E-Commerce Mobile Banking Security: A Comparative Study

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Dr. Maria Matriano

ABSTRACT

In the study, it was about determining the e-commerce security of the selected banks considered. To answer the specific statement of the problems such as (1) To what extent the security of the selected banks in terms of reliability, protection, quality, safety, and confidentiality, (2) Is there significant difference on the perception of respondents? (3) What are the problems encountered by the respondents of the study? What are the suggestions offered by the respondents of the study? Questionnaires were distributed to the qualified respondents using purposive sampling. Data were analyzed using percentage, arithmetic mean, standard deviation, and t – test, spearman rank correlation in the validation. The results of the study were, in reliability, protection, quality, safety, and confidentiality most of the respondents agreed on greater extent or the banks offered good services as far as the e-commerce security.

INTRODUCTION AND ITS BACKGROUND

Introduction

E-commerce refers to the use of electronic means and technologies to conduct commerce (sale, purchase, transfer, or exchange of products, services, or information), including within business, business-to-business, and business-to-consumer interactions. Delivery of product or service or service may occur over or outside of the internet (Whinston, Choi, & Stahl, 1997). Electronic commerce is more and more sought after among rich and industrial country. Long time ago since its inception to the society to manage the transfer of money, payment, remittances and the like, its convenience, elegance, attractiveness were among the desired end among the people, and in business in particular. This study is aiming to assess the security of mobile banking of selected banks in terms of its reliability, protection, quality, safety, and confidentiality.

Conceptual framework

Below are the conceptual frameworks of the study.

The web portal refers to the web pages of the organization that are the main communication medium used by the organization to its stakeholders: students, teachers, suppliers, vendors, and marketing tool. It was also provides mails, learning management system. Assessments were done to determine its value to the
organization, utilization, quality, relevance, customer service. Results were the output of the study which was used by the management in their diagnostics of the web portal.

Data and information quality represent important and maturing area in the field of management information (Wang, 2005).

From the dictionary.com web page, stated that the portal site or web pages also called portal site or web portal. (http://www.businessdictionary.com/definition/portal.html).

The aim of the value chain is to find sources for a company’s competitive advantage (Porter, 1985).

Statement of the problem
Below are the statements of the problem of the study.

1. What are the profiles of the respondents in terms of age, gender, education, interest in the web portal?
2. To what extent are the security of mobile banking of selected banks in terms of reliability, protection, quality, safety, and confidentiality?
3. Is there significant difference on the perception of respondents on the selected bank?
4. What are the problems encountered by the respondents of the study in the services of the banks?
5. What are the suggestions offered by the respondents of the study?

Hypothesis
Ho: There’s no significant difference on the perception of respondents in terms of services of the selected banks.

Scope and delimitation of the study
The study was confined only to the services of the selected banks on their e-commerce security particularly the reliability, protection, quality, safety, and confidentiality.

Significance of the study
To the organization: The study will be an evaluation of their web portal in the mind of its stakeholders. To the general public: The study will be enhancing the quality of the services. To the other researcher: The study will be a source of their referencing.

METHODS AND PROCEDURES

Research Design
The study will be utilizing the descriptive type of research since it will be assessing the present or current state of crisis preparedness of the organization. Descriptive method is designed for the investigator to gather information about present existing conditions. (Sevilla, 1992, p.94)

Research Instrument Used
The research instruments used in the research were the questionnaires, documentary analysis, and interview. Interview was administered to selected respondents to verify if the reply were agreed to the questionnaires, to validate the response in the questionnaires. However their response was not included in the data.

Documentary analysis was used to examine the crisis preparedness of the organization. The study involves gathering information examining record. (Sevilla, 1992 p. 108).

Questionnaires were the main instrument, since this can get the opinion of the target respondents, and it is the most cost effective of getting data from the respondents, since they cannot be interfere with their time and not interrupting on them.

Data Gathering Procedure
The data were taken from the qualified respondents through questionnaires. Then retrieve the same questionnaires within a week span of time.

