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Factors Affecting Non Bank-Issued POS E-micropayment Choice: A Study of Taiwan Market

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Abstract

In Taiwan, organizations with existing captive markets, that is, transport-related companies and convenience stores, have issued their own non bank-issued POS e-micropayment programs and achieved good success. Due to legal restriction imposed on non bank-issued programs, Taiwan's market has evolved further resulting in two major categories: non bank-issued programs and bank-issued programs. Through an extended Post-acceptance Model of IS Continuance which incorporated network externality, we examined the factors which influenced users to continue using non bank-

issued programs and the impact of bank-issued programs on the development of non bank-issued programs. Our study found that perceived usefulness, satisfaction of users and the demand side of network externality directly affected users' intention to continue using the program. The study also showed how external factors in Taiwan such as regulatory restriction and retail structure have affected programs' development.

Keywords: Non Bank-issued POS e-micropayment Program; Network Externality; Taiwan

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INTRODUCTION

Micropayment is common for POS transactions (Bank for International Settlements, 2001). Even though the amount per micropayment transaction is very minimal, the aggregated amount can be substantial. Anticipating business opportunity, operators had introduced a number of e-micropayment programs around the world. However, with the exception of a few, many programs are not so successful. The vision of a cashless society (Clark, 2005) is still a dream, leading McGrath (2006) to remark very smallest payments have stubbornly remained the domain of cash and coin.

Success of POS e-micropayment program depends to a large extent on the presence of network externality. POS e-micropayment program is a networked good (Baddeley, 2004) with micropayment market being a two-sided market with both consumers (demand side) and merchants (supply side) subjecting to network effects and facing the chicken and egg dilemma (See-To, Jaisingh and Tam, 2007). Hong Kong's Octopus card is successful because of its huge pool of users (the demand side) and being widely accepted by merchants and retail operators (the supply side).

The evolution of POS e-micropayment program in Taiwan is subjected to the uneven development of public transportation system, the important role of convenience stores in Taiwan's retail structure and legal restriction on such financial instrument. As a result, Taiwan has evolved into two major categories of POS e-micropayment programs: non bank-issued program and bank-issued program. Against this background, this paper examines the factors which influence users to continue using non bank-issued programs and the impact of bank-issued programs on non bank-issued programs. In our analysis, we also concentrate on finding the linkage between the program with the highest potential to succeed and the public transportation system as well as retail structure.

POS E-MICROPAYMENT PROGRAMS IN TAIWAN

Organisations with existing captive market (public transport-related companies and convenience stores) have issued their own non bank-issued POS e-micropayment programs and achieved good success. Launched in 2002 by the Taipei Smart Card Corporation (TSCC), EasyCard is a contactless smartcard ticketing system for buses, metro, and car parks in Taipei City and Taipei County. It is now widely used in Taipei City (the capital of Taiwan) and Taipei County. More than 9 million EasyCards are in use (Taipei City Government, 2007) and can be easily value-added in convenience stores and metro stations. Card users also enjoy 20 per cent discount on each metro trip.

Taiwan's retail market has the highest density of convenience stores in the world (Liu, 2007). In 2006, Taiwan had 8,798 convenience stores for a population of 23 million within a total area of 36,000 sq km. 7-Eleven chain dominated with 4,385 stores (50 per cent). As most of the transactions are micropayment, 7-Eleven launched its own POS e-micropayment program, icash in 2004. The store operator hopes to use this stored value card to lock-in customer's loyalty and increases its sales volume ("FamilyMart," 2007). With close to five-million icash cards in use, it is Taiwan second-largest e-wallet product after EasyCard ("President Chain," 2005; Liu, 2007).

