Mobile payment and e-wallet adoption in emerging economies: A systematic literature review

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A R T I C L E   I N F O

A B S T R A C T

Against the backdrop of greater smartphone and internet penetration across the emerging markets, electronic wallet (e-wallet) has emerged as a reliable and well-known digital payment method. The main purpose of this paper is to review the growing volume of studies on e-wallet adoption in this region. E-wallet is widely used worldwide, but it has yet to become mainstream in developing countries, including Malaysia. Hence, scholars have conducted numerous studies on e-wallet use, but there seems to be a lack of consensus on the predictors influencing its adoption. This study examines these publications to analyze the potential research gaps, offer a multi-stakeholder eco-system framework and make recommendations for future research. We retrieved scholarly articles on E-Wallet adoption published from 2016-2021 through the Google Scholar and Scopus database. After the screening process in which some papers were excluded, 77 previous studies were reviewed regarding the methodology, findings and adaptation of theories/models. Considering that a large portion of the studies are grounded based on the technology acceptance framework and typically involved drivers and enablers, we call for a distinct approach that draws in other factors into the equation. For instance, future research may divulge the inhibitors to E-wallet adoption and incorporate the external environment and consumer psychological factors as potential predictors.

1. Introduction

The evolution of Information and Communication Technology (ICT) has impacted the lives of mankind. The proliferation of ICT enormously contributes to the transformation of businesses' financial operations (Slozko & Pello, 2015) and ehances their bottom line performance (Ali et al., 2010). Through nearly infinite number of applications available, mobile apps and the internet drive consumers to move

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beyond traditional routines and embrace digital transactions. For instance, the swap from cash-based payment to electronic-based payment. With the help of internet growth, the trend of using e-commerce is constantly on the uptrend. E-commerce is now a popular platform to conduct transaction between business partners (B2B), or business and customers/consumers (B2C). Correspondingly, electronic payments –a requisite for any e-Commerce transactions to conclude, are rapidly substituting the use of banknotes and cash-based systems. These developments drive the emergence of a digital payment application, termed as the electronic wallet or e-wallet. Generally, E-wallet is considered as an online prepaid account that can be used to store money and operate online/offline transactions through the use of a mobile app (Pahwa, 2017).

A recent Dataportal's survey on online transactions revealed that 58% of Malaysian purchased by using mobile phone apps, 66% of users has made bank transactions, and 42% of consumers has made online payment (Kepp, 2019). The market research agency also reported that the share of e-wallet in e-commerce transaction and point-of-sale (POS) spending are 7% and 1%, respectively. In the same year, Nielsen Malaysia's (2019) survey found that 67% of Malaysian users performed cashless-based payment that comprises of online banking (57%), credit/debit cards (27%), and mobile wallets (8%). The reported lack of e-wallet usage in POS and retail transactions among Malaysians are a serious concern considering the country's ambition to transform itself into a cashless society. In view of this issue, the aim of this paper is to analyze the research trend involving e-wallet adoption and provide insights on potential avenues for future researchers to investigate.

According to The Economic Times (2018), e-wallet is defined as an electronic card or an app that consumers use when conducting online transactions via mobile devices such as tablet, laptop, or smartphone. The functions of an e-wallet is similar to a traditional wallet and it should be connected to the user's account in order for it to function securely. The use of e-wallet allows for hassle-free sales transactions between any businesses and their customers, thus aiding in revenue generation (Kony, 2018). In another perspective, e-wallet is an app created by the authorized bank (or licensed non-bank E-money issuer) that converts the physical wallet into digital features (Singh & Sinha, 2020). For an e-wallet to function, the account needs to have sufficient balance pre-loaded and hence it requires money to be credited. Therefore, e-wallets often require users to store certain bank and card details. Users can also accept, store and transfer money between accounts. Boost, Touch n Go, or GrabPay are the most popular examples of e-wallet applications in Malaysia.

People often confuse themselves over the interchangeable use of the terms e-wallet and digital wallet. However, Pahwa (2017) argued that digital wallet is slightly different from e-wallet, in the sense that a digital wallet serves a platform to keep user's card details for cardless transactions (in which consumers need to register, save, and validate their card details). Contrary to e-wallets that mandate users to place their money in advance, digital wallets do not require any reload top-ups or upfront credits as the users' money remained in their respective bank accounts. Among the well-known examples of digital wallets are Masterpass, Google Wallet, and Apple Passbook. Despite this argument, it may appear that digital wallet and e-wallet are similar to one another as there are companies, such as, Paypal that provide both services. Moreover, there is also the term mobile wallet (m-wallet) that refers to apps that only support buyer-merchant transactions only via the smartphone instead of laptop, tablet, or other devices. To clear up the misunderstanding around the use of the term, we define E-wallet as a mobile device-based platform that facilitates cashless payments of a sales transaction –either in proximity or remotely, between consumers and merchants or service providers.

Numerous studies on the use of e-wallets have been undertaken (refer to Table 2 and 3), but there appears to be a lack of consensus on the factors that influence its acceptance especially within the emerging markets context. Hence, this study aims to examine these publications to identify the research gaps and offer recommendations for future research on e-wallet adoption.

1.1 History and types of e-wallet

The origins of payment can be traced back to 1997 when Coca Cola served *cokes* that can be purchased via text messages, to their consumers in Helsinki through vending machines. Although this kind of digital payment is different compared to the modern e-wallet transaction, it serves as a proving ground for future developments that later saw the advancement of mobile phones as the device to purchase tickets, food, and book hotel accomodations. Digital payment does not involve the exchange of currency notes, by which, the process of releasing and accepting money is performed digitally (Sahayaselvi, 2017). In the early days, electronic payment can be managed by using several methods such as debit/credit card, Automated Clearing House (ACH) network which consists of direct debit, e-cheque, and direct deposit (Hord, 2005).

Besides, by using Near Field Communications (NFC) technology, Google became the starter in launching a mobile wallet (m-wallet) around 2011. This m-wallet enables consumers to make transactions such as digital payment, receiving loyalty points or retrieve coupons and rewards. At that point of time, these transactions can only be made on mobile devices and received by only a few merchants, but it was very popular. A year later, Apple Passbook emerged to conduct digital transactions such as processing boarding pass, tickets, or redeem vouchers. This trend is followed by the establishment of Apple Pay, Android Pay and Samsung Pay, all of which operate using the NFC technology. Given the diverse operationalization and usage of e-wallets, we classified the different types of e-wallet according to themes, specifically (1) accessibility, (2) technology-based, and (3) network-vs-card-based.

This classification is summarized in Table 1 below. In terms of accessibility, the users are served with three different types of e-wallets which are closed e-wallet, semi-closed e-wallet, and open e-wallet. Users of closed e-wallets can perform transactions with only the specific e-wallet providers –for example, Starbucks cards or Lazada Wallet. Meanwhile, semi-closed e-wallet allows the users to purchase goods and services from merchants who contract with the e-wallet providers –for instance, Alipay or LinePay. On the other hand, consumers of open e-wallet are enabled to conduct transactions in stores, apps, or web. Only banks can be the issuer of open e-wallet, which works like credit cards, up to pre-funded amounts. Examples of open e-wallet are Visa Checkout or Masterpass. Trotman (2021) indicated that between these types of e-wallets, the open e-wallet has an extra advantage that enables the users to withdraw money via ATMs.

In addition, e-wallet services can be segregated based on different technological bases. Some e-wallet only requires an internet connection to reach their customer, but transactions can only be conducted online rather than on-site. For over-the-counter retail dealings, NFC and QR-code based technologies are widely used via the smartphone. NFC-based e-wallets work via radio-frequencies, and rapidly communicate with the merchants' RFID terminal upon physical contact with the NFC-enabled smartphone. Meanwhile, QR-code-based e-wallets operate through QR image scans (printed or displayed) to make payments without physical contact.

Furthermore, e-wallet can be categorized into network-based e-wallet and card-based e-wallet. Both network-based and card-based are capable of issuing electronic money and performing activities with other merchants (open-loop). However, only a card-based e-wallet is linked to the card scheme (Wycech, 2015). In Malaysia, the examples of network-based e-wallets are Touch n Go e-wallet and Boost. Meanwhile, Aeon wallet and BigPay wallet are famous examples of card-based e-wallet.

