



## Standing up for or against: A text-mining study on the recommendation of mobile payment apps

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### ABSTRACT

Mobile payment systems offer enormous potential as alternative payment solutions. However, the diffusion of mobile payments over the years has been less than optimal despite the numerous studies that have explored the reasons for its adoption. Consequently, there is an increased interest in exploring alternative actions for promoting its diffusion, especially user recommendation of the technology. This is because positive recommendations can enormously influence the decisions of potential consumers to use the technology while negative recommendations can increase resistance to it. The few extant studies in this domain have followed the traditional survey approach with hypothetic-deductive reasoning, thus limiting an understanding of factors outside their conceptual models that could influence recommendations. To address this shortcoming, this study uses a qualitative text-mining approach that explores themes from user reviews of mobile payment applications (apps). Using 5955 reviews from 16 mobile payment apps hosted on the Google Play store, this study applied the latent Dirichlet allocation (LDA) text-mining method to extract themes from the reviews that help to explain why users provide positive or negative recommendations about mobile payment systems. A total of 13 themes (i.e. ease of use, usefulness, convenience, security, reliability, satisfaction, transaction speed, time-saving, customer support, output quality, perceived cost, usability and trust) were generated from the LDA model which provides both theoretical and practical insights for advancing mobile payments diffusion and research.

### 1. Introduction

Over the years, the technical capabilities of mobile devices have increased profusely, opening up the opportunity for using these devices for offering a variety of services. One such service that has received a lot of attention over the years is mobile payments. This is not surprising as mobile payments are considered to be superior to other payment systems as they provide numerous benefits to consumers and businesses (e.g. convenience, fast processing times, cashless and ubiquitous transaction, bulk transactions etc.) and an enhanced consumer experience (Karimi and Liu, 2020; Verkijika, 2020). However, despite these benefits, mobile payment adoption has been less than optimal in several parts of the globe (Johnson et al., 2018; Park et al., 2019; Ramos de Luna et al., 2019). Consequently, several researchers (e.g. Johnson et al., 2018; Karimi and Liu, 2020; Kaur et al., 2020a; Oliveira et al., 2016; Patil et al., 2020; Ramos de Luna et al., 2019; Singh et al., 2020; Verkijika, 2020) over the years have sought to understand the salient factors that influence user adoption of various mobile payment systems. However,

limited efforts have been put into exploring post-adoption behaviors (Jun et al., 2018), especially those that can further foster the uptake of the technology by new consumers. More specifically, there have been limited efforts at understanding user recommendation of mobile payment systems, a domain that researchers acknowledge to be currently understudied (Oliveira et al., 2016; Singh et al., 2020; Kaur et al., 2020a; Talwar et al., 2021).

The intention to recommend (ITR) also referred to as word-of-mouth (e.g. see Talwar et al., 2021) depicts an informal communication that a consumer directs towards others to fundamentally describe their experience with a product/service offering in an attempt to influence their perceptions regarding the offering (Verkijika and De Wet, 2019). ITR is particularly important because it has been known to shape user behaviors regarding a system and can influence both their adoption and resistance to a technological offering (Talwar et al., 2021). By understanding why consumers might recommend mobile payment systems, service providers could better design their service offering to attract and retain more consumers. Consequently, with the low diffusion of mobile

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payments, there have been some notable studies (e.g. Kaur et al., 2020a; Oliveira et al., 2016; Singh et al., 2020; Talwar et al., 2021; Verkijika, 2020) examining user recommendation of mobile payment systems in recent years. While these studies have set strong foundations for understanding consumer recommendation of mobile payments, there still exist several gaps that could be further explored to enhance the current understanding of user recommendation of mobile payments.

Firstly, some prior studies have only looked at recommendation intentions of mobile payment as an outcome of use intentions (Oliveira et al., 2016; Verkijika, 2020) or satisfaction (Singh et al., 2020). Kaur et al. (2020a) extended this limitation by including four other factors from the diffusion of innovation theory that could also influence ITR. Nonetheless, along with the former studies, ITR in the context of mobile payments was only examined from a positive perspective where users recommend for the technology to be adopted without considering negative recommendations that encourage resistance to the technology. Talwar et al. (2021) started addressing this gap by examining six factors that might influence the intentions to engage in both positive and negative recommendations for mobile payment systems. Despite these efforts, comparable to factors that have been studied in the context of mobile payment use intentions, it becomes evident that more factors still need to be studied especially as factors that affect use intentions also have the potential to influence recommendation intentions (Kaur et al., 2020a). As such, Talwar et al. (2021) acknowledge the need for studies to examine and add to the possible list of factors that could influence the recommendation of mobile payments. Additionally, these extant studies have only focused on intentions to recommend mobile payments without examining the actual recommendation behavior. Against the backdrop of the foregoing discussion, this study has as primary objective to explore the factors that influence user recommendation of mobile payment apps.

