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Design and Security impact on consumers' intention to use single platform E-payment

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This paper summarizes an explorative study of the novel design and security that contribute to consumers' adoption of an integrated, single platform payment system encompassing card, Internet and mobile technologies in the ASEAN. The attempt to survey these areas in an integrated fashion is a novel approach that differs from existing studies that mainly focus on adoption factors of these technologies in isolation as well as focuses on the novel design and the security elements. The empirical results from the quantitative analysis suggest that design, security, perceived usefulness as well as perceived ease of use are significant factors that contribute to consumers' intention to utilize a single platform payment System. Organizations will be able to utilize the study information for developing products and services that meet the consumers' single platform E-payment system while also fulfil their objective of corporate social responsibility.

KEYWORDS: Design, Security, Technology Acceptance Model, Consumers' Intention to use, Single Platform E-payment

1. Introduction

Earlier studies have investigated E-payments separately and individually, for example payment cards (Rinaldi, 2001), smart cards (Humphrey, Kaloudis and Øwre, 2004), Internet (Izquierdo-Yusta and Calderon-Monge, 2011), Internet banking (Gerrard and Cunningham, 2003), mobile e-wallet (Amoroso and Magnier-Watanabe, 2012), mobile Payment (Cruz, Neto, Muñoz-Gallego and Laukkanen, 2010), mobile banking (Koenig-Lewis, Palmer, and Moll (2010). Maran, Lawrence, Fazilah, Kishna and Ng (2011) found that the lack of ability to use during emergency (Design problem) and inconvenience for using the payment cards are the problems faced by financial institution consumers. Meuter, Ostrom, Roundtree, and Bitner, 2000; White and Nteli, 2004; Lai, 2006; found out customers were dissatisfied on current payment technology (e.g: design and security). In fact, there is an increasing interest in this topic given the problems such as inconvenience, unattractive design and risk as well as the need for security of E-payment technology solutions faced by organizations to increase consumers' intention to use E-payment systems (Lallmahamood, 2007; Geron, 2009, Jovanovic and Organero, 2011; Lai and Zainal, 2015). Near Field Communication (NFC) as well as Radio-frequency identification (RFID) in many aspects like security and design reliability have dominated the E-payment market for site E-payment (e.g: Point of Sales) at present (Smart Card Alliance, 2007; Lai, 2007; Kamran, Hanifa and Paul, 2010; Wei, Shuo, Luo, Chen and Ling, 2011; Chong and Chan, 2012). The lack of empirical investigations combining the determinants of the three E-payments (Card, Internet and Mobile) in one study encourages the study of the single platform E-payment system known as MySIM™. MySIM™ is a cutting-edge technology that looks like a regular SIM card or GSM SIM or bankcard SIM but with an integrated hybrid antenna on the SIM itself, which operates at 13.56 MHz that can be used for Card, Internet and Mobile Payment to work on any mobile phones (Lai, 2013; Lai, 2014; Lai, 2015; Lai, 2016). Such a payment system can be deployed to operate in numerous areas: for e.g. public transport payment, shopping, e-tickets, banking, healthcare and collection of loyalty points. As the future integrated E-payment instruments, single platform E-payment system is a novel system as previous researches only focused on the three systems separately and individually (Card, Internet, Mobile).

According to the Mobile Payments Readiness Index by MasterCard, Singapore is the most mobile E-payment ready in South East Asia (ASEAN), followed by Philippines, Malaysia, Thailand, Vietnam, and Indonesia. Singapore is a developed country leading in contactless as well as cashless payment in this region and just introduced the Near Field Communication (NFC) mobile payment that require to change both the phone to NFC phone and Single Wire Protocol SIM (SWP-SIM) for E-payment. Nevertheless, only limited handsets with NFC like Sony Xperia Sola, Samsung Galaxy S III and Sony Xperia S that are costly and additional inconvenience to change to SWP-SIM for E-Payment has

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encourage another option of solution like single platform E-Payment System in this research. In the case of Malaysia, it's troublesome to top up the Touch N Go E-wallet mainly used for public transport with limited number of physical outlets for top-up, therefore this combination allows the user to top-up the Touch N Go E-wallet even at 11 pm through Internet banking for the LRT ride back home. There is a lack of empirical investigations combining the factors of the three E-payments (Card, Internet and Mobile) in one study which encourages the researcher to study the single platform E-Payment system since previous researches only focused on the three systems separately (Card, Internet, Mobile).

This study focuses on the consumers-based research orientation such as consumers' intention to use that is measureable with the adoption of Technology Acceptance Model (TAM) (Davis, Bogozzi and Warshaw, 1989) to enhance the potential of deploying an integrated single platform E-payment system with single platform E-payment design and security. Therefore, this study seeks to investigate the single platform E-payment design and security that influence perceived ease of use and perceived usefulness. Furthermore, this study investigates the relationship between perceived ease of use, perceived usefulness and security with consumers' intention to use one single platform E-payment System that integrates Card, Internet and Mobile as the novelty system.

2. Literature review and Hypothesis

2.1 Overview

TAM model developed by Davis (1986) is the most used framework in predicting information technology adoption (Legris, Ingham, Collerette, 2003). Lee and Jun (2007) argued that TAM should be able to analyze factors affecting adoption intentions beyond perceptions of convenience and usefulness. Though TAM had received much support (Yang, 2005), it focused on the effects of perceptions of the technology's ease of use, usefulness and design on adoption intentions (Lai and Zainal, 2015). It is good for the use of determining new technology like MySIM™ and studying the security impact on this technology.

In fact, TAM has become so popular that it has been cited in most of the research that deals with users' acceptance of technology (Lee, Kozar and Larsen, 2013). TAM attempts to help researchers and practitioners to distinguish why a particular technology or system may be acceptable or unacceptable and take up suitable measures by explanation besides providing prediction. Even though TAM has been tested widely with different samples in different situations and proved to be valid and reliable model explaining information system acceptance and use (Mathieson, 1991; Davis and Venkatesh, 1996,), many extensions to the TAM have been proposed and tested (e.g. Venkatesh and Davis, 2000; Moon and Kim 2001; Venkatesh, Speier and Morris 2002; Henderson and Divett, 2003, Shish, 2004; Chong and Chan, 2012; Lai and Zainal, 2014; Lai and Zainal, 2015).