Samples and Sampling Techniques
The samples of the study to be considered were 30. (Sevilla, 1992, p.192) Sampling techniques to be used were the purposive sampling, sampling with a purpose (Sevilla, 1992, p. 190), since the respondents: (1) Person who are subscribe to the services of the banks (2) Person or customer of the identified banks for a definitive period at least nearly one year. (3) Person who have access to the mobile services of the selected banks. (Martinez, 1992, p. 145)

Statistical Treatment of Data

The statistical tools to be used in the research were as follows.

**Percentage** – was used to determine the weight of the variable. Relative to the number of respondents

\[ p = \frac{f}{n} \times 100\% \]

Where: 
- \( p \) - percentage
- \( f \) – Frequency
- \( n \) – Number of item

Frequency distribution – this statistical tools were used to represent the quantity of the respondents.

Weighted mean – this statistical tools were used to determine the range of data in the interpretation.

\[ x' = \frac{\sum}{N} \]

Where: 
- \( x' \) – weighted mean or average
- \( \sum \) - sum
- \( N \) - no. of responses

Standard deviation – this statistical tools were used to determine the variability of the data representing the respondents opinion asked in the questionnaires.

\[ s = \sqrt{\frac{\sum (x-x')^2}{(n-1)}} \]

Where: 
- \( \sqrt{\text{square root}} \)
- \( \sum \) - summation
- \( x \) – Item value
- \( x' \) - mean
- \( s \) – Standard deviation
- \( n \) – Number of item / value

Spearman rank correlation – used in validating questionnaires.

\[ \rho = 1 - \frac{6\sum d_i^2}{n(n^2 - 1)} \]

Where: 
- \( d_i \) = difference in paired ranks
- \( n \) = number of cases

\[ \rho = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2\sum(y_i - \bar{y})^2}} \]

Where: 
- \( i \) = paired score

Spearman Rank correlation, (Stats tutor, 2015)

- .00-.19 “very weak”
- .20-.39 “weak”
- .40-.59 “moderate”
- .60-.79 “strong”
- .80-1.0 “very strong”
\textit{t–test} – was used to determine the significance of the perception of two groups of respondents considered in the study. (Punzalan, 1989) This test was used to determine if an observed difference between the averages of two groups is statistically significant. (Sevilla, 1992, p.260)

For calculating \( t \) value:

Formula:

\[
t = \frac{x_1 - x_2}{\sqrt{s_1^2/n_1 + s_2^2/n_2}}
\]

Where: \( t \) – \( t \) test (for two tail)

\( x_1 \) – mean of the first group

\( s_1 \) – standard deviation of the first group

\( n_1 \) – number of item in the first group

\( x_2 \) – mean of the second group

\( s_2 \) – standard deviation of the second group

\( n_2 \) – number of item in the second group

For locating the \( t \) value in the table:

\( df \) – degree of freedom

Alpha set to 95\% level of significance or 5\% error

Scale to be used in the interpretation of value.

Likert scale:

<table>
<thead>
<tr>
<th>Scale</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.25 - 4.00</td>
<td>Highly Acceptable / To a Great Extent</td>
</tr>
<tr>
<td>2.50 - 3.24</td>
<td>Acceptable / Extent</td>
</tr>
<tr>
<td>1.75 - 2.49</td>
<td>Moderately Acceptable / Moderate Extent</td>
</tr>
<tr>
<td>1.00 - 1.74</td>
<td>Not Acceptable / Lesser Extent</td>
</tr>
</tbody>
</table>

**PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA**

Below were the presentation, analysis, and interpretation of data.

