Smart Card-Based Electronic Payment Systems and Retailing in HO CHI MINH City

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Abstract: This study focuses on determining the impacts of some factors to the usage behaviors of smart card-based electronic payment systems for retail operations in the locality of Ho Chi Minh City. Based on a research sample of 333 consumers in Ho Chi Minh City, some statistical methods for reliability assessment, such as Cronbach’s Alpha, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM), have been used for analysis. The research results are shown that these factors, including Relative Advantage, Compatibility, Previous Experience, and Social Influence have directly and positively affected to Perceived Usefulness. Additionally, Perceived Usefulness has a direct and positive impact on the Usage Behavior in smart card-based electronic payment systems in retail operations in the locality of Ho Chi Minh City.

Key words: Payment, Electronic Payment System, Card Payment, Retail.

INTRODUCTION

With the current trend of digital technology development, payments in trading operations have also been more and more improved through electronic payment methods. Over the past years, the most outstanding one, card payment, is considered as an indispensable step in the globalization of commercialization (Lok, 2015).

It is hard to deny the payments through electronic payment systems in the context of our economy resonating with the current technological booms, which is the reduction in transaction costs and travelling costs by the trends of online shopping, limiting a number of unnecessary transactions and manipulations when purchasing goods and commodities (Shang et al., 2005). Therefore, the payments through the electronic payment systems have been becoming increasingly necessary. Accordingly, card payment through these systems is addressed as one of the quick and easy ways for most consumers (Oh et al., 2003).

By the above reasons, the objectives of this study aim to identify and measure the influence degrees of certain factors to the usage behavior of smart card-based electronic payment systems in retail operations in the locality of Ho Chi Minh City. Based on that basis, the study have proposed a certain number of administrative implications for improvement in usage behavior of smart card-based electronic payment systems in retail operations in the locality of Ho Chi Minh City.

LITERATURE REVIEWS

Electronic payment system:

According to Dennis (2004), the electronic payment system is defined as a form of financial commitment, involving the buyers and the sellers, through using a several means of electronic communications. Briggs and Brooks (2011) implied that the electronic payment was a form of association between the organizations and individuals supported by the banks that allowed the exchanges of digital currencies. In another framework, Peter and Babatunde (2012) demonstrated the electronic payment systems as a method of wire transfer via the Internet. As reported by Adeoti and Osotimehin (2012), the electronic payment system is referred to an electronic means of making the payments for online shopping goods and services at a lot of supermarkets and shopping centers. Another definition has indicated that the electronic payment means a payment method by digital currencies for goods or services when shopping instead of paying by cash or checks, both in directly or by post. These electronic payment systems are usually classified into four categories: credit cards, debit cards, digital currencies, and micropayment systems (Maiyo, 2013).

In consequence, such smart card-based electronic payment system is the most typical form of payment of commercial transactions based on the basis of combination of payment card and electronic payment system. By using this payment method, it is easier for the buyers, customers, or clients to make their transactions with the suppliers anywhere at any time, both online and offline (Lok, 2015).

Research hypotheses:

Relationship between Relative Advantage (RA) and Perceived Usefulness (PU):

The application of advanced technologies in combination with the intuitive and user-friendly interfaces is considered as some advantages in smart card-based electronic payment systems. This allows its users to make payment actions more efficient and faster than those of others (Lok, 2015). The benefits of technology, interface, and fast transaction processing time are believed as the relative advantages of such smart card-based electronic payment systems (Lok, 2015). In addition, these advantages mainly help the users realize the usefulness of smart card-based electronic payment systems (Shang et al., 2005). Hence, the study has proposed Hypothesis H1: Relative Advantage has a positive impact on Perceived Usefulness of the consumers to the smart card-based electronic payment systems.
Relationship between Compatibility (CO) and Perceived Usefulness (PU):
Compatibility is implied as one of the conditions that make it easy for the consumers to make their sole discretion to use a certain product or service (Plouffe et al., 2001). Moreover, the compatibility has been found to positively correlate with perceived usefulness (Al-Gahtani & King, 1999). Chau & Hu (2001) have taken compatibility into their consideration as an external variable affecting to perceived usefulness, so their results is demonstrated that the compatibility actually has a significant impact on the perceived usefulness. Furthermore, Wu, Wang & Lin (2007) have also confirmed that the compatibility is fundamental to an increase in perceived usefulness. Besides, Oh et al. (2003) have confirmed that the compatibility make some impacts to perceived usefulness. Thus, the study have proposed Hypothesis H2: Compatibility has a positive impact on Perceived Usefulness of the consumers to the smart card-based electronic payment systems.