Davis (1989) identified the design features that are directly related to perceived ease of use and perceived usefulness but didn't measure direct relationship towards attitude and intention to use. Davis (1986) mentioned that behavior intention to use was being mediated by attitude. Nevertheless, attitude was excluded as its mediator in Venkatesh and Davis (2000) TAM2 and theorized a direct relationship between the constructs and intention to use. TAM initially included attitude, but this was later dropped due to its weak role as a mediator between the constructs and intention to use (Mun, Joyce, Jae and Janice, 2006). Venkatesh and Davis' (1996) version of TAM measure external variables (e.g: design) but without measuring any external variables direct relationship towards intention to use. Thus, the researcher will adapt the Venkatesh and Davis' (1996) version of TAM to measure consumers' intention to use instead of Davis' (1986) version by omitting the attitude towards intention to use as well as design directly towards intention to use. In addition, the present researcher will extend the 1996 version of Technology Acceptance Model by including security in this research.

2.2 Design

Design in this research is defined as the technical "design and functionality" (Szymanski and Hise, 2000: Lai, 2014) of MySIM™ novelty that is in line with the adaptation to consumer's capabilities of using the single MySIM™ platform system for Card, Internet and Mobile Payment. Davis (1989) identified the design features which are directly related to perceived ease of use and perceived usefulness. Lin and Hsieh (2006) as well as Lai and Zainal (2014) noted that consumers enjoyed using their phones as the electronic payment and valued the benefits of the design that provided ease of use and usefulness.

Szymanski and Hise (2000) found that the easier the design of the site for online navigation that led purchase and E-payment, the higher the attraction of consumers towards using the online site design. Belanger, Janine and Wanda (2000) and McKnight, Vivek, and Charles (2002) concluded that the impact of online shopping site design will influence the consumers' intention to use online shopping. Ahn, Ryu, and Han (2004) discovered that design, navigation and response time had a positive impact on consumers' intention to use online shopping through perceived ease of use and perceived usefulness.

In this study, design of the MySIM™ is being introduced in this research. The technical design and functionality of MySIM™ novelty is in line with the adaptation to consumer's capabilities. Designs are divided into two (2) parts, the first part of which is the look and feel of the MySIM™ systems and the second part is an adequate and logical (from consumer's perspective) progression of tasks, without unnecessary repetitions, simplified operations, task clarity and

adaptability to consumers' needs/wants, clear information to proceed through the complete process of E-Payment and allowing consumers to have control of their choices.

2.3 Security

Security is vital in determining the decision of consumers to use MySIM™ E-payment solution. Usually, Security is defined as the state of being protected or safe from harm. However, Security in this research encompasses of three dimensions: reliability, safety, and privacy (Polatoglu and Ekin, 2001). Consumers are concerned with carrying cash and cards that expose them to theft and loss. MySIM™ is capable of providing additional level of security such as pin before use to reduce the risk. Security is usually associated with organization providing the level of security to consumers and risk is usually associated with consumers' confidence in adopting new technology. Nevertheless, in the E-payment industry, a set of security standards are already set to reduce the risk. For example, the ISO 27000 series of standards have been specifically reserved by ISO for information security matters. Consumers view relationships with banking based on trust and how they view the security banking is important (Al-alak and Alnawas, 2010).

There are indications that aid consumers to put their trust in MySIM™ E-payment associated with security. These include positive word-of-mouth recommendations (Ha, 2004), reputation information (Fuller, Serva, and Benamati, 2007), brand equity (Horppu, Kuivalainen, Tarkiainen, and Ellonen, 2008), consumers' experience-based knowledge of security aspects (Lallmahamood. 2007; Kim, Steinfield, and Lai, 2008) and risk management (Lai and Zainal, 2015). Identity plays a vital role and banks offering Internet-based services to their customers should use effective methods to authenticate the identity of customers using the Internet banking services (White and Nteli, 2004; Sharma and Singh, 2010). Ndubisi and Sinti (2006) noted that consumers were concerned that their information would be known or tampered by others while conducting internet transaction.

Cornwell (2000) represents the key issues of trust that must be addressed by any method of payment systems with the PAIN Acronym (Privacy, Authentication, Integrity and Nonrepudiation) as trust is the basis of good relationship. Lu, Wang and Linda (2012) argue that it is vital to enhance user technology readiness in terms of optimism through innovation and reduce customers' technology concern in terms of insecurity and discomfort at the same time. Sumanjeet (2009) highlights that E-payment security that needs to take into consideration includes:

- Authentication: to ascertain that there are reliable proofs of identities of all parties involved.
- Integrity: to ascertain that transmitted financial information is unchanged in transit.
- Non-repudiation: to ascertain that all parties have non-deniable proof of receipt.
- Confidentiality: to ascertain that transactions are protected from possible eavesdroppers.
- Reliability: to ascertain that there is reduced possibility of failure.
- Authorization: to ascertain that individuals are recognized and granted the desired rights and privileges.

Therefore, building trust through security with consumers is one of the key areas that organizations will need to put priority when building and marketing their products and services through MySIM™ E-payment. Organisations can build trust with products/services through MySIM™ E-payment that fulfil the standard IT security compliances (e.g: Level 5 security or ISO 27000 or Euro Money Verification compliance) and adapt to the consumers' security policies (e.g: personalised authentication and identification). Organisations can also value add with MySIM™ secured trusted services like Electronic identification and electronic Trust Services are key enablers for secure cross-border E-payment transactions.

2.4 Hypothesis

This study used the underlining variables shown in Figure 1 to determine the consumers' intention to use the single platform E-payment system. For the purpose of the study, the following hypotheses were posited:

H1a: Design is positively associated with perceived usefulness.
H1b: Design is positively associated with perceived ease of use.
H2a: Security is positively associated with perceived usefulness.
H2b: Security is positively associated with perceived ease of use.
H2c: Security is positively associated with consumers' intention to use
H3: Perceived ease of use is positively associated with perceived usefulness.
H4: Perceived usefulness is positively associated with consumers' intention to use
H5: Perceived ease of use is positively associated with consumers' intention to use

3. Methods

The target population in this study includes only respondents who have used both Card, Internet and Mobile payment for last 12 months from a pull of database of ASEAN events of 1370. Online survey questionnaire was used as data collection method for 1 month through e-mail blast invitation to the database. A total of 450 respondents that fulfill the pre-set requirements were collected and used for this analysis. Based on Klien, (2011) using 10:1 and using non probability sampling, the minimum recommended sample size for this study is 400. The research managed to collect 450 data (represent 33% respond rate from the database) that being used here that provided a robust study for this

