

## **Consumer Perceptions in Adopting E-money in Developed Markets**

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### **Abstract**

Ways of managing money have been evolving along with technological developments, from golden coins in ancient times to today's virtual money. Since the 1990s, the Internet has caused a major shift in financial eco-systems and now mobile phones are taking finance to the next step. Mobile phone usage is growing across the world and financial systems are exploiting this, trying to integrate consumers and the payment industry using mobile technology. Mobile-based solutions have become very popular in developing nations and are being used to address many challenges related to banking services. These solutions provide convenience to all stakeholders in the financial system. However, similar products have not gained the same popularity in developed markets. With the latest developments in the smartphone industry, digital wallet banking solutions have once again come into the limelight. Near-field Communication (NFC) technology has been accepted as a standard and many banks and payment providers have started launching new mobile applications (apps) for managing e-money. This paper aims to explain the factors that influence consumer intentions in adopting e-money apps. The focus of this study is on providing a better understanding of consumer intentions in relation to the use of e-money apps in developed markets, such as Singapore, the United States of America, the United Kingdom, Australia and Hong Kong. The key factors addressed are perceived usefulness, ease of use, substitution and the nature of transaction. The observations of this study will be of benefit to all stakeholders in the mobile payment systems of particular economies.

**Keywords:** e-money, ease of use, substitution, transaction nature, perceived usefulness

### **Introduction**

The world today is experiencing a technological revolution with radical developments in the mobile communication industry and these changes are transforming people's lifestyles (Anne Bouverot 2013). The innovations taking place in social media are influenced mainly by the technological revolution in the mobile industry and also the availability and affordability of Internet services.

Yan Gao et al (2014) state that the rapid changes in mobile technologies are changing every aspect of day-to-day life for consumers. The smartphone concept is evolving, and integrating Near-field Communication (NFC) technologies which provide enhanced opportunities to users in relation to managing information (Anindya Ghose et al 2014). Financial institutes are leveraging these developments, designing solutions for their consumers that are suitable for

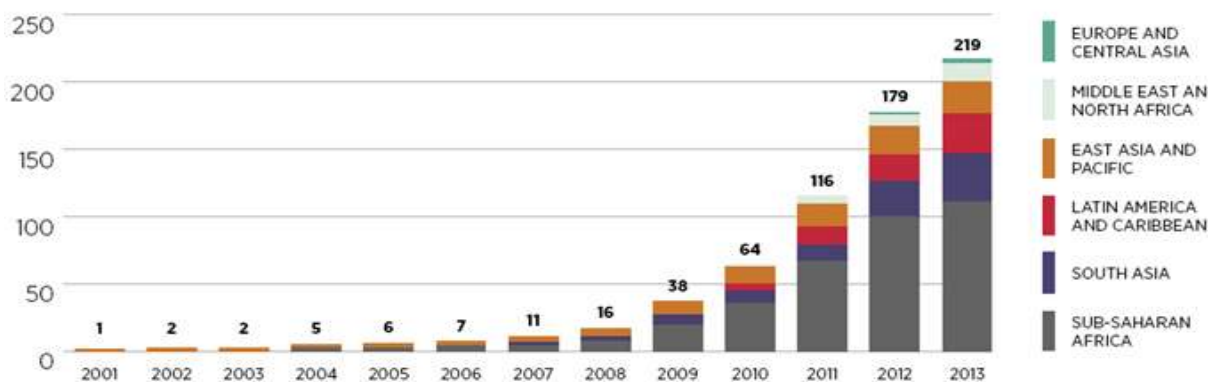
managing their cash on a daily basis. These new innovations are redefining the relationships between consumers and merchants and also those with financial institutions. Banks, telecommunication operators and other third party providers are trying to establish relations with retail consumers.

As an increasing number of people carry mobile phones these days, efforts are being made to replace physical wallets with mobile devices. Krassie Petrova (2013), argues that customers prefer to use mobile solutions to make payments quicker and with greater ease. Mobile-based solutions have helped economies in developing nations by integrating the ‘unbanked’ population into the countries’ financial systems (Daniel Radcliffe 2010). M-Pesa, for example, launched by Vodafone in 2007 for mobile providers in Kenya and Tanzania, has since spread internationally and is considered the benchmark solution for digital wallet-based applications. Similar solutions have been introduced in advanced markets, but have not proved successful. Google wallet, launched in 2011, was not well received and efforts are being made to improve the offering. Gene Marks (2013) argues that advanced banking facilities and a lack of infrastructure to support NFC has caused the slow adoption of these services in developed markets.

However, since last year digital wallet concept applications (apps) have been back in the limelight and many banks and payment gateway providers have launched mobile applications. This is attributed to changes in smart phone devices. An increasing number of mobile manufacturing companies are adopting NFC, including Apple which launched its product ApplePay with its new models during the third quarter of 2014; markets are waiting to see the response to this new product in the retail sector.

The demand for apps to manage e-money is growing across the globe and to meet this demand, mobile apps have been launched in many countries to provide e-money services using smartphones. These include apps provided by banks, telecom operators and other third party providers. Figure 1 shows the increasing trend in the provision of such applications in different parts of the world from 2001 to 2013.

Figure 1: Mobile payment solutions launched in recent years



Source: [www.gsma.com](http://www.gsma.com)

From Figure 1, it can be seen that developing nations are taking the lead in adopting mobile apps. This study aims to understand why these applications have not been adopted to the same extent by consumers in developed countries over the past decade. What are the factors that influence adoption or lack of it?

This research explains and empirically verifies a model determining the factors that influence consumer perceptions in relation to adopting e-money apps in developed economies, specifically Singapore, United States of America, United Kingdom, Australia and Hong Kong. This research could be helpful to financial institutions, mobile operators and other third party operators providing services for managing e-money. The study may also help merchants in designing payment solutions or enhancing solutions which are already available.