Table 1. Summary on E-wallet by category

Category		Description	Pros	Cons	Example
Accessibility	Closed	Exclusively transactions at e-wallet issuer's company.	Express purchase activities as the payment are made straight to the e-wallet issuer.	The fund stored cannot be used for other purposes except purchasing from the particular issuer	Starbucks card, Lazada wallet, The Coffee Bean card
	Semi-closed	All transactions can carried out at merchants that registered with the e-wallet provider.	Users are allowed to make variety of purchases at many merchants	Transactions can be longer due to security issues	Big Pay, Ali Pay, Line Pay, Touch n Go, Boost, Grabpay
	Open	All transactions can be conducted at any merchants that provide card-scanning terminal.	Cash withdrawal is available	Only bank can be the issuer of this type of e-wallet	Masterpass, Visa Checkout
Technology	NFC	E-wallet that includes secure element either inserted in the device or employ HCE (Host Card Emulation) in the cloud	Very fast, secure, flexible	Limited to PoS terminal that provide NFC, Distance limitation	ApplePay, Samsung Pay
	QR-code	Transactions can be made by scanning Qr-code that provided by merchants or in the user's device.	Very simple and quick application, Do not require any physical contact	Can be difficult to read in less than ideal lighting conditions	Touch n Go, Boost, Grabpay, WeChat Pay, AliPay
	Internet	Created only for online uses	Simple to install	Cannot be used in physical world	Paypal
Network-based e-wallet		The fund must be loaded first (prepaid) to make payment. Network-based e-wallet does not connected to bank account	No need for card to enjoy services as this e-wallet is installed in user's device. Commonly, the services are come with variety of incentives	Depends on internet availability	Boost, Grabpay, Touch n Go, Setel
Card-based e-wallet		Collaboration between e-wallet provider and credit card network	Promptly can be used at any card accepting merchants without time consuming process	Balance statement is not available for user	BigPay, Aeon wallet

1.2 Benefits and issues arising from e-wallet use

Some benefits drive e-wallet adoption among consumers. To seek consumers' attention, the providers commonly serve plenty of incentives as a reward for using their services. For instance, they offer cashbacks, reward points, good deals, or discounts. By using e-wallet services, consumers can easily transfer their money to other third-party accounts. Moreover, e-wallet users are also able to pay the same receipt separately because it has the capability to split the bills. Some e-wallet providers offer consumers to save on costs provided by their related services. For example, there will be no processing fee for AirAsia ticket purchases made by travelers who pay using the Big Pay wallet. Likewise, road users are able to earn toll payment discounts when they signed up and reload with the Touch n Go e-wallet app.

To attract consumers, e-wallet providers have invested significantly to enhance their services' security, safety, and convenience. For instance, the user's information in the e-wallet account is typically encrypted and not saved on the mobile phone. Plus, all the payment transactions are stored automatically to be easy for the consumers to refer to the historical ledger. Convenient-wise, e-wallet users also do not have to scrabble around to locate and count the banknotes and coins. Travelers can also save time and physical

effort. For instance, Touch n Go card users can link their smart card with the e-wallet, thus allowing them to top-up their money online rather than physically queuing at selected merchants. From the ecological view, reducing paper use promotes a lesser risk of environmental waste and pollution.

However, several reasons kept thwarting Malaysia from achieving a successful e-wallet adoption among its citizens. Rathore (2016) suggested that security and confidentiality are the main problems, especially in terms of the safety of the bank account details and funds credited. Besides losing money, consumers fear that their confidential banking information would be leaked and severely compromised if their phones are lost or stolen (Upadhayaya, 2012). Consumers face security risks such as hack, malware, and phishing attacks in online transactions. Due to the newness, e-wallets may have some forms of security risks and issues that experts find hard to resolve (Yuen, 2019). Other than security issues, consumers' interest in using e-wallet may wade due to internet inaccessibility. This barrier toward e-wallet adoption commonly persists in rural areas, as any e-wallet providers' serviceability is primarily supported by the internet connection (Rathore, 2016). The consumers are left with no choice but to reuse the cash when the phone is out of battery or no internet coverage (Yuen, 2019). Besides, the usage of e-wallet application might cause overspending as the inclination of consumers to use up more money is greater if they use the intangible digital money. Furthermore, e-wallet services can be pretty inconvenient when it requires the consumers to constantly upgrading the application. Sometimes, it demands the consumers to go through a few unnecessary stages to process a transaction that raises annoyance for the consumers, especially the first-time users. However, these issues are highly subjective and may resolve over time.

1.3 E-wallet in Malaysia

The year 1997 had witnessed the dawn of electronic money in Malaysia that emerged in the form of Touch n Go cards, a contactless smart card used mainly for the country's toll, parking, and transit collection system. Users can link it with credit or bank cards or conduct the transactions at toll booth or certain ATM terminals to load money in the cards. Since then, the card was the leading electronic payment for its citizens, despite its limited use in the transportation sector and its unsuccessful adoption in retail transactions. As the world rapidly embraced e-wallets as a payment method of choice in the 2010s – especially in China and Scandinavia, the rate of e-wallet penetration among Malaysians remains dismal. They conservatively prefer cash and cards, not unlike their other Southeast Asian counterparts.

The situation appears to look promising in 2017 when several dozens of e-wallet providers entered the market. To date, Bank Negara Malaysia (BNM) has granted 54 e-money issuer licenses to 6 banks and 48 non-banks e-money issuer. Despite having e-wallet services launched for several years, e-wallet adoption is still in its early stages compared to other countries with higher utilization rates (Yuen, 2019). The adoption of e-wallet services is low considering that most of the Malaysian users have ignored the fact that e-wallet serves many benefits and has limited knowledge regarding e-wallet usage. An industry report revealed that Malaysian users tend to choose debit cards or online banking rather than e-wallet regarding non-cash payment transactions (Omarini, 2018). To mitigate this problem and accelerate the country's cashless society agenda, the country's central bank introduced the Financial Sector Blueprint (FSBP) to encourage e-wallet usage. This incentive includes providing financial aids for merchants in the small/medium business sector and e-wallet cash handouts for its citizens. Despite the waves of reform measures to shift the consumers preference to digital payment over the cheque or cash, the outcomes remain uncertain (Tan & Li, 2018).

2.   Research methodology

This article review is conducted to provide comprehension of the current state of e-wallet adoption. This study started with an extensive search on articles that are related to e-wallet adoption. Several prominent scholarly databases namely Google Scholar, and Elsevier's Scopus were employed due to their reliability, accuracy and comprehensiveness in measuring the impact of scholarly manuscripts and the people who authored them (Walters, 2009). By using the funneling method, several articles that are related to e-wallet adoption were considered and retrieved. The article search included keywords as follows: "E-wallet" "digital wallet" "digital payment" "mobile payment" "electronic payment" and "mobile payment system".

Records identified through searching scientific databases

190 articles from 2016-2021: Abstract screened at first stage

190 articles filtered

Inclusion criteria: (1) written in English; (2) conducted in countries listed as secondary emerging and advance emerging economies; (3) uses primary data (4) within the social science domain