To achieve this objective, the present study adopts text analytics of user-generated reviews of mobile payment apps. This approach has several advantages. Firstly, consumer-generated reviews have been known to be instrumental in shaping consumer behaviors as most consumers depend on such reviews to make adoption/purchase decisions (Ansari and Gupta, 2021; Park et al., 2021). Moreover, through text analytics, mobile payment providers can evaluate user reviews for feedback regarding how to improve their systems and also develop a better understanding of their customers (Yi and Oh, 2021). Also, text-mining can help to facilitate benchmarking of their product/service offering with peers and market leaders. Secondly, the open-ended nature of such reviews makes it possible to examine a wide range of factors that might be salient in fostering recommendation behaviors in the mobile payments sector. Lastly, users of mobile payments systems use such reviews to explicitly demonstrate their recommendation behavior for or against the payment system, thus ensuring that the evaluation moves beyond intentions.

The rest of the paper is structured as follows: Section 2 presents the related literature on the recommendation of mobile payments and the role of online consumer reviews. Section 3 describes the data collection, processing and analytical approach used in the study. Section 4 presents the results from the analyses while the discussion of these results and conclusions of the study are presented in Sections 5 and 6 respectively.

## 2. Literature Review

### 2.1. Prior research on user recommendation of mobile payment systems

Over the years, there has been a consensus that word of mouth (WOM) is one of the fundamental approaches for improving customer acquisition (Ahrens et al., 2012). WOM generally refers to communication from one consumer that is directed to other consumers regarding a product/service offering or its provider (Matos and Rosi, 2008). Given the importance of WOM, researchers in the domain of technology adoption have increasingly considered WOM as a key strategy for

improving user adoption of a given technology (Oliveira et al., 2016). Early studies had focused on traditional WOM which was more of physical communication. However, as technology advanced, it became easy for consumers to share product-related information as well as their user experiences on digital platforms such as websites and social media, a phenomenon that has been dubbed as electronic WOM or simply eWOM (Hu and Kim, 2018). Through these platforms, users can either communicate positive or negative views about a product/service offering (Talwar et al., 2021). WOM and eWOM communication often encompass user recommendations regarding whether or not a product or service should be adopted by others. As such, WOM/eWOM and recommendation intention are commonly used interchangeably (Talwar et al., 2021). Given the importance of user recommendations in fostering consumer adoption of a given technology, many researchers have included the intention to recommend as a key factor in the study of consumer technologies, including mobile payment systems (Oliveira et al., 2016; Singh et al., 2020; Verkijika, 2020). The facilitation of eWOM by online technologies have shown that users are increasingly using user-generated context such as online reviews on product websites and social media to make recommendations about a technology (Oliveira et al., 2016).

Following the sub-optimal adoption of mobile payment technologies, researchers have thus resorted to examining user recommendation of the technology as a means of fostering its adoption (Oliveira et al., 2016; Verkijika, 2020). This is particularly important as post-adoption behaviors have received limited attention in the mobile payment's literature (Jun et al., 2018; Tam et al., 2020). A positive recommendation of a technology can play a vital role in improving its acceptance (Oliveira et al., 2016). This is because when individuals who have experienced a technology approve its use by others, the likelihood of accepting the technology by those who are yet to use it become high, especially significant others (Verkijika, 2020) and those who trust the recommendation. Similarly, negative recommendations will minimize user acceptance of the technology and thus increase the resistance towards adopting and using it (Talwar et al., 2021).

Due to the vital role played by consumer recommendations in shaping acceptance behaviors, several studies (Oliveira et al., 2016; Singh et al., 2020; Kaur et al., 2020a; Talwar et al., 2021; Verkijika, 2020) have examined the underlying factors that affect user intentions to recommend a mobile payment system. One of the first attempts at understanding user recommendation of mobile payment systems was presented by Oliveira et al. (2016). The authors conceptualized and validated a model which indicated that the intention to adopt a mobile payment system was positively associated with the intention to recommend the technology. Additionally, the authors found six factors (i.e. Compatibility, innovativeness, perceived technology security, performance expectancy, effort expectancy, and social influence) that had a positive and significant indirect effect on the intentions to recommend mobile payments via the mediating role of intentions to adopt the technology. A study by Verkijika (2020) confirmed the positive effect of intentions to adopt mobile payments on the intentions to recommend the technology and further showed two factors (i.e. affect and anticipated regret) with a significant indirect effect on the intentions to recommend technology. In another study, Singh et al. (2020) showed that user satisfaction with mobile payments positively influenced their intention to recommend the technology and that the relationship is moderated by social influence.