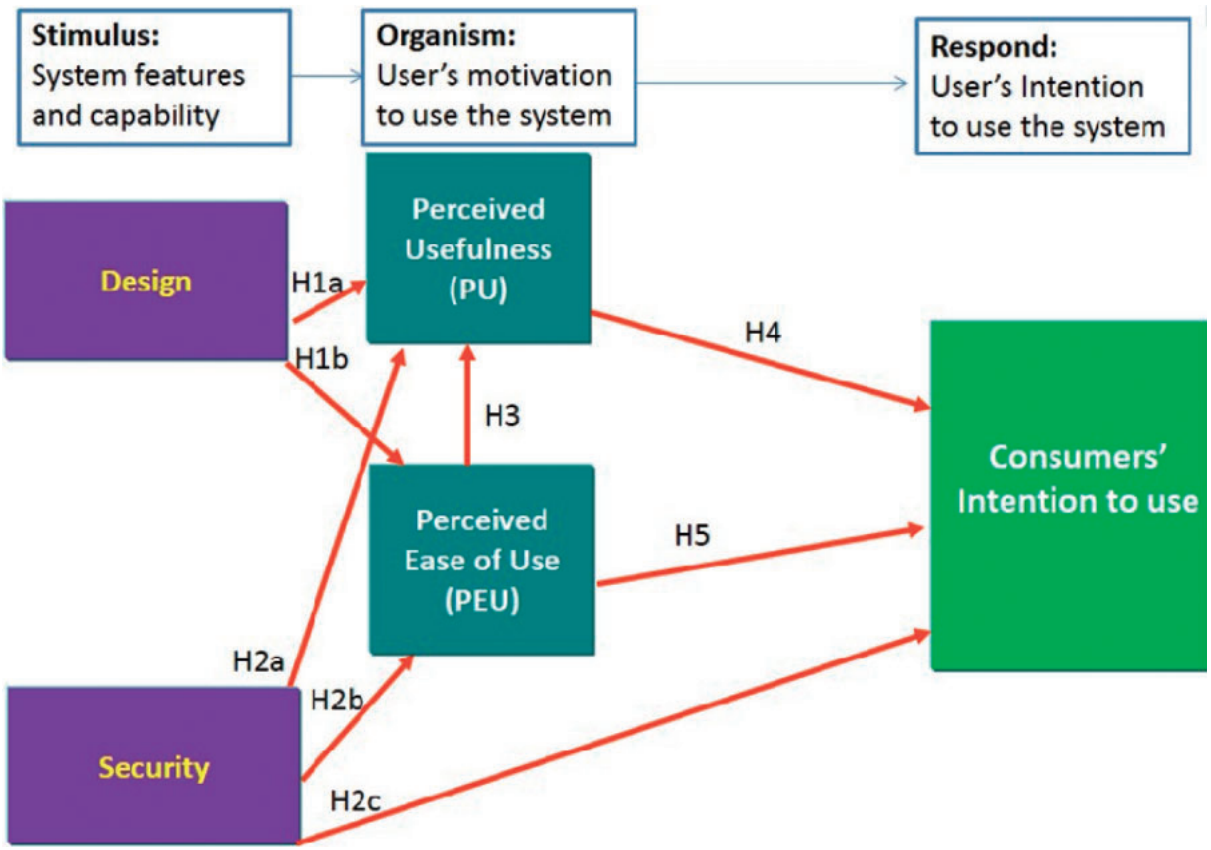

Fig. 1. Theoretical Framework for Design and Security Stimulus.

research. In this study, the five-point scale Likert-type of measuring the consumers' intention to use Single platform e-payment system like 'strongly agree' to 'strongly disagree' were used. When responding to the survey items, participants specify their levels of agreement to a subject given. The five points scale is selected to encourage respondents to make positive or negative choices (Cooper, Schindler, and Sun 2008) in order to produce more emphatic information (Oppenheim, 1992). The Cronbach's alphas for the variables are as follows: design (.94), security (.87), perceived usefulness (.94), perceived ease of use (.93) and consumers' intention to use (.91).

4. Results (Respondent profile)

In this study, analysis have been done for each variable separately to gather a summary of respondents' demographic profile in order to get the preliminary information and the feel of the data (Sekaran, 2003). Table 1 showed the respondents' demographic profiles of the survey. The highest respondents of 45.4% are in the age range of <25 with male respondents of 38.2% and the marital status for single respondents at 54.2% mostly with at least college/university at 57.6% with job position of other 45.8% in Education industry at 46%.

4.1 Measurement model

For the purpose of determining the construct validity, convergent validity was checked first. The estimates of the standardized factor loadings were employed. The factor loading of the CFA ranged from .77 to .97 for the indicators of perceived usefulness and perceived ease of use. All indicators in the consumers' intention to use model were statistically significant as all factor loading estimates were greater than .50 for convergent validity to be achieved (Hair *et al.*, 2010). Furthermore, the construct validity is good at composite reliability (CR = .96) which is greater than .70 and the average variance extracted (AVE) is good at (AVE = .82) above .50 (Bagozzi and Yi, 2012).

All the goodness of fit indices was good and satisfied the requirements with the validity assessment of the CFA model. Chi-Square was 290.36 at p = 0.00 and df (degree of freedom) was 80. According to Tabachnick and Fidell (2007), the relative Chi-Square ($\chi 2$/df) at 3.63 is below the 5.0 required for good fit. As stated by Hair *et al.*, (2006). In absolute fit indices, the goodness of fit index (GFI) was 0.92, well higher than 0.90 (Hair *et al.* 2010). Comparative fit index (CFI) was 0.98, above the 0.90 required for good fit (Hu and Bentler 1999). Root mean square error of approximation (RMSEA) was .07, below the 0.08 required for good fit (Byrne 1998). For the overall measurement model, the results indicated good fit model.

Table 1. Respondents profile.

Variable	Frequency (n = 450)	Percent (Total 100%)
ASEAN Countries Status		
Developed Countries (Singapore, Brunei)	77	17.2
Developing Countries (Malaysia, Thailand, Indonesia, Philippines)	278	61.7
Lesser Developed Countries (Vietnam, Cambodia, Loas, Myanmar)	95	21.1
Gender		
Male	243	54.0
Female	207	46.0
Marital Status		
Single	244	54.2
Married	206	45.8
Age		
<25	172	38.2
26–40	169	37.6
41–55	82	18.2
>55	27	6.0
Education		
Secondary/High school	129	28.7
College/university	259	57.6
Graduate school	62	13.8
Job position		
Top Management	12	2.7
Middle Management	156	34.7
Junior Management	33	7.3
Professional	43	9.6
Other	206	45.8
What industry you work in		
Education	207	46.0
Banking/Finance/Manufacturing/ICT	122	27.1
Retail/Hypermarket	65	14.5
Other	56	12.4

4.2 Structural model

Based on the results of measurement model, the structural model was examined with the theoretical links as shown in Table 2 with all of the goodness of fit indices that indicates an acceptable model.