104 articles met the criteria

Exclusion criteria: (1) duplication; (2) not strongly related to e-wallet adoption; (3) student's thesis or dissertation
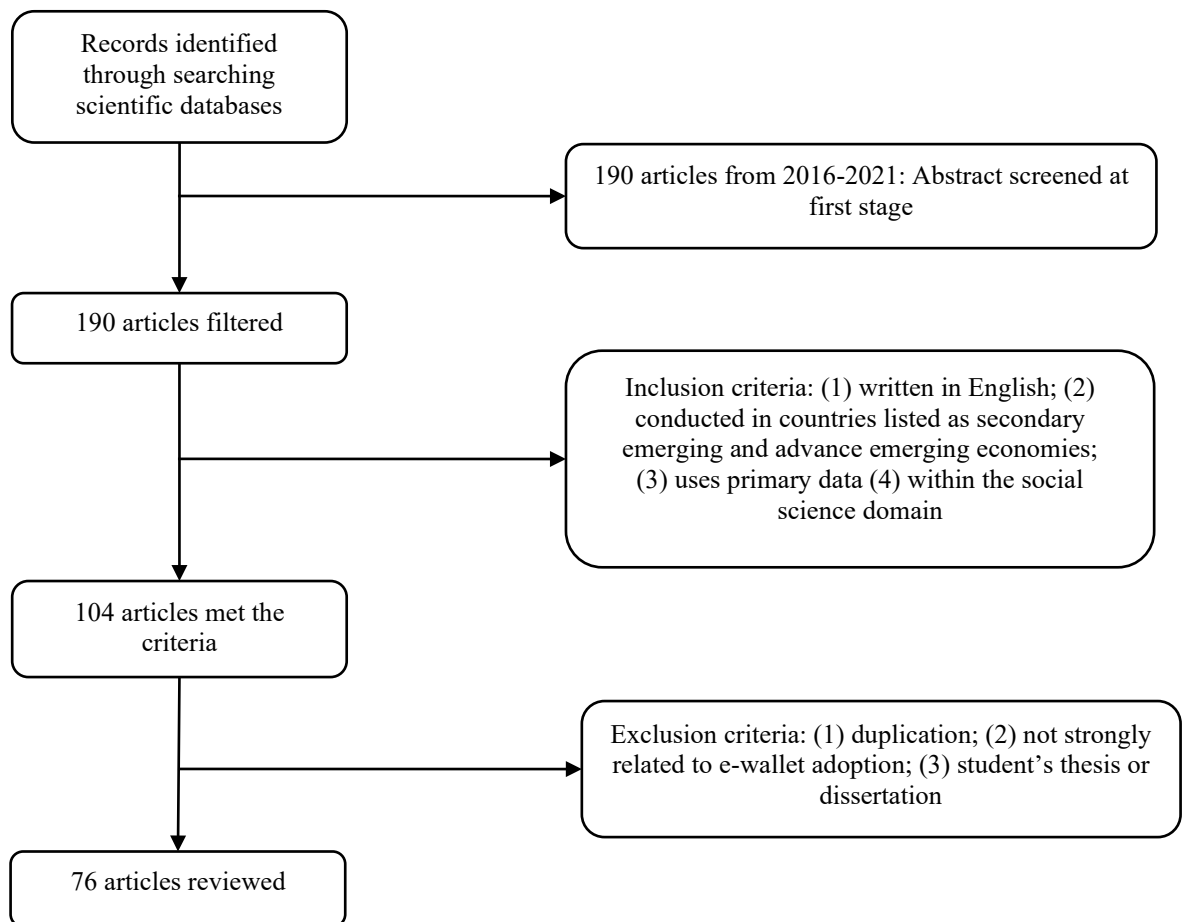
76 articles reviewed

Figure 1. The screening process for literature review on mobile e-wallet

Three stages of screening process were formed to obtain the most suitable studies to be reviewed. At the first stage, this study combined and assessed the data from the previous literature of digital wallet or digital payment between 2016 to 2021 by using a systematic review of the electronic wallet acceptance research. The rationale of choosing this time of period is basically to gather data and information on e-wallet adoption in the current context, assuming that the number of published papers regarding this area

has increased. The past studies in the last five years are believed to provide more insight than several years before. After screening the abstracts, 190 past papers were gathered. At the second stage, the articles were separated based on some specifications. These papers should be written in English, conducted in countries listed as advanced emerging (AE) or secondary emerging (SE) economies, complete, and full access. The main reason to choose articles from AE and SE countries is because of the economic condition. These countries are believed to have similar economic conditions whereby they are not too advanced or too lagging. Although the list of countries by FTSE indicated that China is one of the secondary emerging countries, e-wallet adoption studies originated from China were excluded on the basis that the country has reached maturity (more than 90% penetration in urban populations) in e-wallet adoption. Moreover, 76% of Chinese are active smartphone users. This high penetration rate –higher than United States' penetration rate of 36%, drives them to embrace e-wallet services currently duopolized by Alibaba's Alipay Tencent's WeChat Pay (Groenfeldt, 2017). One hundred and four articles were successfully retrieved. At the last stage, 28 documents were removed due to duplication, student's thesis or dissertation, or not strongly related to the e-wallet adoption. Seventy-three articles were analyzed at the final review.

3.   Analysis of result

This study prioritizes the published research articles in academic journals and conference proceedings. At the end of the screening process, 76 papers were successfully obtained and considered sufficient for the final review. These papers were classified into two categories, quantitative and qualitative. The findings indicated that quantitative studies on proximity-based mobile payment were dominant. Out of 76, 73 articles were done using a quantitative approach. Meanwhile, the rest used a qualitative approach. The details of the past studies are summarized and presented in Table 2 and Table 3 below.

Table 2. Summary of qualitative studies on proximity-based mobile payments adoption in Developing Countries (excluding China)

Sources	Country	Context	Findings
Halaweh and Qaisi (2016)	UAE	A total number of 18 participants from public and private business sectors were directly interviewed to solicit their views regarding NFC technology as a mobile payment at their Point of Sale (POS).	The authors discovered that there is still a lack of knowledge, awareness and experience on the part of both merchants and retailers concerning the NFC mobile payment system.
Adharsh et al. (2018)	India	The researchers conducted interview (in-person questionnaires) with certain group among student to assess the degree of mobile wallet usage	Indians mostly use e-wallets on online activities, ticket booking, and mobile reloads due to their time-saving benefit. The impacts of demonetization in India drive the proliferation of its' e-wallet services. The promotions and incentives served by the providers have attracted Indian consumers to choose and use e-wallets.
Moghavvemi et al. (2021)	Malaysia	In-depth interviews with merchants from multiple retail categories were conducted to gain insight into their motivational drives, barriers, and challenges in the context of the adoption and implementation of m-payment	M-payment adoption among merchants is impacted by decreasing payment processing time and fees, convenience, enhanced payment security features. Meanwhile, they refuse to use m-payment because of technological incompatibility, complexity, the cost of investment, and the lack of critical mass and knowledge.

Table 3 Summary of quantitative inferential studies on proximity-based mobile payments adoption in Developing Countries (excluding China) from 2016 to 2021.

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Rouibah et al. (2016)	Kuwait	150 employees who graduate from leading business school in Kuwait (Online based) 200 students (Paper-based)	Cognitive Dissonance Theory (CDT)	Perceived enjoyment (sig), Customer trust (sig), Perceived risk (ns)		Adoption intention
				Personal innovativeness (sig), Propensity to trust (sig), Familiarity (sig), Presence of third-party seals (sig), Perceived enjoyment (sig), Perceived risk (sig)		Consumer trust
				Personal innovativeness (sig)		Perceived enjoyment
				Presence of third-party seals (ns)		Perceived risk
De Luna et al. (2016)	Brazil	423 mobile phone users in Brazil	Technology Acceptance Model (TAM)	Attitude towards the use (sig), Perceived Ease of Use (sig), Perceived usefulness (sig), Subjective norm (sig), Perceived security (sig), Perceived compatibility (sig), Individual mobility (ns), Personal innovativeness in IT (sig)		Intention to use mobile payment

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Abrahão et al. (2016)	Brazil	605 mobile phone users	Unified theory of acceptance and use of technology (UTAUT)	Performance expectancy (sig), Effort expectancy (sig), Social Influence (sig), Perceived risk (sig), Perceived Cost (ns)		Behavioural intention
Trivedi (2016)	India	336 students (Gen Y)	Theory of reasoned action (TRA), Technology Acceptance Model (TAM)	Perceived usefulness (sig), Perceived ease of use (sig), Subjective norm (ns), Perceived trust (ns), Attitude (ns), Self-efficacy (ns)		Behavioural intention for using e-wallet
Aydin and Burnaz (2016)	Turkey	639 mobile wallet users, 666 non-users	Unified theory of acceptance and use of technology (UTAUT)	Attitude (ns), Compatibility (ns), Perceived ease of use (ns), Personal innovativeness (ns), Perceived security (ns), Social influence (ns), Perceived usefulness (ns), Rewards(ns)		Use intention
Abidin et al. (2017)	Philippines	90 mobile phone subscribers	Unified theory of acceptance and use of technology 2 (UTAUT 2)	Performance expectancy (ns), Effort expectancy (sig), Social influence (ns), Facilitating condition (ns), Hedonic motivation (ns), Price value (ns), Habit (ns), Trust (sig), Perceived risk (sig)		Behavioral intention