Despite highly popular in Taipei City/County, EasyCard's evolution into a full-pledged Hong Kong's Octopus-like system in the future is mired with obstacles. Expanding to include other non-transportation functions that involve financial transaction (such as payments at convenience stores and food outlets) is restricted by Taiwan's Banking Act. According to the Banking Act, only banks are allowed to issue cash storage cards with multiple functionalities ("Announcing," 2006). Non-bank bodies can only issue cash storage card for financial transactions within its own sector. Card issuers (e.g. TSCC and convenience stores) form alliances with banks to get around the restriction imposed by the Banking Act. An EasyCard/Credit Card that incorporated 3 functions: credit card; transport payment system; and e-wallet for micropayment, was introduced by TSCC and Taiwan banks in 2006. These cards can be used for functions beyond transport-related micropayment. There are also incentives for consumers. Participating merchants offer discounts on purchases paid through EasyCard/Credit Card. 7-Eleven co-operated with Chinatrust Commercial Bank, Taiwan's largest local credit card issuer, and introduced icashwave, a co-branded contactless credit card in 2007 ("President Chain," 2007).

EasyCard is not the only transport e-micropayment card in Taiwan. Kaohsiung City in Southern Taiwan, the site of second metro system in Taiwan, has introduced TaiwanMoney Card which integrated transport and shopping payments in Southern Taiwan ("Multipurpose cash card," 2005). The public bus companies in Northern Taiwan (Taoyuan County, Hsinchu City/County and Miaoli County but exclude Taipei City/County) have also introduced their own version of EasyCard.

RESEARCH MODEL AND HYPOTHESES

Despite the business potential, many e-micropayment programs offered worldwide are not so successful. Taiwan's POS e-micropayment programs have also gone through such experience but are now going through a revival. Hence, the happenings in Taiwan and its analysis can offer useful lessons for both researchers and practitioners on the characteristics which lead to the successful adoption and diffusion of such programs. As a networked good, it is useful to understand how network externality is impacted by the unique external environment of Taiwan and such understanding will give researchers and practitioners better appreciation of the dynamics of POS e-micropayment programs.

Works by Fishbein and Ajzen (Fishbein and Ajzen, 1975; Lee and Park, 2001) and the Technology Acceptance Model (TAM), including the extended forms (Davis, 1989; Davis, Bagozzi and Warshaw, 1989; Venkatesh and Davis, 2000) are widely used to explore why users adopt various systems and applications (Agarwal and Prasad, 1998; Amoako-Gyampah and Salam, 2004; Chan and Lu, 2004; Devaraj, Fan and Kohli, 2002; Money and Turner, 2005; Robinson, Marshall and Stamps, 2005). However, Information System

(IS) adoption is just the first step toward overall IS success. Bhattacharjee (2001) has introduced the Post-acceptance Model of IS Continuance and suggested that IS overall success must move beyond initial adoption to continue using the system. Bhattacharjee's theory suggests that users' intention is determined by their satisfaction with IS use and perceived usefulness of IS. User satisfaction, in turn, is influenced by their confirmation of expectation from prior IS use and perceived usefulness. Perceived usefulness of the IS system is influenced by users' confirmation level. This study uses the Post-acceptance Model of IS Continuance as the theoretical foundation to study which factors influence users to continue using non bank-issued programs in Taiwan because given the earlier failures of e-micropayment programs, it is important to look not just at the adoption of such programs but also the issue of users continuing using such programs. In addition, we extend Bhattacharjee's model to incorporate network externality to examine the role of network externality.

According to Choi Stahl and Whinston (2003), digital currency payment system should have the following fundamental properties: possess monetary value, convenience, security, authentication, non-refutability, accessibility, reliability and anonymity. Smart Card Alliance names speed, convenience, better ability to track spending and security as benefits to consumers (Vanderhoof, 2007). Madhoushi and Mohebi (2004) also listed security, acceptability, convenience, cost, anonymity, control, traceability and control of encryption methods as requirements of electronic payment methods. Researchers and practitioners are also interested with security issues (e.g. Linck, Pousttchi and Wiedemann, 2006). Coase (1937) initiated the idea of transaction cost which covered all the costs arising from conducting a transaction (Williamson, 1985). Papaefstathiou and Manifavas (2004) explained that since micropayment systems were used for purchase of extremely inexpensive items, it was vital to keep the cost of individual transactions low. Time spent is also a component of transaction cost. Convenience is definitely important. Jeff Slawsky and Samee Zafar (2005) mentioned that the primary causes for failure of Mondex and other similar schemes were linked to its inability to offer the same level of convenience that payment cards offer for mid-value transactions or the speed that cash offers for small-value payments. After considering the above reviews and interviews with users and operators, we included safety, convenience and transaction cost as the three elements under the variable, confirmation, to explore whether they are influential for Taiwan users to continue using the program. We propose the following hypotheses:

