: Some Undergraduate, Graduate, Masters, Doctorate.
Type of internet connection: Dial-up, Broadband
Number of computers at home: 1, 2, 3, 4+
Bank: First National Bank of Omaha, Bank of the West, US Bank, Other _____

Please answer the following questions on a scale of 1 to 5; with 1 meaning less likely to 5 meaning more likely.
Please check only one square for each question below.

| Questions | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. I believe my account information will be secure when using this site. | | | | | |
| 2. If I perform a transaction from this website, I believe it would be a secure transaction. | | | | | |
| 3. The third party assurance seals on this website make me feel this website is secure. | | | | | |
| 4. I find the information logically presented. | | | | | |
| 5. I find the information on this site to be well organized. | | | | | |
| 6. All product options, product attributes and product information are well presented. | | | | | |
| 7. I can easily navigate this site. | | | | | |
| 8. I find this website easy to use. | | | | | |
| 9. This site provides good navigation facilities to information content. | | | | | |
| 10. The degree of interaction (video, demos) offered by this site is sufficient. | | | | | |
| 11. This site allowed me to efficiently tailor the information for my specific needs. | | | | | |
| 12. This website looks professionally designed. | | | | | |
| 13. The screen design (*i.e.*, colors, images, layout, *etc.*) is attractive. | | | | | |
| 14. The website animations are meaningful. | | | | | |
| 15. I can trust this website. | | | | | |
| 16. I trust the information presented on this website. | | | | | |
| 17. I trust the transaction processing on this website. | | | | | |
| 18. This website appeals to me visually or emotionally. | | | | | |
| 19. The website completely fulfils my needs and expectations. | | | | | |
| 20. This website satisfies my needs well. | | | | | |
| 21. Using this website is satisfactory overall. | | | | | |
| 22. I would consider doing transactions from this website in the future. | | | | | |
| 23. I would visit this website again. | | | | | |

Thank you, for your help in filling out this survey.