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Manikandan and Jayakodi (2017)	India	150 mobile wallet users in Chennai	No model or theory specified	Privacy (ns), Security (ns), Ease of use (ns), Convenience (sig), Pricing (ns), Utility of innovation (ns), Usefulness (sig), Brand loyalty (ns)		Usage of mobile wallet
Oney et al. (2017)	Turkey	299 Turkish university students.	No model or theory specified	Perceived security (sig), Perceived trust (sig), Technical protection (sig), Transaction procedure (ns), Security statements (sig: PS), Past experience (sig)		Electronic payment system (EPS) use, Perceived security, Perceived trust
Trachuk and Linder (2017)	Russian	429 consumers	Perceived Organizational E-Readiness (POER), Perceived Environmental E-Readiness (PEER), Technology Acceptance Model (TAM)	Testing capability (sig), Comparative advantage (sig), Complexity (sig), Enjoyment of use(ns), Reliability (sig), Control of usage process (sig), Risk of use (sig), Technical feasibility (sig), Perceived risk(ns), Perceived advantage and need for alternative payment system (sig), Operating costs (sig), Network effect (sig), Market pressure (sig), Technological changes in the industry (sig)		Use of technology

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Aslam et al. (2017)	Pakistan	335 users of mobile payment system	Technology Acceptance Model (TAM)	Perceived security(ns), Perceived compatibility (sig), Perceived usefulness (sig), Perceived ease of use(ns), Subjective norm (sig)	Attitude towards usage (sig)	Intention to use
Busu et al. (2018)	Malaysia	150 students of a higher education institutions	Technology Acceptance Model (TAM), Diffusion of Innovation (DOI)	Perceived usefulness (sig), Perceived ease of use(ns), Compatibility (sig), Perceived cost (sig), Additional value(ns), Personal innovativeness(ns), NFC related knowledge(ns), Concern on theft/fraud/loss(ns), Consumer trust(ns)		Intention to adopt
Kongarchapatara (2018)	Thailand	275 respondents who had experience with QR-code payment application	Technology Acceptance Model (TAM)	Perceived usefulness (sig), Perceived ease of use (sig), Perceived credibility (sig)	Perceived self-efficacy** (sig)	Behavioral intention to use
Jaz et al. (2018)	Kuwait	132 users of mobile application	Technology Acceptance Model (TAM)	Perceived ease of use (sig), Perceived usefulness(ns), Trust(ns), Social influence (sig), Online payment (sig)		Adoption

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Chakraborty and Mitra (2018)	India	150 respondents in India	Unified theory of acceptance and use of technology (UTAUT)	Perceived usefulness (sig), Perceived ease of use (sig), Social influence (sig), Perceived self-efficacy (sig), Personal innovativeness and Individual playfulness (sig), Personal compatibility (ns), Attractiveness of alternative (sig), Peceived value (sig), Perceived risk (ns)		Adoption intention
Padiya and Bantwa (2018)	India	318 smartphone users were chosen through non-probability convenience sampling to answer a structured questionnaire	No model or theory specified	Pricing (sig), Ease of use (sig), Security (ns), Privacy (sig), Discount offer (sig), Trendy to use (ns), Usage by peers (ns), E-commerce (sig), Record keeping of transaction (sig), Refund or failed transaction (ns), Ability to pay from anywhere (ns), Cashback benefits (sig)		E-wallet adoption
Lonare et al. (2018)	India	285 valid responses: consumers and vendors	Technology Acceptance Model (TAM)	Perceived ease of use, Perceived usefulness	Attitude*, Intention to use*	Actual use

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Taufan and Yuwono (2018)	Indonesia	214 GoPay e-wallet users	Technology Acceptance Model (TAM)	Attractiveness of alternative (ns), Perceived security (ns), perceived ease of use (sig), Perceived usefulness (sig), Social influence (ns), Perceived trust (ns), Perceived value (sig)		Intention to use
Humbani and Wiese (2018)	South Africa	416 mobile phone users	Technology-Readiness Index (TRI)	Drivers: Optimism(ns), Innovativeness(ns), Convenience (sig), Compatibility (sig) Inhibitors: Insecurity (sig), Discomfort(ns), Cost (sig), Risk (sig)	Gender** (sig)	Adoption
Ruangkanjanases and Sirikulprasert (2018)	Thailand	400 respondents	Technology Acceptance Model (TAM), Diffusion of Innovation (DOI)	Complexity(ns), Trust and Security(ns), Relative advantage (sig), Cost(ns), Compatibility (sig), Social influence (sig)		Intention to adopt
Intarot and Beokhaimook (2018)	Thailand	400 individuals in Metropolitan areas	Unified theory of acceptance and use of technology (UTAUT)	Performance expectancy (sig), Effort expectancy (sig), Social influence(ns), Facilitating condition(ns)		Behavioural intention
Matemba et al. (2019)	South Africa	224 Wechat e-wallet users	Observational Learning Theory (OLT)	Familiarity (sig), Word-of-Mouth (sig), Scan merchant services (sig)		Adoption
Ng and Mei (2019)	Malaysia	384 M-wallet users in Klang	Technology Acceptance Model (TAM)	Convenience (sig), Confidential(ns), Social influence (sig)		Perceived usefulness

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Almasri and Alshareef (2019)	Saudi Arabia	More than 100 responses from three main regions: Western, eastern and Saudi Arabia	No model or theory specified	Anonymity and Privacy, Usability, Reliability, Trust, Security, Scalability and Efficiency, Mobility and Ubiquity, Transaction cost and expenses		M-payment system usage
Nizam et al. (2019)	Malaysia	222 e-wallet users in Malaysia	No model specified	Convenience (sig) , Security (sig), Cost-saving (sig)		Consumer purchase decision
Widodo et al. (2019)	Indonesia	345 respondents	Unified theory of acceptance and use of technology 2 (UTAUT 2)	Performance expectancy (sig), Effort expectancy (ns), Social influence (ns), Facilitating condition (sig), Hedonic motivation (ns), Price value (ns), Habit (sig), Perceived risk (ns), Trust (sig)		Behavioural intention
Baraja & Gunawan, (2019)	Indonesia	110 merchants in SME sector who use GOpay and OVO	Behavioral Reasoning Theory (BRT)	Cost (ns), Usage barrier (ns), Risk barrier (ns)		Adoption intention
Sitinjaka and Koesrindartoto (2019)	Indonesia	1005 students	Unified theory of acceptance and use of technology (UTAUT)	Performance expectancy (sig), Effort expectancy (sig), Social influence (sig), Perceived risk (ns), Costs (sig)	Involvement** (sig: PE & SI; ns: EE)	Behavioural intention
Isrososiawan et al. (2019)	Indonesia	100 DANA e-wallet customers among postgraduate students	Technology Acceptance Model (TAM)	Perceived usefulness (sig), Perceived ease of use (sig)		Mobile payment usage

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Wijayanthi (2019)	Indonesia	183 mobile phone users	Technology Acceptance Model (TAM)	Perceived usefulness (sig), Perceived trust (sig)	Attitude towards using* (sig)	Intention to use
Vasantha and Sarika (2019)	India	200 mobile wallet users	Technology Acceptance Model (TAM)	Perceived enjoyment (sig), Social norms (sig), Perceived innovativeness (sig)		Intention to use mobile wallet
Tiwari et al. (2019)	India	200 NCR consumers	No model specified	Age (sig), gender (sig), annual income (sig), occupation (sig), marital status (sig) and qualifications (sig)		Awareness about digital wallet
Malik et al. (2019)	India	100 mobile wallet app consumers	Unified theory of acceptance and use of technology (UTAUT)	Performance expectancy (sig). Ease of use (sig), Social influence (sig), Enjoyment (sig), Incentives (sig), Aesthetics (sig), Trust		Adoption
Bobde (2019)	India	250 mobile wallet users in Pune	No model specified	Perceptive, Discretionary, Systemic (risk factor)		Mobile wallet usage
Malaquias and Hwang (2019)	Brazil	201 Brazilian undergraduate students	Technology Acceptance Model (TAM)	Perceived usefulness (sig), Perceived ease of use (sig), Trust (sig), Social influence (sig)		Mobile banking use