- H1: Users' extent of confirmation (with safety, convenience and transaction cost) is positively associated with their satisfaction with the program
- H2: Users' extent of confirmation (with safety, convenience and transaction cost) is positively associated with their perceived usefulness of the program

Perceived usefulness is an important primary belief construct of TAM and is the degree to which a person believes that use of a system will improve his or her performance (Davis, 1989). In addition, satisfaction influences users' intention to continue using the technology. Hence, we suggest the following hypotheses:

- H3: Users' perceived usefulness is positively associated with their satisfaction with the program
- H4: Users' perceived usefulness is positively associated with their continuance intention to use the program

H5: User's level of satisfaction is positively associated with their continuance intention to use the program

The idea of network externality started off as bandwagon effect in 1950. Harvey Leibenstein (1950) described bandwagon effect as the extent to which the demand for a commodity was increased due to the fact that others were also consuming the same commodity. Rohlfs (1974) further developed the bandwagon effect and applied it to the development of communications network. Network externality is often defined as an increase in value of a product as the number of users of that product increase (Katz and Shapiro, 1985). Network externalities provide positive benefits on both the supply and demand sides of the market (Deak, 2003). Networked goods have characteristics such as complementarities, switching cost, lock-in, and economies of scale (Shy, 2001). Furthermore, network economy is tippy and it can quickly become winner once the network has shown its worth and achieved the critical mass, (Besen and Farrell, 1994).

The concept of network externality can help us to understand the factors needed for successful e-micropayment program. Electronic payment system can be viewed as a networked good (Baddeley, 2004) with micropayment market being a two-sided market with both consumers and merchants subjecting to network effects and facing the chicken and egg dilemma (See-To, Jaisingh and Tam, 2007). The economic value of an e-micropayment program is an increasing function of its ubiquity, that is the more users (demand side) use it and the more merchants (supply side) accept it, the more valuable the system is to users, merchants and system operators. Hence one key characteristic is the need for a captive audience that drives critical mass (Chakravorti, 2004) and, hopefully lead to high transaction volume which in turn generate economics of scale (Rochet and Tirole, 2003). Public transport system is one good choice for e-micropayment program as it has the required captive audience. If these consumers are concentrated in a small geographical region, chance of success will be higher (Van Hove, 2004). Consumers and merchants must also be convinced of the benefits brought by the program. Transport ticketing systems require contactless feature to cope with the high volume of users and to minimise the processing time per user.

Launched in 1997, Hong Kong's Octopus card has many of the above characteristics. The card outperforms other e-micropayment programs backed by international financial organizations (Westland, Kwok, Shu, Kwok and Ho, 1997) and has the support of key transport companies (Poon and Chau, 2001). With more than 70 per cent of Hong Kong residents using public transport everyday and concentrating in a small geographical region, it has the captive market to achieve critical mass. Using contactless smart card, it is reliable, completes transactions faster than cash and offers an automatic reload feature. Over 400 providers (e.g. F&B and recreational outlets, supermarket, and convenience stores) accept Octopus card. Wide adoption of Octopus Card is possible because of the interoperability of the system. We thus hypothesise:

- H6: Network externality of the program is positively associated with users' extent of confirmation
- H7: Network externality of the program is positively associated with users' perceived usefulness
- H8: Network externality of the program is positively associated with user's level of satisfaction with the program

H9: Network externality of the program is positively associated with user's continuance intention to use the program

RESEARCH DESIGN AND DATA ANALYSIS

Due to the restriction imposed by Taiwan's Banking Act, we categorised e-micropayment programs into two major categories: Non bank-issued program and bank-issued program. Each major category could be further divided into three sub-categories: transport-related (e.g. EasyCard for non-bank issued program and EasyCard/Credit Card for bank issued program), convenience store (e.g. icash for non-bank issued program and icashwave for bank-issued program) and others.