The study has been completed in two phases: the initial stage which comprised a literature review, observations and consultations within industry experts to form the proposal; in the second stage, primary data were collected through a non-line survey for analysis through PLS-SEM (Partial Least Squares- Structural Equation Modelling). The research focuses on the following parameters within the framework of the Technology Acceptance Model (TAM) to understand consumer adoption of e-money apps:

- Perceived usefulness (PERUS)
- Substitution(SUBST)
- Transaction nature (TXNNAT)
- Relative advantage(PERADV)
- Ease of use (EAUS)

### **Materials and Methods**

Money has evolved from addressing basic needs as a medium for exchanging goods to being one of the major commodities currently driving all the economies across the globe (Benton E. Gup 2014). It has transformed from coins to paper form and then to an electronic mode in the form of plastic cards/notes and is now progressing to the next stage of digital coins (Figure 2). With the revolution in information technology, digital currency has been launched and has started to be used widely.

**Figure 2: Progression of monetary forms**



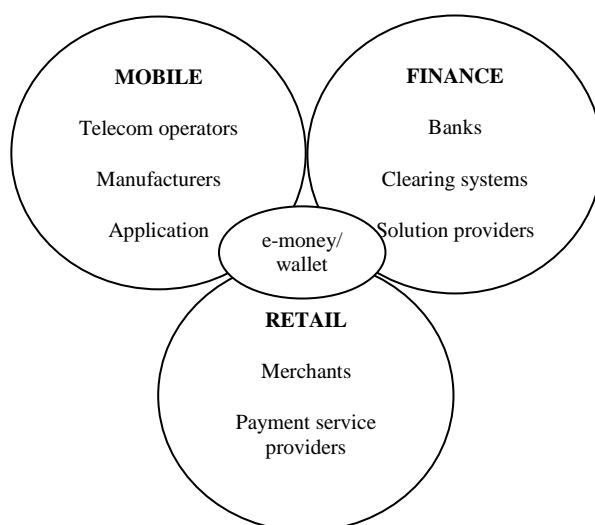
The concept of the smart card, with stored value, has become very popular in developed countries due to developments in infrastructure and technological advances. Smart card systems help to address simple payments, such as bus/train fares, toll gate fees, parking fees, etc. and it is a very popular mechanism of payment in these areas across all developed markets. Electronic forms of money have helped society in many ways. Domagoj Sajter

(2013) argues that there are increasing complications with the use of physical money and that governments across the world are using the convenience of electronic forms of handling transactions (debit/credit cards, smart cards) as a means of enforcement in the cashless society, so that every transaction can be tracked and fraud can be controlled.

Adewale Adegoke (2012) points out that the adoption of cash-less payment systems by society benefits all the stakeholders in the financial system. Consumers benefit from increased convenience and lower risk in managing cash, merchants benefit from faster access to funds and lower handling costs and governments benefit in terms of tax management and cash management. However, allowing digital currency in its entirety has led to the privatization of money, with non-banking institutions starting to provide e-money services. This in turn has given rise to greater regulatory challenges and to address these, the European Union has put restrictions in place to allow only established banks to issue e-money (Nathalie J. 2004, Antoine G. 2012).

Hsueh, Y. W. et. al., (2010) emphasize that there has always been a huge demand for innovation in the ways in which banks manage cash. With the success of the Internet, banks have been forced to provide on-line services, giving clients access to their accounts whenever they need. Payment system services are regarded as two-sided markets, in which both consumers and merchants play significant roles. Armando, C. et. al., (2010) contend that solutions will be successful only when both of these participants see an advantage and join the platform. It is important to note that all the stakeholders in the financial eco-system need to be involved in promoting digital wallet solutions. The interconnected nature of these stakeholders is illustrated in Figure 3.

**Figure 3: Financial eco-system of e-money applications**



At the same time, technological developments also bring issues along with the benefits. As Mark E.B.(2012) notes, consumers are particularly concerned about issues related to security, privacy, system availability, etc. Marius P. and Adrian C. (2009) argue that consumers lose the key benefits of anonymity and physical saving through the use of e-money.

Electronic money options based on smart card technology have not been integrated in developing nations and with the expansion in mobile phone use, the concept of the mobile wallet has started to gain ground in these economies where banking facilities are not widely available ((Joanna S. et al., 2010); however, similar solutions have not received the same acceptance in advanced countries). Meiling P. (2011) argues that customers hesitate to move from existing payment systems, which are already at an advanced stage. Retailers are experiencing more sales with the adoption of new technologies, but there are challenges in establishing point-of-sale technologies for various types of mobile solutions (Krassie P. (2013).

**Table 1: Comparison of empirical studies on the adoption of e-money apps**

Study	Inference for adoption of e-money	Effect of parameters on adoption	Discussion of each parameter	Adoption of e-money(mobile wallets)
Brian Mantel(2000)Why Do Consumers Pay Bills Electronically? An Empirical Analysis	Analyses the evolution of payment methods from paper to electronic methods.	Key factors: <ul style="list-style-type: none"> <li>• demographics</li> <li>• convenience</li> <li>• incentives</li> <li>• transaction nature</li> <li>• privacy protection</li> </ul>	Yes –analysed on the basis of demography and advantages of electronic payments	Not analysed
Jean-Michel Sahut (2008)The Adoption and Diffusion of Electronic Wallets	Explains the initial adoption of mobile wallet apps based on the reasons for adoption and issues	Key factors: <ul style="list-style-type: none"> <li>• perceived usefulness</li> <li>• ease of use</li> <li>• transaction nature</li> </ul>	Yes –addresses adoption issues in the early stage of wallet applications	Analysis pre-dates smartphones, when wallet applications were not considered as user friendly
Daniel Radcliffe (2010)Mobile Payments Go Viral: M-PESA in Kenya	Analyses the growth of wallet applications in Kenya – how banking reached poor people	Key factors: <ul style="list-style-type: none"> <li>• non-banking population</li> <li>• needs</li> <li>• customer service</li> <li>• security</li> </ul>	Yes – focused on the success of wallet solutions in developing nations	Limited to developing nations only
Esther Swilley(2010)Technology Rejection: The Case of the Wallet Phone	Analysis includes reasons why wallets are not accepted	Key factors: <ul style="list-style-type: none"> <li>• security</li> <li>• risk</li> <li>• TAM</li> </ul>	Yes – emphasis on adoption issues, specifically security and privacy	Analysis in early days of smartphones, when awareness was low and very few apps were launched
Ignacio Mas (2011)Scaling Mobile Money	Explains the availability of various payment methods and their influence on adopting mobile wallet solutions	Key factors: <ul style="list-style-type: none"> <li>• banking facilities</li> <li>• channel management</li> <li>• rewards</li> <li>• awareness</li> </ul>	Yes – parameters discussed by comparing the eco-systems of developed and developing nations	Analysis not focused on smartphone use
RashmiMantri, JunkangFeng(2011)Exploring the Key Challenges: Adaptability, Sustainability, Interoperability and Security to M-payment	Analyses the adoption of wallet applications, comparing convenience and safety	Key factors: <ul style="list-style-type: none"> <li>• relative advantage</li> <li>• multiple apps</li> <li>• speed</li> <li>• trustworthiness</li> </ul>	Yes –analyses the advantages of and competition between service providers	Evolution in smartphones addresses some concerns