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Nookhao and Chaveesuk (2019)	Thailand	350 respondents who had experience with e-wallet usage	Information System (IS) Success Model	Information quality (sig), Service quality (sig), System quality (sig)		Trust
				Trust (sig)		Satisfaction
				Trust (sig), Satisfaction (sig)		Intention to use
Alabdan (2019)	Saudi Arabia	198 respondents among students and staffs in Majmaah University	Technology Acceptance Model (TAM)	Awareness(ns), Availability(ns), Security (sig)		Mobile payment adoption
Chua and Ling (2019)	Malaysia	387 WechatPay consumers	Technology Acceptance Model (TAM)	Perceived usefulness (sig), Perceived ease of use (sig), Perceived risk (sig)		Mobile payment acceptance
Leong et al. (2020)	Malaysia	478 respondents in four states	Innovation Resistance Theory (IRT)	Age (ns), Education (sig), Income (ns), Usage barrier (sig), Value barrier (sig), Risk barrier (sig), Tradition barrier (sig), Image barrier (sig), Perceived novelty (sig)		Mobile wallet resistance
Islam et al. (2020)	Pakistan	320 smartphone users	Technology Acceptance Model (TAM)	Perceived ease of use (sig), Perceived risk(ns),	Perceived trust*(sig)	Intention to adopt m-payment

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Giovanis et al. (2020)	Greece	513 users of mobile payment in Greece	Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), Decomposed Theory of Planned Behavior (DTPB),	Facilitating condition (sig), Self-efficacy (sig), Interpersonal influence (sig), External influence (sig), Perceived usefulness (sig), Perceived ease of use (sig), Compatibility (sig), Perceived risk (sig)		Intention to use, Perceived behavioral control, Subjective norm, Attitude
Hariguna et al. (2020)	Thailand	402 users of Mobile Money Application (MMA) services	No model specified	Perceived value (sig), Economic trust (sig), Service trust (sig)		Intention to use
				Perceived value (sig)		Economic based trust
				Perceived value (sig)		Service trust
Mouakket (2020)	United Arab Emirates (UAE)	416 mobile payment users	Information System (IS) Success Model	Satisfaction (sig)		Continuance usage intention
				Effort expectation (sig), Performance expectation (sig)		Satisfaction
				Personal Innovative (sig), Self-efficacy (sig), System Quality (sig), Information quality (ns), Service quality (sig)		Effort expectation
				System Quality (sig), Information quality (sig), Service quality (ns)		Performance expectation

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Malaquias and Silva (2020)	Brazil	115 respondents from rural areas	Technology Acceptance Model (TAM)	Perceived usefulness (sig), Perceived ease of use (sig), Trust (sig), Social influence (sig), Price (ns)		Mobile banking usage
Giovanis et al. (2020)	Greece	513 consumers of mobile internet service providers	Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), Decomposed theory of planned behaviour (DTPB)	Perceived usefulness (sig), Perceived ease of use (sig), Compatibility (sig), Attitude (sig), Interpersonal influence (sig), External influence (sig), Subjective norm (sig), Self-efficacy (sig), Facilitating condition (sig), Perceived behavioral control (sig), Financial risk (sig), Performance risk (sig), Privacy risk (sig), Psychological risk (sig), Time risk (sig)		Intention to use
Chawla and Joshi (2020)	India	744 respondents	Unified theory of acceptance & use of technology (UTAUT), Innovation diffusion theory (IDT)	Perceived usefulness (sig: TR), Trust (sig: ATT), Facilitating condition (sig: PU), Perceived security (sig: TR), Lifestyle compatibility (sig: ATT),	Perceived usefulness* (sig: ATT), Trust* (sig: ATT), Attitude* (sig)	Behavioural intention
				Perceived ease of use (sig: PU), Facilitating condition (sig: PU), Perceived security (sig: TR)	Perceived usefulness* (sig: TR), Trust* (sig)	Attitude
				Perceived ease of use (sig: PU)	Perceived usefulness* (sig)	Trust

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Patil et al. (2020)	India	491 Indian consumers	Unified theory of acceptance and use of technology (UTAUT)	Facilitating condition (sig)		Effort expectancy
				Performance expectancy (sig), Effort expectancy (sig), Anxiety (sig), Trust (sig), Personal innovativeness (sig)		Attitude
				Attitude (sig), Social influence (sig), Facilitating condition (sig)		Behavioral intention
				Performance expectancy (sig), Behavioral intention (sig), Grievance redressal (sig)		Use behaviour
Revathy and Balaji (2020)	India	318 e-wallet users	Unified theory of acceptance and use of technology (UTAUT)	Performance expectancy (sig), Effort expectancy (ns), Social Influence (sig), Perceived Security (sig)		Behavioural intention
Singh et al. (2020)	India	206 online respondents	Unified theory of acceptance and use of technology 2 (UTAUT 2)	Satisfaction (sig)	Social influence** (sig)	Recommendation to use
				Intention to use (sig)	Innovativeness (ns), Stress to use technology (sig)	Satisfaction
				Perceived ease of use (sig), Usefulness (sig), Perceived risk (ns), Attitude (sig)		Intention to use

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Soodan and Rana (2020)	India	613 customers of e-wallet in Punjab state	Unified theory of acceptance and use of technology 2 (UTAUT 2)	Performance expectancy (sig), Effort expectancy (ns), Social influence (sig), Facilitating condition (sig), Hedonic motivation (sig), Price value (sig), Habit (ns), Perceived security (sig), General privacy (sig), Perceived saving (sig)		Intention to use
Laywilla et al. (2020)	Indonesia	100 mobile wallet users	Unified theory of acceptance and use of technology (UTAUT)	Performance expectancy (sig), Effort expectancy (sig), Social influence (sig), Facilitating condition (sig)		Intention to adopt
Chresentia and Suharto (2020)	Indonesia	100 respondents	Unified theory of acceptance and use of technology 2 (UTAUT 2)	Performance expectancy (sig), Effort expectancy (sig), Social influence (ns), Facilitating condition (ns), Hedonic motivation (ns), Price value (sig), Habit (sig), Trust (sig)		Behavioral intention
				Behavioral intention (sig)		Actual use
Rantung et al. (2020)	Indonesia	96 users of Gopay	Technology Acceptance Model (TAM)	Perceived trust (sig), Perceived usefulness (ns), Perceived ease of use (sig)		Behavioural intention

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Aji et al. (2020)	Indonesia Malaysia	259 e-wallet users in Indonesia and Malaysia	Technology Acceptance Model (TAM)	Perceived Covid-19 risk (sig), Government support (ns), Perceived usefulness (sig)	Perceived usefulness* (sig: PR & GS), Country group** (sig: GS) (ns: PR & PU)	Intention to use
				Perceived Covid-19 risk (sig), Government support (sig)		Perceived usefulness
				Perceived Covid-19 risk (sig)		Government support
Ariffin and Lim (2020)	Malaysia	211 young professional	Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB),	Perceived usefulness (ns), Perceived ease of use (ns), Attitude (sig), Subjective norm (ns), Perceived behavioural control (sig)	Trust** (sig: SN & ATT) (ns: PU, PEOU & PBC)	Intention to use
Abdullah et al. (2020)	Malaysia	400 respondents among students or employees of Malaysian public universities in Klang valley	Unified theory of acceptance and use of technology (UTAUT)	Performance expectancy (sig), Effort expectancy(ns), Social influence (sig), Facilitating condition (sig), Security(ns), Trust (sig)		Behavioural intention
Tan et al. (2020)	Malaysia	64 undergraduates	Technology Acceptance Model (TAM)	Perceived Usefulness: Social influence (sig), Perceived enjoyment (sig), Information and knowledge (sig), Perceived Ease of Use: Previous experience (sig), Facilitating conditions (sig)		Intention of using mobile wallet