Recent studies (e.g. Kaur et al., 2020a; Kaur et al., 2020b; Talwar et al., 2021) have been more focused on expanding the understanding of factors that have a direct influence on the intention to recommend mobile payments. Using the diffusion of innovation theory, Kaur et al. (2020a) proposed six factors (i.e. relative advantage, compatibility, complexity, observability, and trialability) that were expected to positively influence the intentions to recommend mobile payments. Their findings showed that except for trialability, all the other factors had a significant positive effect on the intentions to recommend mobile

payments. Based on the innovation resistance theory, [Kaur et al. \(2020b\)](#) proposed three functional barriers (i.e. usage, value, and risk) and two psychological barriers (i.e. tradition and image) that could have a negative effect on the intentions to recommend mobile payments. Of these factors, only the effects of usage and value barriers were significant.

Unlike the aforementioned studies, [Talwar et al. \(2021\)](#) proposed the need to examine both the positive and negative intentions to recommend mobile payment systems. Using the dual factory theory, these authors proposed three enablers (i.e. perceived information quality, perceived ability, and perceived benefit) and three inhibitors (i.e. perceived cost, perceived risk, and perceived uncertainty) that are likely to influence user recommendation of mobile payment systems. Based on this study, enablers are expected to promote positive recommendations while inhibitors are expected to promote negative recommendation. The findings of the study confirmed these views as all the three enablers had a significant positive effect on positive recommendations. Likewise, all three inhibitors enhanced the negative recommendation of mobile payments.

While there have been commendable efforts to advance the research on user recommendation of mobile payments, some consider this to still be in its infancy ([Oliveira et al., 2016](#); [Talwar et al., 2021](#)). This is understandable given that only a fraction of possible factors that influence user recommendation of mobile payments have been examined when compared to factors that influence adoption intentions. For example, only [Talwar et al. \(2021\)](#) examined factors that influence user provision of negative recommendations for mobile payments. Also, some of the mobile payment studies (e.g. [Oliveira et al., 2016](#); [Singh et al., 2020](#); [Verkijika, 2020](#)) have included recommendations simply as an extension of their mobile payment adoption model as opposed to framing the study mainly to unearth diverse factors that specifically influence user recommendation. As such, a more comprehensive understanding of these factors is required thus emphasizing the need for more studies to examine user recommendation of mobile payments. The model-driven approach used in prior studies imply that potential factors that influence user recommendation are determined beforehand and limited to the factors included in the specified model. Expanding the list of factors is still a critical research gap as most prior studies ([Oliveira et al., 2016](#); [Talwar et al., 2021](#)) in this domain have called for a need for future studies to expand the list of factors to better understand the enablers and inhibitors of user recommendation of mobile payments. The present study addresses this call by evaluating consumer reviews of mobile payment apps to unearth factors that influence users' positive and negative recommendations of the system.

## 2.2. The role of online consumer reviews

Mobile payment researchers ([Oliveira et al., 2016](#); [Singh et al., 2020](#)) have argued that nowadays, consumers mostly share their opinions and experiences about the mobile payment systems that they have used on social media, websites and other online platforms (e.g. forums, blogs etc.). With these opinions and experiences, they often can make positive or negative recommendations about mobile payment systems which could significantly influence the behaviors of readers regarding whether or not to adopt and use the technology ([Singh et al., 2020](#)). Online reviews are known to provide insights that are relevant to other consumers (i.e. learn from other's experiences) and service providers (e.g. knowing what users want for development or marketing purposes), thus making them a very valuable source of information. Nowadays, most mobile payment systems are provided in the form of mobile apps that users can download and install on their mobile devices.