Relationship between Previous experience (EX) and Perceived Usefulness (PU):
According to Akaah et al. (1995), it is believed that previous experience and knowledge of the consumers are significantly important in determining how their attitudes were formed. The more positive the previous experience of an individual was, the higher the corresponding attitude of such person was, which leads to the perceived usefulness became higher. As can be seen, their experience is shown that such consumers have a basic understanding of the issues that they are about to make, so the more experience they make, the easier it is for them to make their decisions (Lok, 2015). Not only that, when experienced with the same issue, the consumers will find out the benefits of these products or services more clearly, so the perceived usefulness are higher for those consumers who have higher experience (Lok, 2015). Thereby, the study has proposed Hypothesis H3: Previous experience has a positive impact on Perceived Usefulness of the consumers to the smart card-based electronic payment systems.

Relationship between Social Influence (SO) and Perceived Usefulness (PU):
In addition to the mentioned-above issues, the consumers’ decision-making is partly influenced by the opinions and perspectives of the society and their surrounding peoples (Venkatesh & Morris, 2000). The research results of Yi et al. (2006) are shown that when perceptions of the consumers on products or services are positively affected by social perspectives, that is, when the consumers has referred to the opinions of their surrounding peoples, their decisions tends almost entirely up to the reference point. As a consequence, the study have proposed Hypothesis H4: Social Influence has a positive impact on Perceived Usefulness of the consumers to the smart card-based electronic payment systems.

Relationship between Perceived Usefulness (PU) and Usage Behavior (UB):
Perceived usefulness has always been taken into account as an important presumption for applying technology in some studies of usage behavior (Hong, 2002; Hsu & Lu, 2004; Lippert & Forman, 2005; Shang et al., 2005). Perceived usefulness is considered as the backbone in promoting the usage behavior of the consumer (Shang et al., 2005). The more the consumers perceive the usefulness of a product or service, the more easily they will use the product or service than those who are not aware of the usefulness of such product or service (Hsu & Lu, 2004; Lippert & Forman, 2005). As a result, the study has proposed Hypothesis H5: Perceived Usefulness has a positively impact on Usage Behavior of the consumers on smart card-based electronic payment systems.

RESEARCH METHODS

It is applied the following research methods: (1) Qualitative methods through interviews with ten experts in order to propose the models and build a measurement scale for the research model, as well as designing the questionnaires; (2) Quantitative methods are performed through data analysis such as descriptive statistics, reliability assessment, EFA and CFA factor analysis to determine the suitability of research data with theoretical modeling and structural equation modeling (SEM) to test the hypotheses in the proposed model for demonstration of the impacts of these factors on the usage behavior of smart card-based electronic payment systems in retail operations in the locality of Ho Chi Minh City.

Table 1: Measurement scales for the factors of the research model

| No. | Factor               | Encryption | Measurement scale                                                                                                                                                                                                 | Source                     |
|-----|---------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| 1   | RA1                 | Applying the payment method with a smart card-based electronic payment system gives me better control of my payment                                                                                           | Liao and Lu (2008), Shih (2008) |
| 2   | RA2                 | Applying the payment method with a smart card-based electronic payment system helps me make my payments faster than other methods                                                                              |                            |
| 3   | RA3                 | The payment process by smart card-based electronic payment system is simpler than those of other methods                                                                                        |                            |
| 4   | RA4                 | Applying the payment method by smart card-based electronic payment system is less likely to cause errors than other methods                                                                                 |                            |
| 5   | RA5                 | Applying the payment method by smart card-based electronic payment system is less manipulation than other methods                                                                                          |                            |
| 6   | CO1                 | Applying the payment method by smart card-based electronic payment systems is suitable for my payment needs                                                                                                   | Moore and Benbasat (1991), Wu and Wang (2005) |
| 7   | CO2                 | Applying the payment method by smart card-based electronic payment systems is suitable for my personality                                                                                                  |                            |
| 8   | CO3                 | In my opinions, the payment method by smart card-based electronic payment systems is suitable for the needs of retailers.                                                                                 |                            |
| 9   | EX1                 | For the past 30 days, I have applied the electronic payment system for payment                                                                                                                             | Roberts and Henderson (2000) |
| 10  | EX2                 | For the past 30 days, I have used my card for payment                                                                                                                                                       |                            |
| 11  | EX3                 | If the retailer agrees, I prefer to use the card to pay for my transactions                                                                                                                                    |                            |
By applying convenience sampling method, the survey subjects are the consumers located in the locality of Ho Chi Minh City. According to Hoang & Chu (2008), the minimum sample size is \( n = 5 \times x \) (\( x \): number of variables/measurement scale). This study applied 20 observed variables, so the minimum sample size is \( 5 \times 20 = 100 \) observations. However, to ensure the persuasion and quality of the model results, the author also conducted a survey with 350 questionnaires, of which the number of valid questionnaires was 333 with full of information on the questionnaire.