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Karim et al. (2020)	Malaysia	289 University students	Technology Acceptance Model (TAM)	Perceived usefulness (sig), Perceived ease of use (sig), Privacy and Security (sig)		Behavioural intention
Ming et al. (2020)	Malaysia	450 respondents	Technology Acceptance Model (TAM)	Perceived usefulness (sig), Perceived ease of use (sig), Perceived risk (sig), Rewards (sig)		Adoption of e-wallet
Rosli et al. (2020)	Malaysia	50 users of QR-code mobile payment	Unified theory of acceptance and use of technology 2 (UTAUT 2)	Performance expectancy (sig), Effort expectany (sig), Social influence(ns), Facilitating condition(ns), Hedonic motivation (sig), Price value (sig), Habit (sig), Trust (sig)		Behavioural intention
Teoh et al. (2020)	Malaysia	210 e-wallet users	Unified theory of acceptance and use of technology (UTAUT)	Performance expectancy (sig), Effort expectancy (sig), Social influence (sig), Perceived risk(ns), Perceived cost(ns)		Behavioral intention
Alabdan and Sulphey (2020)	Saudi Arabia	414 mobile phone users	Innovation Resistance Theory (IRT)	Ease of use (sig), Utility(ns), Security (sig), Awareness (sig)		Mobile payment acceptance

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Lin et al. (2020)	Taiwan	342 Taiwanese	Unified theory of acceptance and use of technology 2 (UTAUT 2), Diffusion of Innovation (DOI)	Performance expectancy(ns), Effort expectancy (ns), Social influence (sig), Facilitating condition (sig), Hedonic motivation (sig), Price value (sig), Compatibility (sig), Innovation (sig), Relative advantage (sig), Complexity(ns), Observability (sig)		Behavioural intention
Yeh (2020)	Taiwan	709 college and graduate students	Diffusion of Innovation (DOI)	Usage intention (sig)	Service quality** (sig), Service innovation** (sig), Brand equity** (sig), Switching cost** (sig), Public policy** (sig)	Usage behaviour
				Relative advantage (sig), Compatibility (sig), Complexity (sig), Trialability (sig), Observability (sig)		Usage intention
Ladkoom and Thanasopon (2020)	Thailand	115 Promptpay users	Expectation-Confirmation Theory (ECT).	Satisfaction (sig), Attitude (sig), Confirmation (sig), Perceived usefulness (sig), Trust(ns), Concern for information privacy(ns)		Reuse intention of Promptpay

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Alshurideh et al. (2021)	United Arab Emirates (UAE)	850 e-payment users	Technology Acceptance Model (TAM)	Trust (sig), Perceived usefulness (sig), perceived ease of use* (sig)	Gender**(sig: TR & PU) (ns:PEOU)	Intention to use e-payment technology
				Perceived security (sig), Trust (sig), Perceived ease of use (sig)		Perceived usefulness
				Trust (sig), Perceived privacy (sig)		Perceived ease of use
Rabaa'i and Zhu (2021)	Kuwait	311 users in Kuwait	Technology Acceptance Model (TAM)	Perceived cost(ns), Perceived ease of use (sig), Perceived usefulness (sig), Perceived security (sig), Trust (sig), Attractiveness of alternatives (sig)		Behavioral intention
Persada et al. (2021)	Philippines	155 respondents among Generation Z e-wallet users (online transaction and in-store transaction)	Theory of Planned Behavior (TPB)	Online transaction: Attitude (sig), Subjective norm (sig), Perceived behavioral control (sig) In-store transaction: Attitude (sig), Subjective norm (sig), Perceived behavioral control (sig)		Behavioral intention

Sources	Country	Context	Theory	Predictors	Mediators/ Moderators (if any)	Outcome
Amoroso et al. (2021)	Philippines	1050 Philippines smartphone users	No model or theory specified	Trust (sig), Switching cost (sig),	Loyalty* (sig: TR), Habit* (sig: SC)	Future repurchase intention
				Reciprocity (sig)		Trust
				Reciprocity (sig)		Switching cost
Suebtimrat and Vonguai (2021)	Thailand	1800 users of QR-code based mobile payment	Technology Acceptance Model (TAM)	Compatibility (sig), Attitude (sig), Perceived trust(ns), Adoption readiness (sig), Perceived risk(ns), Perceived innovativeness (sig)		Behavioural intention
Komba and Razak (2021)	Malaysia	384 users in Kuala Lumpur	No model	Brand image (sig), Perceived price (sig), Perceived quality (sig), Relationship marketing (sig)		Consumer retention
Yang et al. (2021)	Indonesia	501 e-wallet consumers in Indonesia	Unified theory of acceptance and use of technology (UTAUT)	Perceived usefulness (sig), Perceived ease of use (sig), Social influence (sig), Facilitating condition (ns), Lifestyle compatibility (sig), Perceived trust (sig)	Behavioural intention* (sig), Age** (ns), Gender** (ns), Education** (ns)	Adoption of e-wallet

Note: *=mediator, **=moderator, sig=significant, ns=not significant

3.1 Geography and research design

Researchers across the developing world have carried out studies on digital wallet or online payments. Figure 2 above indicates that most of the quantitative studies on e-wallet adoption originate from India. This is followed by Malaysia, Indonesia, Thailand, Brazil, the Philippines, South Africa, Kuwait, the UAE, Saudi Arabia, Greece, Taiwan, Turkey, and Pakistan. However, among Indian-sourced studies, there was one past paper used the qualitative approach, by which, study by Adharsh et al. (2018). Apparently, the quantitative field is dominated by the Indian context. India-originated quantitative-based investigations comprise 14 out of 78 reviewed articles, of which the majority of the research focused on consumers' behavioural intention toward using mobile wallets. Malaysia obtains the second spot in mobile payments research with 13 quantitative-based articles and one qualitative-based article by (Moghavvemi et al., 2021). Most of these studies focused on consumer's intention to use e-wallets as the endogenous variable. However, there are several exceptions, notably the effectiveness of e-wallet (Nizam et al., 2019) and consumer retention for e-wallet services (Komba & Abd Razak, 2020). Obviously, a more extensive study on other predictors is needed in the Malaysian context. In this regard, Kabir et al. (2015) echoed that scholars should explore the roles of government, financial institutions, and other stakeholders in the mobile payments platform.

Next is Indonesia, with 12 articles. Indonesian researchers tend to study digital wallets from a specific perspective, such as demographic or e-wallet brands. For instance, Taufan and Yuwono (2018) conducted a study focused on usage intention towards GoPay wallet through the TAM approach. Another example is a study conducted by Laywilla et al. (2020) that considered only the female users' perspective. In addition, seven articles were obtained from Thailand, four past studies were retrieved from Brazil, three papers from Saudi Arabia, South Africa, Philippines, and Kuwait, two articles from UAE, Taiwan, Greece, Turkey, and Pakistan, one paper from Romania. To reiterate, these previous studies were conducted by using the quantitative approach. The data were gathered by dissemination of self-administered questionnaires to the e-wallet or mobile payment services consumers. Besides the Indian-sourced and Malaysia-sourced studies, there was one study has adopted a qualitative approach. To be specific, a study from UAE carried out by Halaweh and Qaisi (2016).
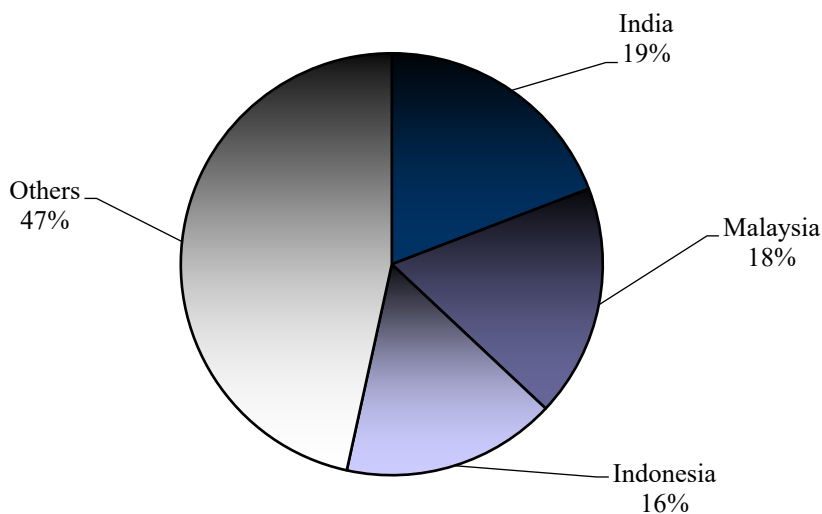