Prior studies ([Hatamian et al., 2019](#); [Jha and Mahmoud, 2019](#); [Tavakoli et al., 2018](#)) examining consumer reviews of mobile apps have shown that user reviews from the mobile app stores can be used for extracting various types of insights. For example, a literature review by [Tavakoli et al. \(2018\)](#) surveyed 34 studies evaluating user reviews of

mobile apps and suggested that such reviews could be used for gathering information/requirements (e.g. bug report, feature request, updates, price, recommendation etc.) that can be used for advancing the development or marketing of these apps. [Jha and Mahmoud \(2019\)](#) evaluated 6000 user reviews from the iOS app store and established that 40% of them signified at least one non-functional requirement. Likewise, [Hatamian et al. \(2019\)](#) that user privacy concerns regarding mobile apps could be mined from mobile app reviews. All these studies point to the fact that online consumer reviews about mobile apps are a vital information resource for understanding user-related perceptions and contexts. As such, mobile app reviews will be used to understand why users recommend mobile apps.

## 3. Data and methods

### 3.1. Data collection

The present study analyzed user reviews from the Google Play store to unearth the reasons why users provide positive or negative recommendations regarding a mobile payment app. Following an online search on Google, a total of 27 mobile payment apps that contained user reviews on the Google Play store were selected for the study. A python script was used to extract the reviews from all 27 apps. Extracted reviews were posted between January 2015 and December 2020. A total of 805,707 reviews were extracted from all the apps. From these reviews, only 5955 (i.e., 0.7%) from 16 Apps ([Appendix A](#)) were used for the text-mining analyses as these were the reviews that explicitly made a recommendation or highlighted their intention to recommend the apps. The selection of recommendation reviews was anchored on the keyword "recommend/do not recommend" and its variants (e.g., do not use, do not download, endorse etc.) in line with measures of mobile payment recommendation used in prior studies ([Oliveira et al., 2016](#); [Singh et al., 2020](#); [Kaur et al., 2020a](#); [Verkijika, 2020](#)). A summary of the items drawn from the literature and the associated keywords used for the extraction of reviews that make an explicit positive or negative recommendation of a mobile payment app is shown in [Table 1](#).

The reviews were further divided into three groups (i.e., positive, negative and neutral) following the ratings for each review similar to prior studies (e.g., [Lang et al., 2020](#)). Since Google Play Store uses a 5-point rating system, reviews with a rating score of 3 were considered to be neutral while scores below and above this neutral point were considered as negative and positive respectively. From this data, there

**Table 1**  
Keywords for extracting recommendation reviews.

Items	Source	Keywords for text extraction
I will recommend to my friends to subscribe to the mobile payment service	<a href="#">Oliveira et al. (2016)</a> ; <a href="#">Verkijika (2020)</a>	I recommend downloading this app; Highly recommended, I recommend others/everyone to use; I strongly recommend this app; Would recommend others to use/download/install; I recommend friends to download; recommend to all my friends and family; I recommend to install and use this app.
I will recommend my friends and others to use m-wallets	<a href="#">Kaur et al. (2020a)</a> ; <a href="#">Kaur et al. (2020b)</a> ; <a href="#">Singh et al. (2020)</a> ; <a href="#">Talwar et al. (2021)</a> <a href="#">Singh et al. (2020)</a> ;	
If I have a worthy experience with mobile wallet, I would recommend friends to download the apps	<a href="#">Singh et al. (2020)</a> ;	
I would be very likely to warn my friends and relatives not to make payment for anything using m-wallets	<a href="#">Talwar et al. (2021)</a>	Do not recommend; do not use, do not make payments; do not download; I recommend others to uninstall; do not install; I do not endorse; do not download; I recommend my family and friends not to use this app.; would not recommend this app.

were only 152 neutral reviews and after further evaluating these reviews, it was observed that most were primarily making recommendations about features that should be added, as opposed to making a positive or negative recommendation about the technology. As such, neutral reviews were not used for the text-mining analyses to identify why users make positive or negative recommendations about the technology. The text-mining was conducted with 2830 positive reviews and 2973 negative reviews.

### 3.2. Analytic approach

The text-mining process commenced with the preprocessing of the data. The preprocessing stage included three steps. Firstly, the contents of the user reviews were tokenized. Secondly, the data was cleaned whereby stop words, punctuation marks, emojis etc., were removed, and all content transformed to lower cases. Lastly, the data was processed to generate bigrams and trigram, however, only bigrams were available. Some of the bigrams that emerged from reviews included “buying load”, “gift card”, “user friendly”, “life saver”, and “direct deposit” while those from negative reviews included “hard-earned”, “user-friendly”, “third party”, and “raised-ticket”.