Table 2. Goodness-of-fit statistics for measurement model.

Goodness-of-fit Statistics		Level of Acceptance	Index Value
Absolute fit Measures			
Chi-square	X^2	$p > 0.05$	5.651 ($p = 0.06$)
Degree of freedom	df	≥0	2
Root mean square error of approximation	RMSEA	<0.08	0.064
Goodness of fit index	GFI	>0.90	0.995
Incremental fit measures			
Comparative fit index	CFI	>0.90	0.998
Parsimonious fit measures			
Relative Chi-Square	X^2/df	<5	2.825

The overall structural model shows all paths of standardize regression weights as shown in Table 3 are statistically significant at the $p \leq 0.001$ and $p \leq 0.01$ level of significance.

Table 3. Standardized regression weights of structural model.

Hypothesis	Standardized Regression Weights	S.E.	C.R.	P	Results
Hypothesis 1a	PEU ← D	0.02	50.18	***	Significant $p \leq 0.001$
Hypothesis 2a	PEU ← S	0.03	6.49	***	Significant $p \leq 0.001$
Hypothesis 1b	PU ← D	0.05	3.12	0.002	Significant $p \leq 0.01$
Hypothesis 2b	PU ← S	0.03	3.80	***	Significant $p \leq 0.001$
Hypothesis 2C	I ← S	0.04	15.80	***	Significant $p \leq 0.001$
Hypothesis 3	PU ← PEU	0.05	14.50	***	Significant $p \leq 0.001$
Hypothesis 4	I ← PU	0.06	2.81	0.005	Significant $p \leq 0.01$
Hypothesis 5	I ← PEU	0.06	2.92	***	Significant $p \leq 0.001$

Note: $^{***}p \leq 0.001$, $^{**}p \leq 0.01$, $^{*}p \leq 0.05$

Hypothesis 1a Design has relationship on Perceived Ease of use.
The results showed that design has strong direct relationship with perceived ease of use with Critical Ratio C.R = 50.18 and p = 0.00 ($p < 0.001$) is the highest among the entire hypothesis. In this case, the higher the design support the greater the perceived ease of use of the system.

Hypothesis 2a Security has relationship on perceived ease of use.
This hypothesis suggests that security as an exogenous factor provides a significant contribution to perceived ease of use as an endogenous factor. Therefore, hypothesis 2a is supported by the data. In this case, security has a significant relationship with perceived ease of use.

Hypothesis 1b Design has direct relationship on Perceived usefulness
This hypothesis suggests that design as an exogenous factor provides a significant contribution to perceived usefulness as an endogenous factor. Therefore, hypothesis 1b is supported by the data. In this case, design has a significant relationship with perceived usefulness.

Hypothesis 2b Security has direct relationship on Perceived usefulness.
This hypothesis suggests that security as an exogenous factor provides a significant contribution to perceived usefulness as an endogenous factor. Therefore, hypothesis 2b is supported by the data. In this case, security has a significant relationship with perceived usefulness.

Hypothesis 2C Security has direct relationship with consumers' intention to use.
The results show that security has strong direct relationship with consumers' intention to use of the system at C.R = 15.80 and p = 0.00 ($p < 0.001$). In this case, the higher the security support the greater the intention to use the system.

Hypothesis 3 Perceived ease of use has relationship on perceived usefulness.
The results of SEM show that the standardized regression weight of the structural path between perceived ease of use and perceived usefulness is positive and significant, in which C.R = 14.50 and p = 0.00 ($p < 0.001$). In this case, the higher the perceived ease of use support the greater the perceived usefulness of the system.

Hypothesis 4 Perceived usefulness is positively associated with consumers' intention to use.
The hypothesis show that perceived usefulness has a significant relationship with consumers' intention to use of the system with explanatory power R^2 of 83.

Hypothesis 5 Perceived ease of use is positively associated with consumers' intention to use.
The hypothesis showed that perceived ease of use has a significant relationship with consumers' intention to use of the system with explanatory power R^2 of 85.

5. Discussions

Design has positive relationship with perceived usefulness and perceived ease of use and also has positive direct relationship with the perceived usefulness and perceived ease of use. The design significant relationship with perceived usefulness ($\beta = .40$) compared to perceived ease of use ($\beta = .66$) which mean design contributes the highest beta figure towards perceived ease of use path coefficient in this study. This showed that single platform E-payment is viewed as easy to use. Nevertheless, design depends on both the perceived usefulness and the perceived ease of use

as in previous studies (Davis, 1989; Ahn, Ryu, and Han, 2004; Lin and Hsieh, 2006). Therefore, design should be considered imperative in determining perceived usefulness and perceived ease of use.

Security shows significant relationship between perceived ease of use and perceived usefulness which are almost the same. Perceived ease of use is vital for example complex system like the single platform e-payment system and the suggestion list can be found in Sun and Zhang, (2006). Therefore, for complex systems like the single platform e-payment system and the organizations planning to implement the system may look at perceived ease of use and may use it as the mediator to enhance perceived usefulness and consumers' intention to use. The results showed that security had positive significant relationship with perceived usefulness and perceived ease of use and consumers' intention to use the system was supported by previous studies by (Muniruddeen, 2007; Lai, 2010). Thus, security could be mediated by both perceived usefulness and perceived ease of use as well as direct relationship consumers' intention to use the System.

The result of structural equation modeling (SEM) established that there is a positive and significant relationship between security and consumers' intention to use based on the hypothesis 2C supported by the research data in which standardized regression estimate $\beta = .48$, 15.80 and $p = 0.00$ ($p < 0.001$). It can be suggested that the higher the security of using single platform E-payment system, the higher the consumers' intention to use the single platform E-payment system. Hypothesis 2C concluded and validated existing studies (Wang *et al.* 2003; Lai, 2010: Chong and Chan, 2012). Thus, hypothesis 2C for single platform E-payment system is confirmed. This result further implied that security was as important element of consumers' intention to use the single platform E-payment system, as were the perceived usefulness and perceived ease of use.