Gene Marks (2013) Whatever Happened to Google Wallet?	Analyses why Google wallet was not accepted when it was launched	Key factors: <ul style="list-style-type: none"> <li>• multiple wallets</li> <li>• security</li> <li>• NFC</li> <li>• competition</li> </ul>	Yes – discussion concerning the availability of technology	Analysis focused on technology
Martin Fiedler, Ali Öztüren (2014) Online Behaviour and Loyalty Program Participation-Parameters Influencing the Acceptance of Contactless Payment Devices	Loyalty programs and rewards influence attitudes towards using wallet solutions	Key factors: <ul style="list-style-type: none"> <li>• security</li> <li>• ease of use</li> <li>• relative advantage</li> </ul>	Yes – discussion analyses the parameters influencing the adoption of e-money	Not analysed

With the introduction of smart phones, mobile banking has been enhanced and has become much more user friendly. This research focuses on e-money apps in developed countries to understand the factors that influence the adoption (or not) of e-money. Table 1 summarizes research in this field, detailing studies in chronological order since 2000.

As can be seen from Table 1, the extant literature has identified a number of parameters that operate as key factors influencing the adoption of e-money applications in different contexts. Based on this literature – and especially taking into account the current smartphone revolution which is changing financial eco-systems around the globe – this study focuses on five parameters regarded as salient: perceived usefulness, substitution, transaction nature, relative advantage and ease of use. This report discusses the importance of each parameter for the adoption of wallet applications in advanced economies, in particular Singapore, the US, the UK, Australia and Hong Kong, with advanced banking systems in place.

### Research Methodology

This research is *descriptive* and *fundamental* and requires the analysis of *quantitative* and *qualitative* data. The data required for the research were collected in two ways:

**Secondary data:** Available academic literature in the area was used to understand various aspects of the topic and to define the conceptual research model.

**Primary data:** First-hand information was collected by conducting an online survey. Additional information was obtained by interacting with a few professionals in the banking industry and merchants who provide services accepting e-money in Singapore. This was to understand the realities on the ground in the Singapore market, which helped during the analysis of the data collected through the survey.

Initially a pilot survey was conducted with a sample of 25 respondents. The survey was designed to include questions related to the factors identified. This sample survey was conducted through personal interviews and covered various industry segments. The face-to-face interviews helped to understand the views of the respondents concerning the research model. The collected pilot data were then analysed and minor revisions were made to the



questionnaire based on the feedback concerning perceptions of consumer behaviour before proceeding to the final survey. The final survey was conducted using Google online forms and various social media channels, such as mail groups, Facebook™ and WhatsApp™, to reach out to respondents in the target countries: Singapore, Hong Kong, the USA, the UK and Australia. In total, 204 responses were received (see Data Analysis).

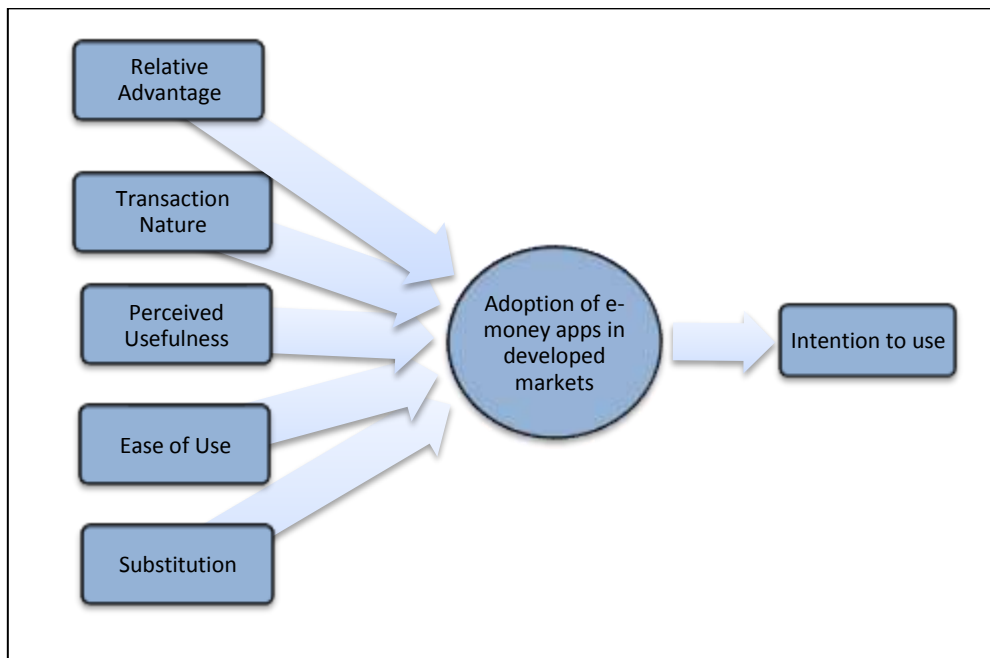
Finally, the data collected through the online survey were analysed using SmartPLS™, which is a structural modelling based tool. The tool was used to build and validate the research model. Partial least squares (PLS) regression techniques were used to analyse the latent constructs.