Figure 2 Sources of quantitative-based e-wallet adoption studies by countries.
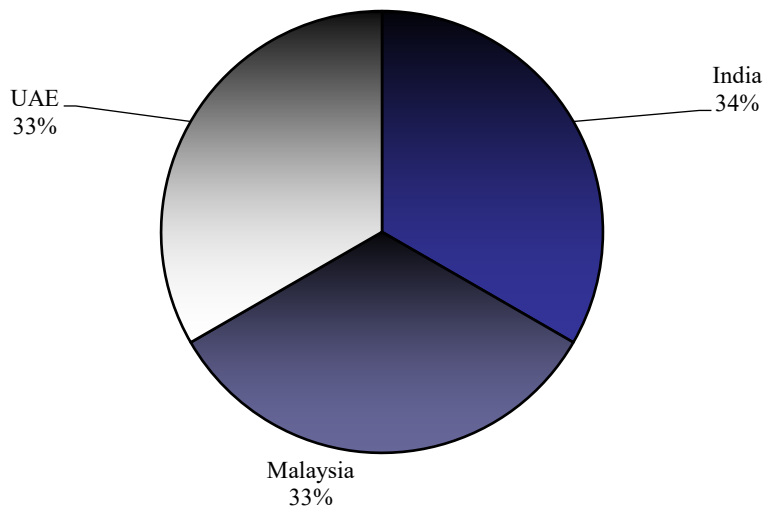
Figure 3 Sources of qualitative-based e-wallet adoption studies by countries.

3.2 Sample and unit of analysis

Choosing appropriate respondents is very critical to the researcher as their selection greatly impacts the research quality. Respondents are derived from the sample size of a particular target population; they are selected to fulfill the research need. According to the result, most previous studies on e-wallet adoption tend to use consumers as their respondents. However, some of the past research have a specific preference of respondents. For example, Karim et al. (2020) chose to sample Malaysian young adults. Only a few studies sampled merchants or vendors. For instance, Lonare et al.'s (2018) study on the diffusion and adoption of e-wallet in India focused on vendors or merchants as the main respondents.

In respect of Malaysia, all quantitative-based papers reviewed have selected consumers as their respondents. Perhaps the newness of e-wallet services in Malaysia has driven the researchers to contextualize e-wallet adoption from the consumers' perspective instead of other types of respondents such as bank staff, e-wallet providers, or merchants.

3.3 Adapted theories and models

The adaptation of theories at different levels of the research process is crucial as it strengthens the impact of findings whether the study is quantitative, qualitative, or mixed method (Stewart & Klein, 2015). Based on the findings, technology use and acceptance models (TAM, UTAUT & UTAUT2) – which underpins 42 of the reviewed frameworks, are the most frequently used by the past studies. Several authors integrate different theories in establishing their research framework. For example, Ruangkanjanases and Sirikulprasert (2018) researched consumer intention to adopt NFC mobile payment in Thailand by employing the TAM model and Diffusion of Innovation theory.

The prevalence of technology acceptance models in mobile payment research is not unexpected considering that e-wallet is an information and communications technology tool. Nonetheless, other theories were also employed, such as Theory Planned Behaviour (TPB) (Persada et al., 2021), OLT, or

Information Learning Theory (Matemba et al., 2019), Diffusion of Innovation (DOI) (Yeh, 2020), Technology Readiness Index (TRI) (Humbani & Wiese, 2018), Innovation Resistance Theory (IRT) (Alabdan & Sulphey, 2020; Chua & Ling, 2019), Information System (IS) Success Model (Malaquias & Hwang, 2019; Mouakket, 2020), Cognitive Dissonance Theory (CDT) (Rouibah et al., 2016), Behavioral Reasoning (BRT) (Baraja & Gunawan, 2019) and Expectation-Confirmation Theory (Ladkoom & Thanasopon, 2020). In addition, eleven previous studies were not adapting any theories when developing their framework. Instead of employing model or theory, these studies chose to use relevant variables from previous research that were already validated. Nevertheless, most of the selected variables are related to popular model/theory such as TAM, UTAUT, or DOI. For example, a study by Amoroso et al. (2021) has selected Habit as a predictor in determining future repurchase intention. Apparently, Habit is one of the variables in UTAUT 2 model. Other predictors were including Loyalty, Switching Cost, Reciprocity, and Trust. These details are summarized in Table 4 below.

Table 4. Analysis of adapted theories/models

Theories/ Models	Frequency
Technoloy Acceptance Model (TAM)	24
Unified Theory of Acceptance and Use of Technology (UTAUT)	12
No Model/Theory specified	11
Combination of Theories	9
Unified Theory of Acceptance and Use of Technology II (UTAUT 2)	6
Innovation Resistance Theory (IRT)	2
IS Success Model	2
Theory of Planned Behaviour (TPB)	1
Diffusion of Innovation (DOI)	1
Expectation Confirmation Theory (ECT)	1
Technological Readiness (TRI)	1
Observational Learning Theory (OLT)	1
Cognitive Dissonance Theory (CDT)	1
Behavioral Reasoning Theory (BRT)	1

4. Discussion and conclusion

To conclude, this paper has reviewed previously published studies on mobile e-wallet adoption (digital payment) from 2016 to early 2021. These articles were selected from developing countries given the lower levels of e-wallet adoption in these countries as compared to the developed countries and China. A few main points were focused on and highlighted in this paper: the study approach, the geographical and research paradigm, the respondent's unit of analysis, and the adapted theories. The result proposed that e-wallet adoption researchers primarily selected quantitative studies for the last five years. The majority of the previous studies had concurred that the adoption mobile payment among the developing nations is rather late than their developed counterparts. On the brighter side, the size of the untapped market may also spark further questions if e-wallet providers may benefit from the early mover advantage strategy –in tandem with the idiom '*the early bird catches the worm'*.

We also found that TAM-based models remain popular and widely used as the predictors of e-Wallet intention and usage behaviour. However, in isolation, this perspective could not offer plausible reasons for the slow e-wallet adoption in developing countries. Sahut (2008) contended that costs, burdens, and risks that come along with digital transactions are the main points why the consumer refuse to use mobile

wallet. In addition, the consumer's rejection is a continuous phenomenon –even in developed economies, due to lack of common standards and inconsistencies between system in digital wallet services (Dahlberg et al., 2015). This is an area that we feel is entirely lacking in the literature and the final section if this paper discussed how this issue could be addressed (see Figure 5).
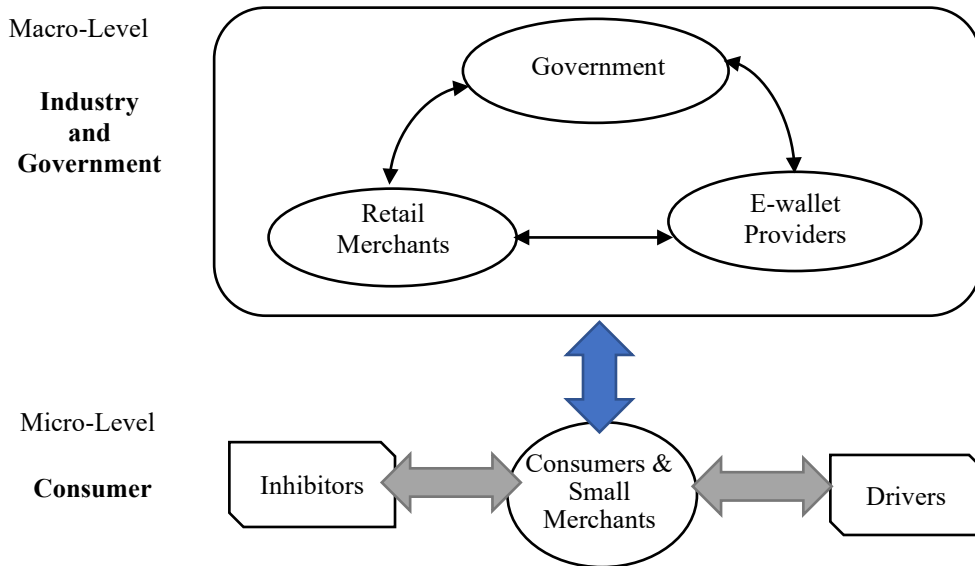

Figure 4. The eco-system and value chains surrounding e-Wallet adoption

Understanding the value chain structure is critical for the further development of prospective e-Wallet adoption models. In cognizant of this issue, the eco-system and value chains surrounding e-Wallet adoption are illustrated in Figure 3 above. E-Wallet providers have the obligation of providing satisfactory services to both consumers and merchants. According to the social exchange theory (Emerson, 1976), people make decisions by consciously or unconsciously evaluating the costs and rewards of an action, with the ultimate aim of maximizing the benefits earned. Similiarly, end-users would evaluate the risks and rewards when deciding whether to use or not to use e-wallet. From the end-users' perspectives, the risks form barriers or inhibitors, while the rewards establish motivation or drivers. This dual-stance of measuring the psychological perception of e-wallet use and identifying the potential predictors influencing e-wallet's use, will be further elaborated in the final section below.