| Variable          | Content                                      | Frequency (n) | Percent (%) |
|-------------------|----------------------------------------------|---------------|-------------|
| **Gender**        |                                              |               |             |
| Male              |                                              | 124           | 37.2        |
| Female            |                                              | 209           | 62.8        |
| **Educational qualification** |                              |               |             |
| High school       |                                              | 54            | 16.2        |
| Vocational school/College |                                | 119           | 35.7        |
| Undergraduate     |                                              | 148           | 44.4        |
| Post Graduate     |                                              | 12            | 3.6         |
| **Age group**     |                                              |               |             |
| Under 30 years old|                                              | 105           | 31.5        |
| From 30 to 40 years old |                                    | 131           | 39.3        |
| From 41 to 50 years old |                                   | 55            | 16.5        |
| Over 50 years     |                                              | 42            | 12.6        |
| **Income**        |                                              |               |             |
| Less than VND 5 million per month |                                    | 69            | 20.7        |
| From VND 5 to 10 million per month |                               | 219           | 65.8        |
| Over VND 10 million per month |                                      | 45            | 13.3        |

Among of 333 consumers, there were 209 female consumers, accounted for 62.8% and 124 male consumers, accounted for 37.2%. The main educational qualification is undergraduate, accounted for 44.4%. The main age group is under 40 years old, accounting for 70.8%. The income from VND 5 to 10 million per month was accounted for the highest proportion with 65.8%.

**RESEARCH RESULTS**

The author conducted the test by applying Cronbach’s Alpha coefficient with 20 observed variables of 6 factors. The test results showed that Cronbach's Alpha coefficients of these respectively factors, including Relative Advantage: 0.826; Compatibility: 0.741; Previous Experience: 0.737; Social Influence: 0.825; Perceived Usefulness: 0.855 and Usage Behavior: 0.795. Thus, all Cronbach’s Alpha coefficients of 6 factors are greater than 0.6 and the correlation coefficients of these variables are greater than 0.3, except for the variable RA5 of the Relative Advantage factor, whose correlation coefficients are less than 0.3. Therefore, the RA5 variable is excluded from the subsequent analysis.

| Factor                | Number of variables at first | Cronbach’s alpha | Variable |
|-----------------------|-----------------------------|------------------|----------|
| Relative Advantage    | 5                           | 0.826            | 4 (Removed RA5) |
| Compatibility         | 3                           | 0.741            | 3        |
| Previous Experience   | 3                           | 0.737            | 3        |
| Social Influence      | 3                           | 0.825            | 3        |
| Perceived Usefulness  | 3                           | 0.855            | 3        |
| Usage Behavior        | 3                           | 0.795            | 3        |

All of 19 variables of these factors that satisfied the conditions of analysis and reliability assessment of Cronbach’s Alpha (removed the RA5 variable of the Relative Advantage factor) were included in the exploratory factor analysis (EFA). The EFA’s mission is to explore the structure of the measurement scales for these factors: RA (Relative Advantage), CO (Compatibility), EX (Previous Experience), SO (Social Influence), PU (Perceived Usefulness), and UB (Usage Behavior).
Usefulness) and UB (Usage Behavior). After ensuring proper implementation of the EFA process, these factors will be tested for data cleaning.

Table 4: EFA analysis results

| Component | Value |
|-----------|-------|
| KMO       | 0.701 |
| Bartlett’s test of sphericity | |
| Approx. Chi-Square | 2,514.909 |
| df | 171 |
| Sig. | 0.000 |

Source: Results of SPSS analysis.