### **Research Framework and Hypothesis Definition**

Customers adopt new technical innovations which add value in day-to-day life. Financial eco-systems exert considerable influence on new technical solutions which allow society to handle cash in convenient ways. For example, smart card systems have changed the way payments are made, as has Internet banking. Consumers demand solutions that enable payments to be made faster and more safely and solution providers have used mobile phones as a replacement for the physical medium of cash. This new channel for payments has been adopted widely in economies where banking services are not readily available and consumers have thus been given the opportunity to integrate into the financial eco-system. However, similar solutions have not proved popular in advanced economies.

This research examines consumer adoption of e-money solutions in developed countries. The focus here is on why these solutions are not accepted widely in advanced economies whereas they are driving the economies in developing nations. The Technology Adoption Model (TAM) is considered one of the best models for studying customer behaviour (Yong-Wee Sek et al 2010). According to K. C. C. Yang (2005), TAM explains how perceived usefulness and ease of use influence customer intentions (Harry Bouwman et al 2008). Here, the factors affecting adoption are measured by usage intentions and the relation to the latent variables: perceived usefulness (PERUS), substitution (SUBST), transaction nature (TXNNAT), relative advantage (PERADV) and ease of use (EAUS). Figure 4 presents the conceptual model of the research and each variable is then discussed in detail.

Figure 4: Conceptual model of the research framework



### *Relative Advantage*

Consumers often carry various cards in their wallet for making payments, but by adopting the mobile wallet solution one can avoid carrying physical cards. In developed countries, changes in infrastructure to support the latest technologies, such as NFC, will help to develop the use of mobile payments, providing incremental benefits in terms of convenience for the customers; this is unlike the use of such technologies in developing countries, where e-money solutions have been used to fill gaps in the financial eco-system. In today’s fast-paced lifestyles, consumers tend to prefer faster payment modes. Mobile money markets are built on speed, with ease of access being a key aspect of payment solutions (Ignacio Mas, 2011). Consumers require the utilization of technology to enhance the payment process in stores so that they can avoid queuing and save time.

Furthermore, existing methods of payment, such as credit and debit cards, require additional attention on the part of the consumer as their security depends on the physical safety of the plastic card and maintaining the confidentiality of PIN numbers. C. Anjaneyuluand Y. M. (2013) argue that consumers need to be vigilant in maintaining cards as the result of any fraud will not be immediate. Wallet applications in mobile phones provide enhanced safety in comparison to managing tangible cards.

The use of mobile technologies also benefits the merchants. Krassie P. (2013) observes that retailers see a growth in sales when offering new technologies to their consumers. In a related area, Sirajbeg S. M. (2012) note that although consumers feel that on-line banking comes



with a risk, many consider that Internet banking is increasingly becoming a “need to have” than a “nice to have” service. It has also been observed that mobile services are being used when other alternatives are not available, for example paying for a taxi having forgotten one’s wallet (Rashmi M. & Junkang F. ( 2011).

Governments and central banks across the globe are encouraging the use of mobile banking solutions as a cashless society allows better control of the financial system (Domagoj S. 2013). These solutions also benefit banks in terms of reducing their costs, mainly through the ability to provide services without establishing branches (John & Tajudeen 2014). However, Mahmoud A., Alsheyyaband, & Dalbir S. (2013) point out that banks have to build confidence in such systems as consumers are very concerned for their privacy. Furthermore, Niels V. (2013) argues that any digital wallet solution must provide value-added services, such as reward schemes, as well as better customer service so that consumers will be encouraged to use it. For institutions, it must also be pointed out that advances in technology not only benefit the eco-system but also come with a cost. Thomas G. et al (2002) state that the security measures of the payment systems must be monitored on a regular basis; continuous supervision of the systems works to prevent the crime and fraud that are inevitable with advances in technology.

A final advantage is that mobile technologies are more environmentally friendly than traditional payment modes, for example in terms of the production of tangible forms of payment, or the costs associated with branch banking. Mobile apps therefore provide a clean and green financing solution.

Most of these researchers have focused on the technology and corresponding advantages related to certain aspects individually; here, the overall financial eco-systems has been considered, examining how e-money apps can potentially add value for users in comparison to the use of traditional payment methods, such as cards and cash. The literature highlights the advantages and disadvantages of digital wallet solutions and thus the following hypothesis is developed:

**H1:** *Relative advantages have a positive impact on the perceived usefulness of e-money apps.*

### ***Perceived Usefulness***

There is continuous development taking place in financial systems to provide better services to all stakeholders and mobile phones have been identified as a quicker medium for the next level solutions. Most people carry a mobile phone and the use of smartphones is growing rapidly. Mobile banking solutions have been taken up well in developing nations due to the lack of traditional banking facilities. M-Pesa, the benchmark solution in Kenya, was adopted by nine million customers (corresponding to 40% of Kenya’s adult population) in less than three years. Daniel Radcliffe (2010) attributes this success to consistent user experience and improvised channels through agent networks. According to Ignacio Mas (2011), only two in

100,000 people in developing countries have access to bank branches compared to 33 in developed countries; similarly, ATMs are available to only 1.3 per 100,000 people in developing countries compared to 67 in developed countries.

Atul S. (2013) notes that mobile banking can have a considerable positive impact on overall financial systems; it has contributed to sustainable growth in India by bringing banking services to a larger part of the unbanked population where banking facilities such as ATMs, credit cards and debit cards are not available. Mobiles are affordable and banks have found mobile solutions present an alternative cheap medium to reach rural populations. The differences in existing banking facilities are one of the main reasons that the adoption of mobile banking solutions cannot be compared between the developing and developed economies.

The other main concern relates to differences in technologies; consumers are not interested in storing multiple applications on their mobile phones and by adopting NFC technologies, the major solution providers are trying to come up with a common platform. Anne B. (2013) and Calum M. (2012) argue that NFC acceptance will represent a major shift in the way consumers view e-commerce. NFC facilitates a wide range of solutions available to consumers at their fingertips and more importantly, when required. These technologies are reaching beyond existing boundaries as consumers demand for them grows. Boon & Intan (2011) argue that social norms have no major impact on the acceptance of mobile banking solutions: consumers prefer the availability and service standards of the solutions.