Five-point Likert Scale was used. All the respondents were asked to identify the e-micropayment program which had the highest potential to succeed. Another section of the questionnaire was for users of non bank-issued programs to respond. The survey lasted for 1.6 months starting from April 20, 2007. A total of 591 questionnaires were received with 526 being valid returns. Fifty-six per cent of the respondents fall within age group of 21-29, 64.6 per cent did not possess credit card, more than 50 per cent were from Northern Taiwan and students formed the biggest category with 56.3 per cent.

Respondents' Opinion about the Future of e-Micropayment Program

Fifty-seven per cent of respondents chose bank-issued program as the program which they thought had the highest potential to expand its services and succeed (Table 1).

Table 1: Cross-tabulation Analysis for Program's Category

Region	Program's Category		Total
	Bank-issued No (%)	Non Bank-issued No (%)	
Northern Taiwan	139 (50.4%)	137 (49.6%)	276
- Taipei City/County	63 (44.7%)	78 (55.3%)	141
- Others	76 (56.3%)	59 (43.7%)	135
Central Taiwan	69 (65.1%)	37 (34.9%)	106
Southern Taiwan	55 (59.1%)	38 (40.9%)	93
Eastern Taiwan	37 (72.5%)	14 (27.5%)	51
Total	300 (57.0%)	226 (43.0%)	526

Note:

Northern Taiwan – Taipei City, Taipei, Keelung, Taoyuan, Hsinchu, Miaoli

Central Taiwan - Taichung, Changhua, Yuanlin, Nantou

Southern Taiwan - Chiai, Tainan, Kaohsiung, Pingtung

Eastern Taiwan - Ilan, Hualien, Taitung

Pearson analysis showed that respondents' location of residence significantly influenced their above choice with $p = 0.005$. Table 1 also showed that respondents from Northern Taiwan were generally indifferent to whether bank-issued or non bank-issued program had the highest potential. However, other parts of Taiwan showed stronger preference for bank-issued program. When we only examined the data of Taipei City/County (the only place with metro system and hence EasyCard), 55.3 per cent of the respondents

chose non bank-issued program as their preferred choice but other parts of Northern Taiwan chose bank-issued program. Similarly, location of residence also significantly influenced their opinion on which sub-category of program had the highest potential to succeed with $p = 0.000$.

Table 2 revealed that respondents from Northern Taiwan felt that transport-related program had the highest potential while other parts of Taiwan felt that convenience store was the one, hence highlighting potential for both sub-categories. To get a more complete picture, we separated the data of Taipei City/County from other part of Northern Taiwan. It could be confirmed that transport-related programs (EasyCard and EasyCard/Credit Card) were deeply entrenched in Taipei City/County.