Security has been the major concern but the standard regression weight of 48% is considered medium and need to be noted as a vital factor. Thus, the management of the organizations providing single platform E-payment system need to look into providing secured solutions with high security standard as well. In order to reduce the perceptions of security, single platform E-payment system suppliers can organize talk to educate consumers on how to safeguard their E-payment transactions with the additional security and privacy features. This research emphasized in providing consumers with security solutions to perform their single platform E-payment transaction. Furthermore, by increasing the security features, it will increase the consumers' trust and confidence that lead to the intention to use in single platform E-payment system.

The explanatory power R^2 scores of perceived usefulness by perceived ease of use, security and design variables are .83. The explanatory power R^2 scores of perceived ease of use by security and design variables are .85. The explanatory power R^2 scores of Consumers' intention to use by perceived usefulness, perceived ease of use and security variables are .69. According to Cohen (1998), the explanatory power R^2 scores were decoded as small ($\geq$.01), medium ($\geq$.09), or large ($\geq$.25). Thus, the results showed that the single platform E-payment system has very high perception of usefulness and ease of use and moderate to high consumers' intention to use by the consumers' respondents. Thus, the consumers' intention to use is considered very well with 69% user's intention to use the single platform E-payment system in this study.

There have been increasing studies of the factors influencing technology acceptance especially in the area of Card, Internet and Mobile lately but focused on individual element like payment cards (Rinaldi, 2001), smart cards (Humphrey, *et al.*, 2004), mobile e-wallet (Amoroso and Magnier-Watanabe, 2012) as well as their disadvantages. Specifically, as far as the researcher is aware, variables contribute to the finding in accepting single platform E-payment system (MySIM™) has not yet enticed the interest of the research community. Thus, this research breaks new ground within technology acceptance literature because this study validated the variables of the well-established theories in this context.

5.1 Managerial Implication

With the emerging of single platform E-payment system, many organizations are facing the vital issues in regard to their consumers' technology acceptance. Since consumers play the vital role in organizations bottom line, organizations need to take into consideration of consumers' points of view in regard to their intention to use the single platform E-payment system. These research findings have many managerial implications for different industries as well as countries.

Ahn, Ryu, and Han, (2004) acknowledged the importance of online E-commerce with the need of presence of banking support for payment. Banks are on the lookout to reduce their high cost of operation (OECD, 2006, Lai, 2010). Besides core banking services, banks generate good revenue from transaction payment (e.g., Cards Payment). Nevertheless, at times banks also lose money due to fraud transactions (Mohammad, 2008; Cheah, 2011). Therefore, the security elements become an important factor that cannot be ignored. Another challenge is to keep the customers satisfied and loyal through innovation (e.g., to have all banking solution in one (1) single platform) with the novel design. Therefore, this research provides valuable insight of consumers' perspective in regard to Card, Internet and Mobile Payment as well as the potential of having an innovation solution in one single platform for banking purpose in the future.

Respondents in this study like to use single platform E-payment Solution to replace their Card, Internet and Mobile payment because the single platform E-payment Solution is believed to improve their E-payment transactions and

productivity, straight forward and easy to use, operation efficiency and reliable, have the design benefits that attract consumers and allow consumers to have control of their choices, to be used to solve emergency need of funds and come with the level 5 standard security features. Therefore, marketers and management of companies providing the single platform E-payment system (MySIM™) should give priority to the reasons why respondents choose to use single platform E-payment Solution when designing the program. The information here can be used to support the E-payment applications for the mobile transaction using single platform E-payment in the E-marketplace. Furthermore, there will be more people going cardless, cashless and contactless with MySIM™ (Lai, 2013) that help to create a more social-environment green job.

The study results provide the information needed for the development of new products and services caring for the social-environment by promoting cardless, cashless and contactless MySIM™ (Lai, 2013) that will create new businesses for green job in the single platform E-payment environment. New products and services like online Internet and mobile payment help to create, send and receive payments without paper also help to create green job environment. Organizations that provide this type of green jobs are committed to reduce waste and prevent pollution as part of their social-environment strategy. Organizations will be able to utilize the study information for developing products and services that meet the consumers' single platform E-payment system while also fulfilling their objective of corporate social responsibility. Thus, with MySIM™ platform, the solutions like (e.g: Site Payment using Point of Sales, Internet Payment on mobile) able to be deployed easily and further examples can be found in the appendixes of "SMART LIVING for SMART CITIES @ the palm of your hand" and SMART HEALTHCARE @ the palm of our hand" (Lai, 2015; Lai, 2016).

5.2 Limitation, future study and conclusion

One limitation of using online survey is reaching target audiences who have Internet or mobile data access only. The data also represents ASEAN context and might not be relevant in other region. The data was collected at one point of time and may change over time due to greater experience and advancement of E-payment technologies. Therefore, future study should be expanded to non-internet users using traditional survey method where information can assist management to target non Internet users. This study can be replicated in other region as well and use a longitudinal study to examine the single platform e-payment system and consumers' intention to use at various points of time.

In conclusion, the empirical results from the study suggest that security can lead to increase the usage of consumers' intention to use single platform E-payment system. Therefore, security should be taken into consideration when designing E-payment system in order to increase the consumers' intention to use. It is noted that the stimulus of the single platform E-payment system should include design while providing security to reduce the risk that support the motivation of ease of use and usefulness of the single platform E-payment that can lead to consumers' intention to use single platform E-payment system.

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REFERENCES

[1] Ahn, T., Ryu, S., and Han, I. "The impact of the online and offline features on the user acceptance of internet shopping malls," *Electronic Commerce Research and Applications*, **3**(4), 405–420 (2004).

[2] Al-alak, B. A., and Alnawas, I. "Evaluating the effect of marketing activities on relationship quality in the banking sector," *International Journal of Marketing Studies*, **21**, 78–91 (2010).

[3] Amoroso, D. L., and Magnier-Watanabe, R. "Building a Research Model for Mobile Wallet Consumer Adoption: The Case of Mobile Suica in Japan," *Journal of Theoretical and Applied Electronic Commerce Research*, **7**(1), 94–110 (2012).

[4] Belanger, F., Janine, S. H., and Wanda, J. S. "Trustworthiness in electronic commerce: The role of privacy, security, and site attributes," *Journal of Strategic Information Systems*, **11**, 245–270 (2002).