Perceived usefulness does not only relate to banking. One aspect of mobile phone use that is on the rise relates to location-based technology. The smart phone has become a part of everyday life and the device has turned a user's location into valuable information. Location-based applications have advantages for multiple stakeholders, helping in services like buying or selling products, giving directions, buying tickets, or even locating an item in a shop (Christian L. 2011).

According to existing research, there is a relation between perceived usefulness and intention to use, extended here to examine the perceptions of consumers relating to e-money applications in advanced countries, primarily driven by the revolution in the smart phone industry. Thus, the second hypothesis is as follows:

**H2:** *Perceived usefulness has a positive impact on the consumers' intentions to use e-money applications.*

### ***Ease of Use***

The world is experiencing a mobile revolution that is transforming people's lives in many respects: smart phones and tablets are becoming a major part of life and app designers are competing to provide solutions that are easily used. In financial eco-systems, payment solution providers evolve in line with technology to provide banking solutions to consumers.

According to Robertson et al (2012), Martin, F. & Ali, Ö. (2014), users are highly concerned about the issue of security in adopting contactless payment solutions and ease of use plays a significant role in this regard, particularly as most users are non-technical. Kate F. (2011) and Dianne C.(2006) argue that consumers prefer to use simpler mobile applications which require less technical skill. A solution will be adopted only if the users find it easy and safe. One issue is that for any new innovation, merchants face challenges in providing the corresponding point-of-sale equipment (Krassie P.2013). Furthermore, any solution in the payment eco-system has to ensure effective integration of both sides (consumer and merchant),or the solution will not meet its objectives (Armando C. et al 2010); if either of these parties do not see any advantage in using the solution, it is difficult to persuade them to adopt it.

According to Esther S. (2010), consumers find mobile wallets convenient compared to the tangible forms of cash or cards, they find these applications easy to use and they are able to identify the risk that comes with these soft solutions. The payment service providers (banks, telecoms providers and third parties) have identified the change in the trend and have started to launch applications that are compatible with smart phones. Will H. (2011) points out that although consumers are interested in using wallet applications, they will want to carry only one wallet on their mobile and may not be interested in downloading all the applications available on the market as it is tedious to employ more than one solution. However, Scott S. (2013) observe that demographic factors influence the extent to which solutions are adopted: the younger generation tend to prefer to use multiple options and there are also early adopters who can be targeted first for all new solutions.

In this study, ease of use is considered in relation to the preferences of consumers in the smart phone arena ,in which quite a few applications have been launched in 2014. Based on the above arguments, the following hypothesis is developed:

**H3:** *Ease of use influences consumer intentions to adopt e-money applications.*

### ***Transaction Nature***

Changes in technology, related predominantly to handheld devices, are influencing consumer spending. Customers now have many options and many payment methods at their disposal to satisfy their needs and providers need to consider factors that might discourage consumers from using their solutions. For example, Barry S. et. al (2008) consider that any additional charges at the point of sale can have a drastic impact on sales volume. The nature of the transaction is certainly one of the main considerations in using wallet solutions and Anne K & Robert V. (2013) have observed that wallet applications are generally used only for small value transactions. Mireya A. (2014) argues that the pricing of the solution and transaction costs (if any) play a major role in the adoption of wallet solutions.

In most developed countries, electronic payment methods are widely accepted and yet, unlike other developed countries, the adoption of non-cash payment methods has been very slow in the US (Joaquin at 2007 & Brian Mantel 2000). Ignacio Mas (2011) points out that the wallet solutions designed by banks are primarily related to basic banking facilities, such as merchant payments and transfers. He argues that there is still scope to extend these services to other banking facilities, such as savings, borrowing, etc., which would add greater benefit to both parties and improve adoption levels.

During the pre-smart phone era, the use of mobile apps came with a cost, requiring an upgrade of phones to use the applications. With the latest trends, almost every new phone bought in developed countries is a smart phone, thus reducing the potential cost.

Based on the above, this research aims to determine the influence of transaction nature in terms of perceived usefulness and the extent of adoption of e-money applications:

**H4:** *Transaction nature has a positive impact on perceived usefulness.*

**H5:** *Transaction nature influences consumer intentions in relation to adopting digital wallet applications.*

### ***Substitution***

Technological innovations are influencing financial eco-systems in providing alternative methods for managing cash. One of the latest trends is to integrate mobile banking with digital wallets, replacing tangible forms of cash or cards (Kevin Rowland 2013). As noted previously, the digital wallet solution has experienced greater acceptance in developing countries where the traditional banking infrastructure is not available to support the financial eco-system. However, this success has not been replicated in developed countries. A possible reason for this is that customers hesitate to move from existing payment systems which are already in advanced stages to any new solutions as there is no immediate need for them to adopt the new technology (Meiling P. 2011).

Solution providers in advanced markets are experimenting with various options to show the advantages of these solutions. According to Kelly Liyakasa (2013), the Europay-Master Card-Visa (EMV) smartcard payment system is one of the internationally accepted standards, addressing multiple availability options. More than 25 countries have adopted this technology, but American consumers are still not showing a move to this alternative, perhaps because they are happy with the existing infrastructure.

Another concern for consumers is the safety of digital wallet solutions and the availability of the device. Tanai K. (2014) and Mark E. B. (2012) explain that consumers are worried about issues related to security, privacy, unauthorized transfers, error resolution, viruses, system breakdown, manual mistakes, etc.