Table 2: Cross-tabulation Analysis for Program’s Sub-Category

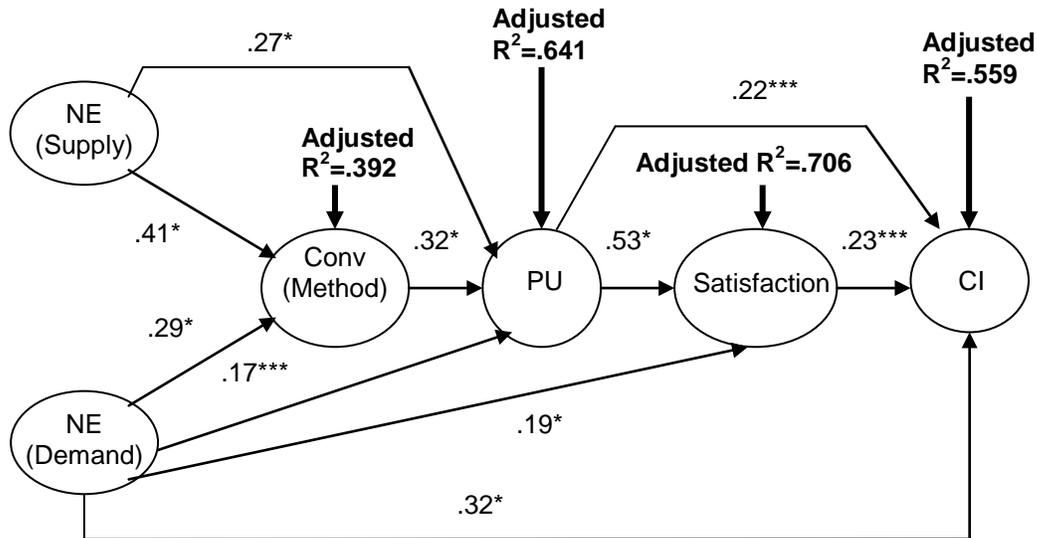
Region	Program’s Sub-Category			Total
	Transport No (%)	Convenience Store No (%)	Others No (%)	
Northern Taiwan	144 (52.2%)	95 (34.4%)	37 (13.4%)	276
- Taipei City/County	96 (68.1%)	35 (24.8%)	10 (7.1%)	141
- Others	48 (35.6%)	60 (44.4%)	27 (20.0%)	135
Central Taiwan	20 (18.9%)	64 (60.4%)	22 (20.8%)	106
Southern Taiwan	22 (23.7%)	57 (61.3%)	14 (15.1%)	93
Eastern Taiwan	9 (17.6%)	35 (68.6%)	7 (13.7%)	51
Total	195 (37.1%)	251 (62.9%)	80	526

Note:
 Northern Taiwan – Taipei City, Taipei, Keelung, Taoyuan, Hsinchu, Miaoli
 Central Taiwan - Taichung, Changhua, Yuanlin, Nantou
 Southern Taiwan - Chiai, Tainan, Kaohsiung, Pingtung
 Eastern Taiwan - Ilan, Hualien, Taitung

Regression Analysis of Non Bank-issued e-Micropayment Program

The KMO Measure of Sampling Adequacy Test and Bartlett's Test of Sphericity revealed that the data met fundamental requirements for factor analysis since KMO value was more than 0.5 and the Bartlett's Test reached statistical significance (Kaiser, 1974; Bartlett, 1954). Factor analysis revealed that while we could extract 2 components each from questions related to Convenience and Network Externality, the rest were one component each. Upon examining the questions, we named the 2 components from Convenience as Convenience (Method of Usage) and Convenience (Place of Usage). Convenience (Method of Usage) was related to how the program was being used, for example through smart card and mobile phone. Convenience (Place of Usage) was related to where the program was being used, for example metro system and public bus service. The 2 components from Network Externality were labelled as Network Externality (Demand) and Network Externality (Supply) since the former was related to the demand side of network externality while the latter was related to the supply side of network externality. Coefficients of Cronbach's Alpha, with value ranging from 0.64 to 0.92, indicated internal consistency reliability was acceptable (Cronbach, 1951; Cuieford, 1965). Multiple regression procedure was then performed to produce the β weights and the causal structure of the hypothesized model. Statistical significance for all tests was

set at the .05 level. Hypotheses 3, 4, 5 and 7 were supported and hypotheses H2, 6, 8 and 9 were partially supported. Figure 1 shows the relationship between the various variables. Only those with significant relationships and ultimately related to Continuance Intention, either directly or indirectly, are shown.