[5] Bagozzi, R. P., and Yi, Y. "Specifications, evaluation, and interpretation of structural equation models," *Journal of the Academy of Marketing Science*, **40**, 8–34 (2012).

[6] Byrne, B. M. Structural Equation Modeling with LISREL, PRELIS, and SIMPLIS: Basic Concepts, Applications, and Programming, New Jersey: Lawrence Erlbaum Associates (1998).

[7] Chong, A. Y. L., and Chan, F. T. S., Understanding the acceptance of RFID in the HealthCare industry: Extending the TAM model.

[8] Chan, H. K., *et al.* "Decision making for supply chain integration," Decision Engineering, Springer-Verlag, London (2012).

[9] Cheah, K. L. "Payment Systems in Malaysia, Payment Systems Policy Department," Bank Negara Malaysia (2011).

[10] Cohen, P. N. "Black concentration effects on black-white and gender inequality: Multilevel analysis for US metropolitan areas," *Social Forces*, **77**(1), 207–229 (1998).

[11] Cooper, D. R., and Schindler, P. S., Business research methods (10th ed.), New York: McGraw-Hill (2008).

[12] Cornwell, A. Commerce Service Providers and Future Internet Payment Methods, World Market Series Business Briefings (wmrc.com) (2000).

[13] Cruz, P., Neto, L. B. F., Muñoz-Gallego, P., and Laukkanen, T. "Mobile banking rollout in emerging markets: evidence from Brazil," *The International Journal of Bank Marketing*, **28**(5), 342–371 (2010).
[14] Davis, F. D. A technology acceptance model for empirically testing new end-user information systems: Theory and results, Massachusetts, United States: Sloan School of Management, Massachusetts Institute of Technology (1986).
[15] Davis, F. D. "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, **13**(3), 319–340 (1989).
[16] Davis, F. D., Bogozzi, R. P., and Warshaw, P. R. "User acceptance of computer technology: A comparison of two theoretical models," *Management Science*, **35**, 982–1003 (1989).
[17] Davis, F. D., and Venkatesh, V. "A critical assessment of potential measurement biases in the technology acceptance model: Three experiments Internet," *J. Human-Comput. Stud.*, **45**, 19–45 (1996).
[18] Fuller, M. A., Serva, M. A., and Benamati, J. "Seeing Is Believing: The Transitory Influence of Reputation Information on E-Commerce Trust and Decision Making," *Decision Sciences*, **38**(4), 675–699 (2007).
[19] Geron, G. Business Aspects of the Internet of Things: Mobile Marketing, Seminar of advanced topics, Zurich: Florian Michahelles (2009).
[20] Ha, H. Y. "Factors Influencing Consumer Perceptions of Brand Trust Online," *Journal of Product and Brand Management*, **13**(5), 329–342 (2004).
[21] Hair, J., Black, W., Babin, B. Y. A., Anderson, R., and Tatham, R. Multivariate Data Analysis (7th ed.), New Jersey: Pearson Prentice Hall (2010).
[22] Henderson, R., and Divett, M. J. "Perceived usefulness, ease of use and electronic supermarket use," *International Journal of Human-Computer Studies*, **59**, 383–395 (2003).
[23] Horppu, M., Kuivalainen, O., Tarkiainen, A., and Ellonen, H. K. "Online Satisfaction, Trust and Loyalty, and the Impact of the Offline Parent Brand," *Journal of Product and Brand Management*, **17**(6), 403–413 (2008).
[24] Hu, L., and Bentler, P. M. "Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives," *Structural Equation Modeling: A Multidisciplinary Journal*, **6**(1), 1–55 (1999).
[25] Humphrey, D. B., Aris, K., and Grete, Ø. "The future of cash: falling legal use and implications for government policy," *Journal of International Financial Markets, Institutions and Money*, **14**(3), 221–223 (2004).
[26] Izquierdo-Yusta, A., and Calderon-Monge, E. "Internet as a distribution channel: empirical evidence from the service sector and managerial opportunities," *Journal of Internet Commerce*, **10**(2), 106–127 (2011).
[27] Jarvenpaa, S. L., Tractinsky, N., and Vitale, M. "Consumer trust in an internet store," *Information Technology and Management*, **1**(1/2), 45–71 (2000).
[28] Jovanovic, M., and Organero, M. "Analysis of the Latest Trends in Mobile Commerce using the NFC Technology," Multidisciplinary Journals in Science and Technology," *Journal of Selected Areas in Telecommunications (JSAT)*, May Edition. 1–12 (2011).
[29] Kamran, A., Hanifa, S., and Paul, K. "RFID Applications: An Introductory and Exploratory Study," *International Journal of Computer Science Issues*, **7**(1), 1–7 (2010).
[30] Kim, D. J., Steinfield, C., and Lai, Y. J. "Revisiting the Role of Web Assurance Seals in Business-to-Consumer Electronic Commerce," *Decision Support Systems*, **44**(4), 1000–1015 (2008).
[31] Krejcie, R., and Morgan, D. W. "Determining Sample size for Research Activities," *Educational and Psychological Measure*, **30**, 607–610 (1970).
[32] Kline, R. B. Principles and practice of structural equation modelling (3rd ed.), New York: Guilford Press (2011).
[33] Koenig-Lewis, N., Palmer, A., and Moll, A. "Predicting young consumers' take up of mobile banking services," *The International Journal of Bank Marketing*, **28**(5), 410–432 (2010).
[34] Lai, P. C. "The significant of E-business and knowledge-based Customer Relationship in the E-market Place Environment," *INTI Journal*, **2**(1), 552–559 (2006).
[35] Lai, P. C. "The Chip Technology Management Implication in the Era of Globalization: Malaysian Consumers' Perspective," *Asia Pacific Business Review*, **3**(1), 91–96 (2007).
[36] Lai, P. C. "E-business and E-banking," Japan Society for Software Science and Technology, Itech research group (2010).
[37] Lai, P. C. "Cashless, Cardless, Contactless and Convenience of MySIM™," GlobalCLAS Technology (2013).
[38] Lai, P. C., and Ahmad, Z. A. "Perceived Enjoyment of Malaysian consumers' intention to use a single platform E-payment," International Conference on Liberal Arts & Social Sciences, 25th–29th April, 2014, Hanoi, Vietnam (2014).
[39] Lai, P. C. "Factors influencing consumers' intention to use a single platform E-payment System," UNITEN (2014).
[40] Lai, P. C., and Zainal, A. A. "Consumers' Intention to Use a Single Platform E-Payment System: A Study Among Malaysian Internet and Mobile Banking Users," *Journal of Internet Banking and Commerce*, **20**(1), 1–13 (2015).
[41] Lai, P. C., and Zainal, A. A. "Perceived Risk as an Extension to TAM Model: Consumers' Intention To Use A Single Platform E-Payment," *Australia Journal Basic and Applied Science*, **9**(2), 323–330 (2015).
[42] Lai, P. C. SMART LIVING for SMART CITIES @ the palm of your hand, ResearchAsia (2015).
[43] Lai, P. C. SMART HEALTHCARE @ the palm of our hand, ResearchAsia (2016).
[44] Lallmahamood, M. "An Examination of Individual's Perceived Security and Privacy of the Internet in Malaysia and the Influence of This on Their Intention to Use E-Commerce: Using An Extension of the Technology Acceptance Model," *Journal of Internet Banking and Commerce*, **12**(3) (2007).
[45] Lee, T. M., and Jun, J. K. "The role of contextual marketing offer in Mobile commerce acceptance: comparison between Mobile Commerce users and nonusers," *International Journal of Mobile Communications*, **5**(3), 339–356 (2007).
[46] Lee, Y., Kozar, K. A., and Larsen, K. R. T. "The technology acceptance model; past, present and future," *Communication of AIS*, **12**(50), 752–780 (2003).
[47] Legris, P., Ingham, J., and Collerette, P. "Why do people use information technology? A critical review of the technology