Previous research has focused on the substitution phenomenon in the pre-smart phone era, predominantly related to banking and infrastructure. In contrast, this research focuses on the latest trends, which have seen a number of mobile apps launch in 2014, and this study takes account of the availability of NFC. As part of this research, the perceptions of consumers are captured in relation to using digital wallet applications instead of cash and cards (substitution):

**H6:** *Substitution influences the perceived usefulness of adopting e-money apps.*

**H7:** *Substitution has a positive impact on perceptions of relative advantage.*

### **Data Analysis**

During the pilot survey, responses were collected through personal interviews with 25 respondents. Based on their feedback, changes were incorporated in the on-line survey conducted for the main study. The questionnaire comprised two parts: the first part aimed to collect demographic data; the second part collected data on the factors used to measure the latent variables. The questionnaire consisted of a total of 28 items, seven concerning demographic information and the remaining items related to the study variables. All the indicator-related items were measured on a five-point scale from “strongly disagree” to “strongly agree”.

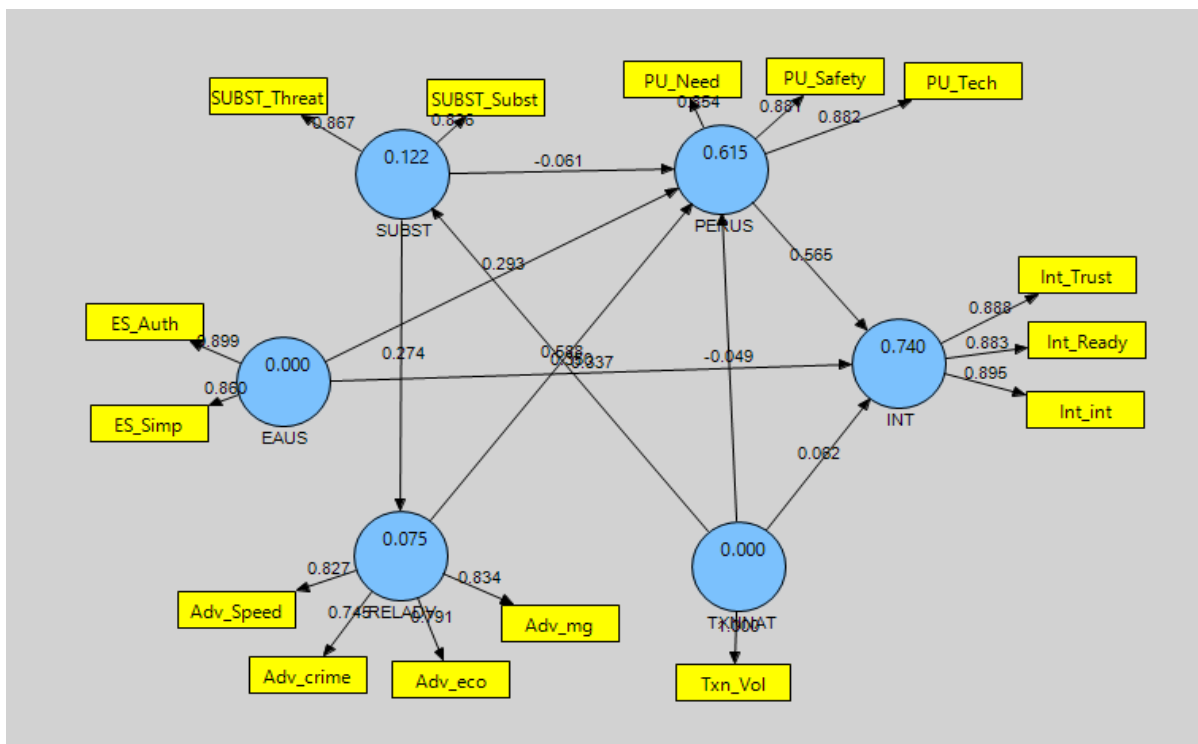
In the online survey, 204 responses were received, of which nine were found to be incomplete. Table 2 provides a summary of the demographic attributes of the participants: age, gender, occupation, income, country, industry, awareness. Of the 204 respondents, 68% were male and 79% were working, with 71% earning more than USD 5,000 per month. The respondents were from various countries: Singapore (51%), the USA (18%), Australia (14%), the UK (10%), Hong Kong (4%) and other (3%). The majority of respondents (62%) were from the information technology and finance industries. It can also be observed that 78% reported being aware of e-money apps, but only 52% had downloaded such applications on their mobile devices.

Table 2: Demographic statistics of respondents

Demographic statistics of respondents (n=204)					
<b>Gender</b>			<b>Income in USD</b>		
Male	138	68%	Not working	39	19%
Female	66	32%	<3,000 per month	17	8%
			3,000–5,000 per month	55	27%
			> 5,000 per month	90	44%
<b>Age</b>			<b>Industry</b>		
Up to 20	6	3%	Finance and insurance	44	22%
21–30	69	34%	Information technology	81	40%
31–40	93	46%	Manufacturing	13	6%
41–50	29	14%	Healthcare	7	3%
above 50	7	3%	Telecommunications	8	4%
			Supply chain	9	4%
			Real estate	4	2%
			Other	38	19%
<b>Occupation</b>			<b>Awareness of e-money apps</b>		
Student	20	10%	Yes	159	78%
Professional	147	72%	No	45	22%
Self-employed	13	6%			
Home maker	20	10%			
Other	4	2%			
<b>Country of residence</b>			<b>e-money apps downloaded</b>		
Australia	29	14%	Zero	98	48%
Hong Kong	8	4%	One	52	25%
Singapore	104	51%	More than one	54	26%
United Kingdom	20	10%			
United States	37	18%			
Other	6	3%			

To analyse the data concerning the latent variables, the SmartPLS2.0 software was employed, using partial least squares analysis to validate the measurements and to verify (nullify) the defined hypotheses. The relationships between the variables are shown in Figure 5.

Figure 5: Relationships between variables



### Measurement Validation and Reliability

The reliability of the model is verified based on the values for *Cronbach's alpha* and *composite reliability* (Joseph F. Hair et al 2013). Cronbach's alpha values should be greater than 0.6 and composite reliability should be greater than 0.7: only then can the model be considered reliable. As can be seen from Table 3, these two scores are above the respective thresholds, so the model can be considered reliable.