1. What is the profile of the respondents in term of age, gender?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Segment</th>
<th>( f )</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>20-29</td>
<td>5</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>30-39</td>
<td>14</td>
<td>47 %</td>
</tr>
<tr>
<td></td>
<td>40-49</td>
<td>6</td>
<td>20  %</td>
</tr>
<tr>
<td></td>
<td>50-59</td>
<td>5</td>
<td>17  %</td>
</tr>
<tr>
<td></td>
<td>60 &amp; above</td>
<td>0</td>
<td>0   %</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30</td>
<td>100 %</td>
</tr>
</tbody>
</table>

| Gender   | Male      | 22     | 73\% |
|          | Female    | 8      | 22   \% |
|          | Total     | 30     | 100\% |

| Education | College level | 10 | 33\% |
|           | College Graduate | 1 | 3   |
|           | Masteral Level  | 3 | 10  |
|           | Masteral Graduate| 4 | 13  |
Table 1 shows the distribution of respondents. On age: 20-29 bracket was 5 or 17%, 30-39 bracket were 14 or 47%, 40-49 bracket were 6 or 20%, 50-59 bracket were 5 or 17%, 60 and above bracket were 0 or 0%. On Gender: Male were 22 or 73%, Female were 8 or 27%. On education: college level were 10 or 33%, college graduate was 1 or 3%, masteral level were 3 or 10%, masteral graduate were 4 or 13%, Ph.D level were 0 or 0%, and Ph.D graduate were 12 or 40%. On occupation: manager position was 3 or 10%, teacher were 16 or 53%, doctor was zero, banker were zero, businessman were 1 or 3%, others: consist of position other than in the table were 10 or 33%. On number of years experiencing mobile banking services: less than 1 year was 14 or 47%, 1-3 years were 12 or 40%, 3 years and above were 4 or 13%. On Banks in which the respondents were affiliated: NBO bank were 10 or 34%, Bank Muscat were 20 or 63%.

2. To what extent are the security of mobile banking of selected banks in terms of reliability, protection, quality, safety, and confidentiality?

Table 2 Distribution of respondents as to extent of the security of mobile banking of selected banks in terms of reliability.

<table>
<thead>
<tr>
<th>Reliability</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful transaction</td>
<td>4.077</td>
<td>1.017</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Clarity of signal</td>
<td>3.846</td>
<td>0.765</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Accuracy of transaction</td>
<td>4.115</td>
<td>0.674</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Accessibility of online system</td>
<td>3.962</td>
<td>0.871</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Available service</td>
<td>3.923</td>
<td>0.935</td>
<td>Greater Extent</td>
</tr>
</tbody>
</table>
Table 2 shows the distribution of respondents as to extent of security of mobile banking of selected banks in terms of reliability. On successful transaction the mean was 4.077 and the standard deviation was 1.017 or greater extent. On clarity of signal the mean was 3.846 and the standard deviation was 0.765 or greater extent. On accuracy of transaction the mean was 4.115 and the standard deviation was 0.674 or greater extent. On availability of online system the mean was 3.962 and the standard deviation was 0.871 or greater extent. On available service the mean was 3.923 and the standard deviation was 0.935 or greater extent. Overall the mean was 3.985 and the standard deviation was 0.852 or greater extent.

Table: 3 Distribution of respondents as to extent of the security of mobile banking of selected banks in terms of protection.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>System password</td>
<td>4.038</td>
<td>1.020</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Protection of transaction</td>
<td>4.000</td>
<td>0.800</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Back up code in mobile</td>
<td>3.731</td>
<td>1.040</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>System automatic timeout</td>
<td>3.846</td>
<td>1.046</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Security question</td>
<td>3.923</td>
<td>1.017</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Overall</td>
<td>3.908</td>
<td>0.985</td>
<td>Greater Extent</td>
</tr>
</tbody>
</table>

Table: 4 Distribution of respondents as to extent of the security of mobile banking of selected banks in terms of quality.