Legend:

* $p < .0000$ ** $p < .002$ *** $p < .01$

NE (Supply) – Network Externality (Supply)

NE (Demand) – Network Externality (Demand)

Conv (Method) – Convenience (Method of Usage)

PU – Perceived Usefulness

CI – Continual Intention

Figure 1: Result of Analysis for Non Bank-issued e-micropayment Program

Our study found that perceived usefulness, satisfaction of users and the demand side of network externality directly affected users' intention to continue using non bank-issued program. The supply side of network externality and convenience (method of usage) indirectly contributed to continuance intention. Other confirmation elements: security, transaction cost and convenience (place of usage) did not ultimately contribute to users' intention to continue using the program when the paths leading to continuance intention were drawn.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The idea of captive market providing the critical mass of users and hopefully generating the demand side of network externality is clearly evident in non bank-issued program. This study also confirms findings that existing captive market is a good starting point for issuers of e-micropayment programs. Operators of transport-related (metro) and convenience store chain in Taiwan are involved in the e-micropayment programs. It also influences users' opinion on the type of program which has the highest potential to succeed. EasyCard is deeply entrenched in Taipei City/County because of the popularity of metro system. The high density of convenience stores in Taiwan and their popularity

among the consumers have also created a ready captive market for program issued by convenience store operator.

However, the development of non bank-issued program to include other functionalities is hindered by legal restriction. Taiwan's Banking Act only allows non bank-issued program to be used for transactions related to the sector which the issuer belongs. The current approach for transport and convenience store issuers to get around this legal restriction is to co-operate with Taiwan banks and introduce bank-issued e-micropayment program. Banks also prefer to co-operate with operators which already have successful track record in this field and have ready captive market to tap on.

The legal restriction also causes users to accept the idea that any increase in functions and places of usage for non bank-issued program will be incremental, if any. Hence, convenience associated with where the program is being used does not surface as a factor directly or indirectly leading to continuance intention. Instead, convenience associated with the methods of how the program is used will be important to increase the usage rate of non bank-issued programs. The issuers will need to devote more attention here if they don't want to see users migrating to bank-issued programs. TSCC is now working with mobile phone makers to include EasyCard function as one of the functions of mobile phone. Another approach will be to persuade Taiwan authority to relax this restriction. If it materializes, it will particularly benefit issuer of EasyCard. The issuer is already working with transport companies in some counties to issue transport-related smart card. Hence, EasyCard will be in a strong position to spread its tentacles and may potentially be the Octopus Card of Taiwan.

E-micropayment program is a networked good and its success depends on both the consumers (demand side) and merchants (supply side) subjecting to positive network effects. However, the role of network externality in Taiwan's POS e-micropayment program has been modified by the uneven development of public transportation system, high density of convenience stores and in particular, legal restriction. As a result, demand side and supply side of network externality exert differently on non bank-issued program. The analysis shows that the demand side of network externality contributes directly to users' continuance intention to use the program. However, the legal restriction curbs the influence of the supply side of network externality resulting in supply side of network externality not having final significant influence on continuance usage.

What is the future of non bank-issued program and bank-issued program? While the latter program promises multi-functionalities and acceptance by many outlets, such promise is not fully realized yet. Taiwan has already seen good development and users' wide acceptance of non bank-issued programs, in particular EasyCard in Taipei City/County and icash by 7-Eleven convenience store. Credit card is also common in Taiwan. Hence, even though bank-issued programs market itself as a card combining both e-wallet and credit card, there are good alternatives available. Therefore, there is still plenty of opportunity for non bank-issued programs to have a secure place in the e-micropayment market.

It is interesting as a future research topic to investigate whether micropayment programs in other parts of the world are seeing the same dynamics as in Taiwan and if not, comparative analysis can be done to see what further insights they can offer to the study

of IT adoption.

CONCLUSION

In Taiwan, organizations with existing captive markets, that is, transport-related companies and convenience stores, have issued their own non bank-issued POS e-micropayment programs and achieved good success. Through an extended Post-acceptance Model of IS Continuance which incorporated network externality, we found that perceived usefulness, satisfaction of users and the demand side of network externality directly affected users' intention to continue using the program. We also observed that the role of network externality and its subsequent impact were definitely constrained and shaped by the regulatory restriction in Taiwan. In addition, the legal restriction imposed on non bank-issued programs, also resulted in two major categories of POS e-micropayment programs: non bank-issued programs and bank-issued programs.

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