Table 3: Model Reliability

	AVE	Composite Reliability	R Squared	Cronbach's alpha	Communality	Redundancy
EAUS	0.774	0.873		0.710	0.774	
INT	0.790	0.919	0.740	0.867	0.790	0.309
PERUS	0.762	0.906	0.615	0.844	0.762	0.234
RELADV	0.640	0.876	0.075	0.815	0.640	0.046
SUBST	0.725	0.840	0.122	0.621	0.725	0.089
TXNNAT	1.000	1.000		1.000	1.000	

Here and in the tables on the following pages, I address issues of validity.



### **Convergent Validity**

To check convergent validity, the *average variance extracted (AVE)* and *outer loadings* were evaluated for each variable. The AVE value should be greater than 0.5 and the outer loading value should be greater than 0.7 (Ken K.W. 2013). Table 4 shows that all the AVE and outer loading values are greater than the accepted thresholds, so it can be concluded that the model has convergent validity.

### **Discriminant Validity**

The discriminate validity of the factors used to measure the strength of the model by the degree at which the items differentiate among constructs or measure distinct concepts. Here the discriminate validity was verified by testing the correlations between the overlapping measures (M. Haenlein, A. M. Kaplan 2004). The highest correlation between any of the measures should be greater than 0.6 and square root of AVE of each latent variable is larger than the cross correlations (C. Fornell, D. F. Larcker 1981). Table 5 shows that the correlation values are above the aforementioned thresholds. Furthermore, the square root value of AVE for each construct is above all the other constructs (Table 6). Finally, Table 7 shows the factors and their significance in the research model. With these verifications, it is possible to conclude that the discriminant validity is satisfactory for the defined model.

Table 4: Item loadings for indicators of latent constructs

Construct	Item	Description	Loadings	AVE	Composite Reliability	R Squared	Cronbach's alpha
Relative advantage (RELADV)	Adv_Speed	Q14: Speed	0.827	0.774	0.873		0.710
	Adv_crime	Q18: Corruption	0.745				
	Adv_eco	Q17: Eco Friendly	0.791				
	Adv_mg	Q16: Cost of money	0.834				
Ease of use (EAUS)	ES_Auth	Q23: Easy authentication	0.899	0.790	0.919	0.740	0.867
	ES_Simp	Q21: Simple use	0.860				
Intention to use (INT)	Int_Brand	Q25: Banks vs. other providers	0.883	0.762	0.906	0.615	0.844
	Int_Ready	Q26: Ready to use	0.888				
	Int_Trust	Q25: Trust	0.895				
	Int_int	Q27: Future usage	0.855				
Perceived usefulness (PERUS)	PU_Safety	Q15: Safekeeping of tangible money	0.881	0.640	0.876	0.075	0.815
	PU_Need	Q7: Need to use	0.882				
	PU_Tech	Q13: NFC	0.836				
Substitution (SUBST)	SUBST_Subst	Q8: Credit/debit cards	0.867	0.725	0.840	0.122	0.621
	SUBST_Threat	Q9: System availability	1.000				
Transaction nature (TXNNAT)	Txn_Vol	Q19: Transaction volume	1.000	1.000	1.000		1.000

Table 5: Item correlations with other constructs

	RELADV	EAUS	INT	PERUS	SUBST	TXNNAT
Adv_Speed	<b>0.827</b>	0.630	0.751	0.717	0.288	0.446
Adv_crime	<b>0.745</b>	0.522	0.443	0.453	0.142	0.335
Adv_eco	<b>0.791</b>	0.594	0.595	0.595	0.197	0.296
Adv_mg	<b>0.834</b>	0.529	0.609	0.609	0.220	0.422
ES_Auth	0.578	<b>0.899</b>	0.716	0.622	0.277	0.438
ES_Simp	0.690	<b>0.860</b>	0.595	0.555	0.220	0.472
Int_Ready	0.672	0.649	<b>0.883</b>	0.665	0.340	0.446
Int_Trust	0.689	0.664	<b>0.888</b>	0.751	0.238	0.386
Int_int	0.686	0.683	<b>0.895</b>	0.750	0.210	0.345
PU_Need	0.590	0.560	0.721	<b>0.855</b>	0.067	0.242
PU_Safety	0.704	0.587	0.702	<b>0.881</b>	0.114	0.356
PU_Tech	0.688	0.609	0.710	<b>0.882</b>	0.251	0.341
SUBST_Subst	0.230	0.248	0.191	0.080	<b>0.836</b>	0.303
SUBST_Threat	0.237	0.237	0.303	0.198	<b>0.867</b>	0.294
Txn_Vol	0.475	0.515	0.439	0.360	0.350	<b>1.000</b>

Table 6: Reliability and correlation for reflective scales

	EAUS	INT	PERUS	RELADV	SUBST	TXNNAT
EAUS	<b>0.880</b>					
INT	0.749	<b>0.889</b>				
PERUS	0.671	0.814	<b>0.873</b>			
RELADV	0.715	0.768	0.758	<b>0.800</b>		
SUBST	0.284	0.293	0.166	0.274	<b>0.851</b>	
TXNNAT	0.515	0.439	0.360	0.475	0.350	1.000

Table 7: Indicators affecting the latent variables

Latent Variables	Indicators	
	Significant	Insignificant
Relative advantage (RELADV)	Speed Corruption control Eco-friendly Cost of money	NA
Ease of Use (EAUS)	Easy authentication Simple use	Multiple applications
Intention to use (INT)	Banks vs. other providers Ready to use Trust Future usage	Brand
Perceived usefulness	Safekeeping of tangible money	Hold due to privacy

(PERUS)	Need to use NFC	Monitoring by service providers Offers as a result of monitoring
Substitution (SUBST)	Credit/debit cards System availability	NA
Transaction nature (TXNNAT)	Transaction volume	Transaction charges

### Structural Model

The hypotheses were verified using structural equation modelling (SEM) generated using the SmartPLS tool. SEM is a second-generation approach based on the multivariate data analysis method that is often used in marketing research because it can test theoretically linear and additive causal models (Marko Sarstedt et al 2010 ,Pui-Wa Lei, Qiong Wu 2007). Using SEM, the relationship between the variables can be examined visually. A bootstrapping technique with 200 samples was used to verify the significance level. Based on the *T-values*, each hypothesis was examined to determine the support for the model and the statistical decision. Below, Table 8 provides the consolidated scores of the SEM for the hypotheses defined.