5.   Limitations and future research directions

One of the weak points of this study is the geographical limitation reviewed. A total number of 106 articles were selected based on strict criterion –the title should be related to e-wallet adoption. After the exclusion of irrelevant articles, majority of the studies were conducted in India, Malaysia and Indonesia. Several papers were retrieved from other countries namely Brazil, South Africa, Saudi Arabia, Greece, Philippines, Turkey, Thailand and Taiwan. Furthermore, this study only focused on a few perspectives such as the demographic, methodology, and adapted theories/models. Other than India, Malaysia and Indonesia, it is suggested that future researcher to review more articles from other countries in the FTSE

list of advance and secondary emerging economies. The inclusion of FTSE's frontier countries would give different results that are more impactful and generalizable to the poorest of nations.

Secondly, this paper investigated the phenomenon of e-Wallet from the adoption perspective rather than the technology and eco-system dimensions (Dahlberg et al., 2015). This 'adoption' research stream has gradually become saturated with studies that are grounded based on the technology acceptance framework, that typically involve the drivers and enablers of E-Wallet adoption. Thus, we call for researchers to factor in other unique predictors into the equation. The antecedents of E-wallet adoption may be investigated from other consumer psychology standpoints namely brand equity, consumption values, protection motivation, and social identity theories. We argue that studies on inhibitors and barriers of e-wallet use are insufficient, and its investigation in the context of emerging markets is beyond the radar of researchers (Leong et al., 2020; Sharma et al., 2018). As illustrated in Figure 5, we offer a strategic framework that multiple stakeholders can use as a reference to understand the contours of the mobile payment and e-wallet adoption, especially in the emerging markets.

We also recommend for future research to diversify the respondents beyond consumers; specifically merchants and e-wallet providers, to gain more understanding from the other stakeholders' viewpoints. Perhaps, understanding the key drivers and inhibitors of e-wallet adoption from these stakeholders allow researchers to comprehend the phenomenon holistically. Apparently, cross-sectional and quantitative-based surveys are widely favoured by the researchers, hence, it is recommended for future research to consider longitudinal, comparative and multi-level quantitative surveys..
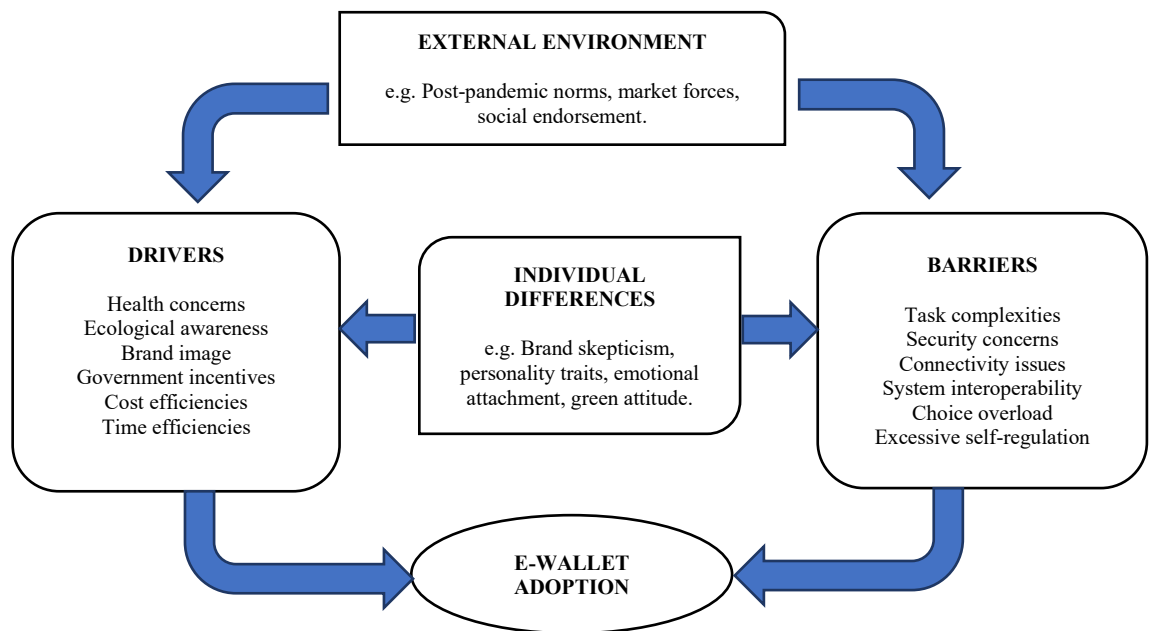

Figure 5. Framework involving potential predictors for future e-wallet adoption research.

These methods shall enrich the literature with evidence surrounding the e-wallet eco-system and its value chain. We strongly suggest that researchers look beyond the planned behavior and technology acceptance theories that generally predict users' intention. Instead, scholars could explore the roles of health concerns (fear toward microbial contamination associated with banknotes and coins in post-Covid-

19 era), ecological awareness (paperless movement), brand image, government incentives, and cost and time efficiencies as potential predictors of e-wallet adoption. Furthermore, the literature lacks much-needed knowledge on the inhibitors and barriers that prevent its adoption. This includes task complexities, security concerns, connectivity, and payment system interoperability issues (e.g., QR-codes standard, NFC infrastructure). Besides, certain psychological factors could be evaluated, namely choice overload (due to too many e-wallet options in the market), attachments toward banknotes, and excessive self-regulation (due to fears of impulsive spending). Figure 5 summarizes the potential research streams that could be investigated other than the traditional concepts, considering their scarcity in the literature. These are the areas of future research opportunities that could be explored to better comprehend the main-effects and contingency approaches of e-wallet adoption. We also call for additional qualitative works on these domains given the method's capacity to capture richer implicit knowledge in the form of unarticulated behaviour and unique insights, that are not bound by the limitations of quantitative methods.

Acknowledgement

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Appendix

FTSE country classification of equity markets as at March 2021

Developed	Advanced Emerging	Secondary Emerging	Frontier
Australia	Brazil	Chile	Bahrain
Austria	Czech Republic	China	Bangladesh
Belgium/Luxembourg	Greece	Colombia	Botswana
Canada	Hungary	Egypt	Bulgaria
Denmark	Malaysia	India	Cote d'ivoire
Finland	Mexico	Indonesia	Croatia
France	South Africa	Kuwait	Cyprus
Germany	Taiwan	Pakistan	Estonia
Hong Kong	Thailand	Philippines	Ghana
Ireland	Turkey	Qatar	Iceland
Israel		Romania	Jordan
Italy		Russia	Kazakhtan
Japan		Saudi Arabia	Kenya
Netherlands		UAE	Latvia
New Zealand			Lithuania
Norway			Malta
Poland			Mauritius
Portugal			Morocco
Singapore			Nigeria
South Korea			Oman
Spain			Palestine
Sweden			Peru
Switzerland			Republic of North Macedonia
UK			Serbia
USA			Slovak Republic
			Slovenia
			Sri Lanka
			Tanzania
			Tunisia
			Vietnam