acceptance model," *Information & Management*, **40**, 191–204 (2003).
[48] Lin, J., and Hsieh, P. "The role of technology readiness in customers' perception and adoption of self-service technologies," *International Journal of Service Industry Management*, **17**, 497–517 (2006).
[49] Lu, J., Wang, L. J., and Linda, A. H. "Technology Readiness, C2C Platform Perceptions and User Satisfaction," *Journal of Electronic Commerce Research*, **13**(1), 50–69 (2012).
[50] Maran, M., Lawrence, A., M. Fazilah, A. S., M. Kishna, M., and Ng, K. K. "Cashless Society and the determinants: An empirical Investigation," *International Journal of Academic Research*, **3**(3), 674–682 (2011).
[51] Mathieson, K. "Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior," *Information Systems Research*, **2**(3), 173–191 (1991).
[52] MasterCard (2016) http://mobilereadiness.mastercard.com/the index.
[53] Meuter, M. L., Ostrom, A. L., Roundtree, R. I., and Bitner, M. J. "Self-service technologies: Understanding customer satisfaction with technology-based service encounters," *Journal of Marketing*, **64**(3), 50–65 (2000).
[54] Mohammad, A. "The Development of E-payments and challenges in Malaysia," (2008), www.seacen.org/GUI/pdf/publications/research_proj/.../Chap5.pdf.
[55] Muniruddeen, L. "An Examination of Individual's Perceived Security and Privacy of the Internet in Malaysia and the Influence of This on Their Intention to Use E-Commerce: Using An Extension of the Technology Acceptance Model," *Journal of Internet Banking and Commerce*, **12**(3), 1–26 (2007).
[56] Moon, J. W., and Kim, Y. G. "Extending the TAM for a World-Wide-Web context," *Information & Management*, **38**, 217–230 (2001).
[57] Mun, Y. Yi, Joyce, D. J., Jae, S. P., and Janice, C. P. "Understanding information technology acceptance by individual professionals: Toward an integrative view," *Information & Management*, **43**, 350–363 (2006).
[58] Ndubisi, N. O., and Sinti, Q. "Consumer attitudes, system's characteristics and internet banking adoption in Malaysia," *Management Research News*, **29**(1/2), 16–27 (2006).
[59] Online Payment Systems for E-commerce. Directorate for Science, Technology and Industry Committee for Information, Computer and Communication Policy. Organisation for Economic Co-operation and Development (OECD), JT03207630 (2006).
[60] Oppenheim, A. N. Questionnaire design, interviewing and attitude measurement, 2nd ed. London and New York: Continuum International Publishing (1992).
[61] Polatoglu, V. N., and Ekin, S. "An empirical investigation of the Turkish consumers' acceptance of internet banking services," *International Journal of Bank Marketing*, **19**(4), 156–165 (2001).
[62] Rinaldi, L. Payment Cards and Money Demand in Belgium. Center for Economic Studies, Leuven Universities' Discussion Paper Series 01.16 (2001).
[63] Sharma, K., and Singh, A. J. "Biometric Security in the E World. Applied Cryptography for Cyber Security and Defense," *Information Encryption and Cyphering. Nemati*, 289–337 (2010).
[64] Sekaran, U. Research Methods for Business: A Skill-Building Approach. 4th ed. U. S. A.: John Wiley and Sons, Inc. (2003).
[65] Shih, H. P. "Extended technology acceptance model of Internet utilization behavior," *Information and Management*, **41**(6), 719–729 (2004).
[66] Smart Card Alliance Proximity Mobile Payments: Leveraging NFC and the Contactless Financial Payments Infrastructure. A Smart Card Alliance Contactless Payments Council White Paper. Smart Card Alliance. Publication Number: CPC-07002 (2007).
[67] Sun, H., and Zhang, P. "Causal Relationships between Perceived Enjoyment and Perceived Ease of Use: An Alternative Approach 1," *Journal of the Association for Information Systems*, **7**(9), 618–645 (2006).
[68] Szymanski, D. M., and Hise, R. T. "E-satisfaction: An initial examination," *Journal of Retailing*, **76**(3), 309–322 (2000).
[69] Sumanjeet, S. "Emergence of Payment Systems in the age of Electronic Commerce: The State of Art," *Global J. Bus. Res.*, **2**(2), 17–36 (2009).
[70] Tabachnick, B. G., and Fidell, L. S. Using Multivariate Statistics, Boston: Pearson Education Inc. (2007).
[71] Venkatesh, V., and Davis, F. D. "A model of the antecedents of perceived ease of use: Development and test," *Decision Sciences*, **27**(3), 451–481 (1996).
[72] Venkatesh, V. and Davis, F. D. "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies," *Management Science*, **46**(2), 186–204 (2000).
[73] Venkatesh, V., Speier, C., and Morris, M. "User acceptance enablers in individual decision-making about technology: Toward an integrated model," *Decision Sciences*, **33**(2), 297–316 (2002).
[74] Wang, Y. S., Wang, Y. M., Lin, H. H., and Tang, T. I. "Determinants of user acceptance of internet banking: An empirical study," *International Journal of Service Industry Management*, **14**(5), 501–519 (2003).
[75] Wei, D., Shuo, Z., Luo, G., Chen, Z., and Ling, X. "Analyze on Mobile Payment Based on RFID," *Procedia Environmental Sciences*, **10**, 950–955 (2011).
[76] White, H., and Nteli, F. "Internet banking in the UK: Why are there not more customers?" *Journal of Financial Services Marketing*, **9**(1), 49–56 (2004).
[77] Yang, K. C. C. "Exploring factors affecting the adoption of mobile commerce in Singapore," *Telematics and Informatics*, **22**, 257–277 (2005).