<table>
<thead>
<tr>
<th>Quality</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer satisfaction</td>
<td>4.154</td>
<td>0.711</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Less complaints</td>
<td>3.923</td>
<td>0.744</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Less error occurrence in login</td>
<td>3.731</td>
<td>0.776</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>Access of the system</td>
<td>3.808</td>
<td>0.800</td>
<td>Greater Extent</td>
</tr>
<tr>
<td>System report / statement generation</td>
<td>3.846</td>
<td>1.046</td>
<td>Greater Extent</td>
</tr>
</tbody>
</table>
Table 4 shows the distribution of respondents as to extent of acceptability in terms of quality. On customer satisfaction the mean was 4.154 and the standard deviation was 0.711 or greater extent. On less complaints the mean was 3.923 and the standard deviation was 0.744 or greater extent. On less error occurrence in login the mean was 3.731 and the standard deviation was 0.776 or greater extent. On access of the system the mean was 3.808 and the standard deviation was 0.800 or greater extent. On system report / statement generation the mean was 3.846 and the standard deviation was 1.046 or greater extent. Overall the mean was 3.892 and the standard deviation was 0.815 or greater extent.

Table 5 shows the distribution of respondents as to extent of the security of mobile banking of selected banks in terms of safety. On transactional safety the mean was 4.192 and the standard deviation was 0.800 or greater extent. On paying / billing safety the mean was 4.269 and the standard deviation was 0.709 or highly extent. On remittance safety the mean was 3.885 and the standard deviation was 1.032 or greater extent. On transfer checking statement the mean was 3.808 and the standard deviation was 1.106 or greater extent. On electronic balance checking the mean was 3.885 and the standard deviation was 1.007 or greater extent. Overall the mean was 4.008 and the standard deviation was 0.931 or greater extent.

Table 6 shows the distribution of respondents as to extent of the security of mobile banking of selected banks in terms of confidentiality.
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3. There’s no significance difference on the perception of respondents in acceptability of the web portal of the organization. (See t test calculation below)

4. The following are the problems encountered by the respondents of the study: long queue on the Module and the lecture, the web portal less friendly, some password may not be working, grades not available for viewing, very slow when upload the assignment were experience.

5. The following are the suggestion offered by the respondents of the study: Better management and system registration, improve the system, open online time table registration.

**SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS**

**Findings**

1. Table 1 shows the distribution of respondents. On age: 20-29 bracket was 5 or 17%, 30-39 bracket were 14 or 47%, 40-49 bracket were 6 or 20%, 50-59 bracket were 5 or 17%, 60 and above bracket were 0 or 0%. On Gender: Male were 22 or 73%, Female were 8 or 27%. On education: college level were 10 or 33%, college graduate was 1 or 3%, masteral level were 3 or 10%, masteral graduate were 4 or 13%, Ph.D level were 0 or 0%, and Ph.D graduate were 12 or 40%. On occupation: manager position was 3 or 10%, teacher were 16 or 53%, doctor was zero, banker was zero, businessman were 1 or 3%, others: consist of position other than in the table were 10 or 33%. On number of years experiencing mobile banking services: less than 1 year was 14 or 47%, 1-3 years were 12 or 40%, 3 years and above were 4 or 13%. On Banks in which the respondents were affiliated: NBO bank were 10 or 34%, Bank Muscat were 20 or 63%.

2. Table 2 shows the distribution of respondents as to extent of security of mobile banking of selected banks in terms of reliability. On successful transaction the mean was 4.077 and the standard deviation was 1.017 or greater extent. On clarity of signal mean was 3.846 and the standard deviation was 0.765 or greater extent. On accuracy of transaction mean was 4.115 and the standard deviation was 0.674 or greater extent. On accessibility of online system mean was 3.962 and the standard deviation was 0.871 or greater extent. On available service mean was 3.923 and the standard deviation was 0.935 or greater extent. Overall mean was 3.985 and the standard deviation was 0.852 or greater extent.

Table: 3 Distribution of respondents as to extent of the security of mobile banking of selected banks in terms of protection. On system password the mean was 4.038 and the standard deviation was 1.020 or greater extent. On protection of transaction the mean was 4.00 and the standard deviation was 0.800 or greater extent. On back up code in mobile the mean was 3.731 and the standard deviation was 1.040 or greater extent. On system automatic timeout the mean was 3.846 and the standard deviation was 1.046 or greater extent. On security question the mean was 3.923 and the standard deviation was 1.017 or greater extent. Overall the mean was 3.908 and the standard deviation was 0.985 or greater extent.