The results of the exploratory factor analysis - EFA are shown that the KMO coefficient equals to 0.701, which is greater than 0.5 so that it is satisfactory. The significant level of the Sig. taken from Bartlett’s test equals to 0.000, which is less than 5% so that it is satisfactory. The Total Variance Explained equals to 71.359%, which is greater 50% so that it is satisfactory. The number of extracted factors is 6, so it is consistent with the hypothesis about the components of the measurement scale. At the same time, the eigenvalue equals to 1.194, which is greater than 1; the factor loadings are greater than 0.5 and arranged in six groups of separate factors, namely RA (Relative Advantage), CO (Compatibility), EX (Previous Experience), SO (Social Influence), PU (Perceived Usefulness) and UB (Usage Behavior), which ensures the inclusion of variables of these factors into the following analysis steps.

Table 5: Rotated Component Matrix

| Component | RA3 | RA2 | RA4 | RA1 | PU3 | PU2 | PU1 | SO3 | SO2 | SO1 | UB3 | UB2 | UB1 | EX2 | EX3 | EX1 | CO2 | CO1 | CO3 | Eigenvalue |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------|
|           | 0.878 | 0.815 | 0.813 | 0.736 | 0.903 | 0.885 | 0.853 | 0.914 | 0.876 | 0.714 | 0.924 | 0.818 | 0.788 | 0.913 | 0.818 | 0.605 | 0.862 | 0.853 | 0.706 |

Cumulative (%) | 16.721 | 32.721 | 45.222 | 56.413 | 65.058 | 71.359

Source: Results of SPSS analysis.

Next, the results of CFA analysis have shown that the distributed value of Chi-square/df = 1.892, which is less than 5; GFI = 0.926, which is greater than 0.9; TLI = 0.934, which is greater than 0.9; CFI = 0.947, which is greater than 0.9, and RMSEA = 0.052, which is less than 0.1, in respectively. Therefore, it can be said that the model is suitable for market data.

Table 6: CFA analysis results according to standardized coefficients

| No. | Content | Value |
|-----|---------|-------|
| 1   | Chi-square/df | 1.892 |
| 2   | P-value c/o Chi-square | 0.000 |
| 3   | GFI     | 0.926 |
| 4   | TLI     | 0.934 |
| 5   | CFI     | 0.947 |
| 6   | RMSEA   | 0.052 |

Source: Results of AMOS analysis.

In the meantime, all standardized loadings are greater than 0.5, which means as having statistical significance, so the concepts reach convergent validity. For that reason, the main factors included in the analysis are: RA (Relative Advantage), CO (Compatibility), EX (Previous Experience), SO (Social Influence), PU (Perceived Usefulness) and UB (Usage Behavior).
In addition, the analysis results have shown that the composite reliability values and the total variance explained of all factors are greater than 0.5. This indicates that these factors ensure its reliability when included in the analysis. As well, the P-value of the correlation coefficients for each pair is less than 0.05 (i.e. less than 5%), so the correlation coefficient for each pair of these concepts differs from 1% at 95% reliability. Thereby, these concepts achieve discriminant validity.

**Table 7: Variance extracted and Composite reliability**

| No. | Factor                | Variance extracted | Composite reliability |
|-----|-----------------------|--------------------|-----------------------|
| 1   | Relative Advantage    | 0.899              | 0.712                 |
| 2   | Compatibility         | 0.856              | 0.701                 |
| 3   | Previous Experience   | 0.871              | 0.799                 |
| 4   | Social Influence      | 0.901              | 0.813                 |
| 5   | Perceived Usefulness  | 0.931              | 0.826                 |
| 6   | Usage Behavior        | 0.813              | 0.797                 |

Source: Authors' calculation results.

Derived from CFA analysis results, the results of the structural equation modeling (SEM) were also consistent with market data. This is reflected in some indicators, such as: the distributed value of Chi-square/df = 1.885, which is less than 5; GFI = 0.925, which is greater than 0.9; TLI = 0.935, which is greater than 0.9; CFI = 0.946, which is greater than 0.9, and RMSEA = 0.052, which is less than 0.1.