Appendix 1

Dimension	Source	Items
Design	adapted from Szymanski and Hise (2000); Lin and Hsieh (2006); Lai, (2014)	MySIM™ design and functionality 1) All in (1) single platform 2) Multi-function 3) Single log in 4) Single touch and go 5) Customised applications 6) No repetitions 7) Simplified operations 8) Task clarity
Perceived Usefulness	adapted from Davis (1989); Lai, (2014); Lai and Zainal (2015)	MySIM™ Usefulness 1) Accomplish task fast 2) Improves the quality 3) Greater control 4) Improves performance 5) Make task useful 6) Valuable skill-sets 7) Provides efficiency 8) Provides effectiveness 9) Support Critical aspects of E-payment 10) Comfortable
Perceived Ease of Use	adapted from Davis (1989); Lai, (2014); Lai and Zainal (2015)	MySIM™ Ease of Use 1) Effortless 2) Straight Forward to use 3) One button touch 4) Single Sign On 5) Just Tap and go 6) Easy to register 7) Easy to activate 8) Easy to understand 9) Easy to pick up the skill 10) Easy to use
Security	adapted from Polatoglu and Ekin, (2001), White and Nteli, (2004), Sumanjeet (2009), Lai, (2013)	MySIM™ Security 1) Safety 2) Reliability 3) Privacy 4) Authentication and Authorization 5) Integrity 6) Non-repudiation 7) Confidentiality 8) Compliance with industry security standard
Consumers' Intention to use	adapted from Venkatesh and Davis' (1996); Lai, (2014); Lai and Zainal (2015)	MySIM™ to make 1) Card payment 2) Internet Payment 3) Mobile Payment 4) All in 1 (Card, Internet and Mobile Payment

Appendix 2

"Smart Living for Smart Cities @ the palm of your hand"

A smart city uses information and communication technologies (ICT) to enhance the efficiency, convenience accessibility, performance and interactivity of urban services, to reduce costs and resource consumption and to improve quality of life in the city. Do you know the number of hours' residents of Greater Kuala Lumpur spend stuck in traffic in a single year? 250,000,000 hours (Source: Malaysia Economic Monitor June 2015, World Bank).

Smart city applications are developed with the goal of improving the management of people flows in and out of the cities and allowing for real time responses to the challenges faced in our daily life. Providing convenient and rapid mobility, connectivity with social cohesion systems to today's urban and suburban consumers can be challenging but possible. Imagine if you can have smart living tools at the palm of your hand using mobile phone as shown in the diagrams below. Start your day by using the "iPark™" (Parking app - The goal is to enhance parking experience by enabling users to view and book parking lots, and use their phones as access cards to parking zones through Near Field Communication. iPark™ saves fuel, time and promotes green environment) to book a parking spot near the public transport terminal (e.g: Kelana Jaya Station) before leaving the house and then able to use the MySIM™ in the phone already activated with transport pre-paid credit to pay at a touch to ride the Light Rail Transit (LRT) to KL Sentral. While in the Light Rail Transit (LRT), just use "Shopbuddy™" to order and purchase breakfast set at special price from food outlet (e.g: McDonald) where you can pick up when you arrive and share the promotion on social media with your friends. Just tap/scan to pick up your breakfast. Then, walk to your office and use the MySIM™ in the phone to open the office door access. While enjoying your breakfast in the office, you can log in to your "smart home app" to make sure your child is safe at home and use "Health app" to see how many calories you're taking for breakfast this morning as well as how many steps you've walk from home to office.

Appendix 3

"SMART HealthCare Innovation @ the palm of our hand"

The Smart HealthCare Innovation solutions allows for stress-less trip to the hospital for medical links information technology, communications and healthcare to improve the quality and safety of patient care @ the palm of our hand. Long queue of patients and parking space are problems faced at hospitals. Furthermore, visitors and patients have difficulty to reach the exact location in hospitals too especially when they have to visit several different clinics or departments during the visit. Medical prescriptions are also "alien" to patients with medical terminology. Therefore, we've come out with solutions on a single platform that can be accessible on mobile phone by the users.

On the day of appointment with doctor, the patient can use the mobile phone to get the queue number with estimate time of seeing the doctor using the Queue ticketing system and then reserve a car park space to ensure the parking space is available upon arrival with iPark™ (Your priority Car Park Booking). The hospital is like a maze to the visitors and patients. Therefore, the QNavigation™ System is available to assist visitors and patients to direct them to the right location both online and offline (advantage over most existing applications which do not support offline navigation). Upon seeing the doctor and get the prescription, the payment can be made using the MySIM™ e-payment. MySIM™ has the cutting-edge technology that looks like a regular SIM card but with combined Telecommunication SIM, Bankcard SIM and Transport SIM (Touch N Go) plus with an integrated hybrid antenna on the SIM itself which operates at 13.56 MHz that can be used for Card, Internet and Mobile Payment works on any phone that uses the SIMCard. MySIM™ can be used to enter the parking space as well as store the owner identity with health information (e.g: allergies, blood type etc) and link to E-payment that can be retrieved by touching at the secured readers in the hospital. The medications information can be transferred to the Medisafe™ app (breakthrough technology on imaging with capability to scan and identify the drug image) on the mobile phone. Basically, Medisafe™ app is to identify the correct medication to be taken at home as an extension to patient safety.

The Smart Healthcare Innovation Solution able to provide comfort to patients by reducing their queuing, searching, waiting and parking time. It also lessens stress on staff so that they can focus on their job instead of managing frustrated patients. The use of the e-ticket is eco-friendly and alternative to paper ticket from queue ticket, parking ticket to prescription of medications on mobile phone. This has positive impact to the well-being of the stakeholders from the perspective of convenience to patients, productivity of staff to patient safety of medication.