Table 8: Summary of hypothesis testing

Hypothesis	Path Coefficient	Mean	Standard Deviation	Standard Error	T-Value	Support (Yes/No)
H1: RELADV -> PERUS	0.588	0.589	0.066	0.066	8.960	Yes
H2: PERUS -> INT	0.565	0.557	0.067	0.067	8.399	Yes
H3: EAUS -> INT	0.337	0.347	0.071	0.071	4.754	Yes
H4: TXNNAT -> PERUS	-0.049	-0.047	0.046	0.046	1.082	No
H5: TXNNAT -> INT	0.062	0.060	0.045	0.045	1.380	No
H6: SUBST -> PERUS	-0.061	-0.063	0.046	0.046	1.338	No
H7: SUBST -> RELADV	0.274	0.285	0.072	0.072	3.818	Yes

Significant T-values (two-tailed)	10%	1.65
	5%	1.96
	1%	2.58

The results for each hypothesis defined in the above sections were validated and verified based on the T-value, the details of each hypothesis and the significance, as explained below.

- The path from relative advantage to perceived usefulness (8.960) is strongly significant, providing support for H1.
- The path from perceived use to intention (8.399) is strongly significant, providing support for H2.

- The path from ease of use to intention to use (4.574) is strongly significant, providing support for H3.
- The influence of transaction nature on perceived usefulness (1.082) also failed to find support, leading to the rejection of H4.
- The influence of transaction nature on intention to use (1.380) proved to be insignificant, meaning that H5 is rejected.
- The influence of substitutes on perceived usage (1.338) proved insignificant, leading to the rejection of H6.
- The influence of substitutes on relative advantage (3.181) is significant, providing some support for H7.

### **Goodness of fit**

The model was also assessed using goodness-of-fit(GOF) measurement. GOF is considered a good means of assessing PLS path modelling (Henseler, J et al2004), although Kevin, H., et al (2012) have highlighted some issues pertaining to the use of GOF in evaluating the model strength. Nonetheless, for the purposes of this study, it is considered a suitable measure to verify the model. The formula to calculate the GOF is:

$$GoF = \sqrt{AVE * R^2}$$

Following H. Latanand I. Ghosal i(2012), the baseline values for GOF are 0.10 for smaller  $R^2$ , 0.25 for medium  $R^2$  and finally, 0.36 for larger  $R^2$ . The GOF value for the model in this study is 0.548, where 0.775 is the geometric mean of AVE and 0.388 is the average of  $R^2$ . The GOF value for this model exceeds the minimum cut-off value of 0.36 and hence the model is supported by this verification.

### **Implications for Industry**

This study has sought to understand consumers' intentions in relation to accepting e-money solutions by focusing on the factors related to the industries which are part of the financial eco-system of the economy. The industry players, which include banks, telecom operators and retailers, can leverage these research findings in understanding consumer intentions when designing new solutions. Retailers should focus on providing services which are compatible with NFC technologies and ensure that faster payment services are offered to their clients. Banks should focus on integrating the solutions in the financial systems by bringing the consumer and merchant together, so that both experience the advantages of the solutions. Governments and central banks in developed countries must encourage the use of these applications to strengthen economies. Telecom operators need to understand the differences in consumer needs in developed countries compared to developing nations. They need to work with retailers to provide promotional offers to bring consumers on board. According to

the findings of this research, users appreciate the advantages of the e-money solutions for the financial eco-system and all the stakeholders can emphasize these to reach out to the customer base.

### **Limitations and scope for further research**

This paper has its limitations. In general, consumer intentions are a reliable means of deriving actual consumer adoption of e-money solutions and the theoretical research model discussed here can be verified with additional measures. The responses were collected from five countries, but the focus was mainly on Singapore. The economies of these countries are entirely different, as are socio-cultural factors. This research was not focused on the differences in socioeconomic factors among these countries, but it is an aspect that future research may address. The focus of this study was only on the consumers and thus it did not look at retailer involvement in detail. Future research can extend the scope by considering the merchants and other retail service providers .Another area of interest is the acceptance of NFC technology During the research period, one of the major smartphone providers, Apple, introduced new products which incorporate NFC. Thus, there may be some conflict with this change in terms of understating the consumer intentions. Future research could include this aspect and see if this manufacturer has influenced the markets.

### **Conclusions**

This study has examined the factors that influence consumer adoption of e-Money apps in developed countries. The model supports the view that the independent variables of perceived usefulness, ease of use, transaction nature, relative advantage and substitution exert an influence on adoption. Earlier studies have highlighted the influence of perceived usefulness and ease of use on adopting any new innovations (Yuanquan L. et. al., 2008; Esther S. 2010; Jonathan B. et al 2011; Martin F.&, Ali Ö. 2014) and this research supports the observation that perceived usefulness exerts considerable influence on the intention to use e-money app products in these markets. Also, the results suggest that consumers prefer to use simple applications with strong authentication.

Previous research has found that mobile phones and associated apps have penetrated very fast in unbanked populations where the infrastructure is not available to support banking (Yan Gaoet al2014). In contrast, digital wallet solutions have not proved as popular in developed economies as consumers are happy with the advanced systems available to manage their cash (Hiroshi F. et al 2014 and Meiling P. 2011). In this study, examining the influence of substitution shows that consumers are willing to use solutions if they are offered. In particular, NFC technology is well received, but consumers still consider that merchants may not accept payment through this means or technical issues might create problems in making payments.

Consumers are provided with many options in terms of managing their cash and unless they see some advantages, they are not willing to use alternative solutions. This study shows that consumers appreciate the advantages afforded by electronic money incurring corruption and balancing environmental concerns (Giorgio M. 2012). Furthermore, consumers are encouraged to use solutions when promotions are offered.

Another significant contribution is that of the nature of the transaction. Here, the findings suggest that consumers are willing to use mobile apps only for small volume transactions and they prefer to use the apps provided by major banks as they feel that the solutions provided by banks are safer.

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