**Table 8: SEM analysis results according to standardized coefficients**

| No. | Content       | Value |
|-----|---------------|-------|
| 1   | Chi-square/df | 1.885 |
| 2   | P-value chi Chi-square | 0.000 |
| 3   | GFI           | 0.925 |
| 4   | TLI           | 0.935 |
| 5   | CFI           | 0.946 |
| 6   | RMSEA         | 0.052 |

Source: Results of AMOS analysis.
Image 2: The results of the SEM show the impact of factors on the use of smart card-based electronic payment systems for retail operations in the locality of Ho Chi Minh City

Source: Results of AMOS analysis.

Table 9: Results from SEM model

| Relationship | Estimate | S.E. | C.R. | P  |
|--------------|----------|------|------|----|
| PU ← RA     | 0.047    | 0.067| 0.711| 0.007|
| PU ← CO     | 0.075    | 0.078| 0.960| 0.007|
| PU ← EX     | 0.006    | 0.088| 0.072| 0.002|
| PU ← SO     | 0.064    | 0.087| 0.740| 0.009|
| UB ← PU     | 0.072    | 0.066| 1.086| 0.008|

Source: Results of AMOS analysis.

Likewise, as can be seen based on the analysis results on the p-values of the influential relationships between the factors, the p-values are less than 5%. Hence, the relationships between factors p, including RA (Relative Advantage), CO (Compatibility), EX (Previous Experience), SO (Social Influence), PU (Perceived Usefulness) and UB (Usage Behavior) are both statistically significant in the structural equation modeling (SEM).

Table 10: SEM model results according to standardized coefficients

| Relationship | Standardized estimate | Standardized estimate according to the diagram |
|--------------|-----------------------|----------------------------------------------|
| PU ← RA     | 0.047                 | 0.05                                         |
| PU ← CO     | 0.067                 | 0.07                                         |
| PU ← EX     | 0.006                 | 0.01                                         |
| PU ← SO     | 0.060                 | 0.06                                         |
| UB ← PU     | 0.063                 | 0.06                                         |

Source: Results of AMOS analysis.

Considering the regression coefficient values among these factors, it shows that the regression coefficient values are all greater than zero, which means that there is a positive influence among these factors, specifically as follows:

The factors, including Relative Advantage, Compatibility, Previous Experience, Social Influence, positively affects to Perceived Usefulness with its standardized regression coefficients 0.05; 0.07; 0.01; and 0.06, in respectively. This means that when these factors, like Relative Advantage, Compatibility, Previous Experience, and Social Influence are increased (by 1 unit), the Perceived Usefulness will increase (with its respectively increasing levels of 0.05 times, 0.07 times, 0.01 times, and 0.06 times). Nevertheless, the Perceived Usefulness positively affects to the Usage Behavior with its regression coefficient of 0.06, which means that when the factor of Perceived Usefulness is positive (increased by 1 unit), the Usage Behavior will increase (with the corresponding increase of 0.06 times).

Thus, after performing the analysis of structural equation modeling (SEM), the study has shown the impacts of these factors on Perceived Usefulness and Usage Behavior to the smart card-based electronic payment systems in retail operations in Ho Chi Minh City.
CONCLUSIONS AND ADMINISTRATIVE IMPLICATIONS

CONCLUSIONS

The research results have confirmed that these factors make direct and positive impacts on the perceived usefulness on smart card-based electronic payment systems in retail operations. By the above reasons, the factor of perceived usefulness has directly and positively impacted to usage behavior to the smart card-based electronic payment systems in retail operations in Ho Chi Minh City.

Administration implications

Based on the research results from the model, to promote the application of smart card-based electronic payment systems in retail operations in Ho Chi Minh City, the study have proposed some administrative implications, as follows:

- Retailers should carry out extensive propaganda of their benefits from smart card-based electronic payment systems to their consumers through a variable of methods of communications, such as leaflets, detailed panels at the stores.
- Retailers should carry out discount activities when their consumers apply the payment method with smart card-based electronic payment systems.
- Nonetheless, the large distributors and retailers in the locality, such as: Big C, Lotte, Maximark, and Co.opmart also need to regularly organize their sessions for consultancy, instructions, and share the benefits in application of the payment method with electronic payment systems.

Although taking the best endeavors to complete this study, due to the limitations of time and knowledge, this study still has certain limitations, such as the sample size is quite small, the scope of research is only taken place in the locality of Ho Chi Minh City. Therefore, the following studies can increase the sample size and expand the scope of research in many other provinces and cities.

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