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3. There’s no significant difference on the perception of the respondents when grouped according to profile.

4. The following are the problems encountered by the respondents of the study: lack of refund after wrong transaction. Sometime hard to access, it takes time to resolve errors, frequent inaccessibility of the account by the issued pin code, some person came late for work (affects the clients who are waiting), staffs have no sufficient information about different service, copying the transaction receipt is very difficult, every time asking over the phone it is one way good but sometime very difficult carrying over the phone token everywhere not feasible, too slow speed of the network, most of the ATM deposit is down,

5. The following are the suggestion: Speeding the wrong transaction refund, improve the system, be able to address problem of inaccessibility, open more branch, offer world-wide service, train the staff, need to be more simplified.

Conclusions
1. About the respondents of the study, it showed that majority of were of age 30-39 brackets were 14 or 47%, followed by 40-49 bracket were 6 or 20%, then by 50-59 bracket were 5 or 17%, and 20-29 brackets was 5 or 17%, then by 60 and above bracket were 0 or 0%. On Gender: Male were 22 or 73%, Female were 8 or 27%

On education: majority of the respondents were Ph.D graduate were 12 or 40%. Then followed by college level were 10 or 33%, then by masteral graduate were 4 or 13%, and masteral level were 3 or 10%, then by college graduate was 1 or 3%. On occupation: majority of the respondents were teacher were 16 or 53%, others: consist of position other than in the table were 10 or 33%. Manager position were 3 or 10%, businessman were 1 or 3%.

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5. The following are the suggestion: Speeding the wrong transaction refund, improve the system, be able to address problem of inaccessibility, open more branch, offer world-wide service, train the staff, need to be more simplified.

Recommendations
1. Study should be repeated on other banks to validate or correlate further the result of the study.
2. The study should be conducted by the third part to verify the veracity of the result.

VALIDATION OF QUESTIONNAIRES

Relating this research, questionnaires were validated through expert opinion and through correlation using the spearman rank correlation that is the identified set of respondents were served the questionnaires in the
morning and served the same questionnaires a day after, data were collected and analysed using the said statistical tool. It showed 0.8. It was acceptable.

BIBLIOGRAPHY

T test calculation

<table>
<thead>
<tr>
<th></th>
<th>NBO</th>
<th>BM</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>3.925</td>
<td>3.960</td>
</tr>
<tr>
<td>S</td>
<td>1.054</td>
<td>0.8617</td>
</tr>
<tr>
<td>N</td>
<td>22</td>
<td>8</td>
</tr>
<tr>
<td>t calc</td>
<td>0.136</td>
<td></td>
</tr>
</tbody>
</table>

Df       | 28   |
Alpha    | 0.05 |
t tabular | 1.697|

(t calc=0.136) < (t tab=1.697)

Rule:
If, t calc > t tabular,
reject H0, otherwise, accept H0
since t calc < t tabular (0.136<1.697)

decision: | reject null |
accept null | x |

For the calculation of the t value:
\[
t = \frac{x_1 - x_2}{\sqrt{s_1^2/n_1 + s_2^2/n_2}}
\]
\[
t = \frac{(2.68 - 2.54)}{\sqrt{.816^2/18 + .864^2/12}} = 0.73488027
\]
For the value of \( t \) tabular or \( t \) critical
\[
df = (n_1-1)+(n_2-1) = 22-1 + (8-1) = 28
\]
From the table: \( \alpha \) set 5%, or 0.05
\[
t \text{ tabular value} = 1.701
\]
From the figure above, the \( t \) computed value is 0.0144, while the \( t \) tabular value is 1.701,
Decision rule, \( t \) calculated > \( t \) tabular reject the null hypothesis.
Since \( t \) tabular > \( t \) calculated value, thus, accept the null hypothesis.

Legend:
\( x \) – Mean
\( s \) – Standard deviation
\( n \) – no. of items.
\( df \)– degrees of freedom
5% error

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Publication

Research
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