After preprocessing the data, Latent Dirichlet Allocation (LDA) algorithm was then used for topic modelling. This is in line with several prior studies (e.g., Lang et al., 2020; Wang et al., 2018) that have employed LDA as a topic modelling approach for analyzing online consumer reviews. LDA was implemented in python with two separate LDA models (i.e., one for positive and one for negative reviews). LDA is a well-known generative probabilistic modelling technique that produces a set of automatically learned themes from a set of documents based on the frequencies of words in the documents. LDA uses the “bag of words” concept whereby each document is represented as a set of topics with each topic being constructed as a multinomial distribution of words (Park et al., 2019). The keywords from the different topics generated using the LDA models were evaluated manually by two independent researchers to generate interpretable themes.

## 4. Results

### 4.1. Themes from positive reviews

A total of ten themes were extracted from positive reviews. These themes highlight several factors that foster user recommendation for mobile payment systems. The summary of the themes is presented in Table 2.

#### 4.1.1. Ease of use

Ease of use refers to the degree to which an individual can utilize a given technology with minimal effort and use is generally known to play a vital role in the adoption of new technologies (Wallace and Sheetz, 2014; Yan et al., 2021). Users indicated that they love some mobile payment apps because of their ease of use and will recommend it to others. “Beside all other payment apps I love ... because of its easy interface and it is very easy to use. I personally recommend ... to everyone.” Some simple stressed the view that they would recommend it because of the ease of use while others stated that they would recommend it to family and friends. “Easy to use and extremely powerful. Would highly recommend!”, “... is extremely easy to use. I highly recommend it”, “I love it! It’s easy to use and I would recommend ... to anyone!” and “It was so easy to make a payment for my ... I will recommend it to all my family members!”

#### 4.1.2. Perceived usefulness

Usefulness encompasses the belief that a given technology can help a user to successfully complete a given task. Generally, the usefulness that a user has towards mobile payment solutions is often known to positively affect their intentions to use the technology (Singh and Sinha,

**Table 2**  
Themes from positive reviews.

Theme	keywords	Reference frequency	Apps involved
Ease of use	easy, online, well, type, design, mostly, transition, extremely, navigate, sufficient	316	9
Usefulness	love, useful, always, ever, personal, check, feature, number, clear, kind	226	10
Convenience	highly, convenient, money, easy, fast, love, transfer, awesome, enjoy, like	527	10
Reliability	pay, highly, reliable, easy, excellent, credit, bill, fast, perfect, card	266	12
Security	safe, secure, really, download, smooth, suck, extremely, feel, efficient, phone	171	8
Satisfaction	great, overall, interface, wallet, performance, site, navigate, sure, reliability, helpful	169	10
Transaction Speed	quick, people, easily, guy, tell, solution, practical, app, mail, worry	152	9
Time-Saving	amazing, save, time, still, place, send, wonderful, email, daily, cashback	163	8
Customer support	problem, friend, family, help, give, star, especially, enough, happy, find	260	9
Output Quality	never, year, issue, experience, bank, digital, complaint, last, safely, fail	192	8

2020; Yan et al., 2021). It was observed that users will recommend a mobile payment system when they find it useful. “Excellent app - very useful for various purposes and payment options - I recommend that everyone use it”, “This app is very useful. I recommend for everyone” and “Very useful app ... one-stop solution ... I am recommending strongly this app”.

#### 4.1.3. Convenience

One of the key benefits of mobile payments of the great convenience the technology offers to consumers and this has been widely known to play an instrumental role in the adoption of the technology (de Kerviler et al., 2016; Gupta and Arora, 2017). It was observed that consumers are also likely to recommend a mobile payment app because of its convenience. “Absolutely convenient app, I highly recommend this”, and “Very convenient to use. Highly recommended for those who seek mobile wallets”. Some recommend it out of love because of the convenience and speed of the transaction. “I love it and recommend it to all, so convenient and instant.”

#### 4.1.4. Security

Security is an important factor that consumers take into account when using mobile payment systems (Singh et al., 2020). Generally, consumers need to feel secure when transacting with mobile payment systems and this minimizes their fears and enhances the desire to transact with the system (Oliveira et al., 2016). It was observed that consumers are likely to recommend mobile payments when they believe that the systems are safe and secure. For example, some users indicated that “I recommend everyone to use it because it is safe and secure” and “safe and secure way to shop. Highly recommend for online Purchases.” Besides other benefits (e.g. speed of transaction) some consumers suggest security is one of the most important reasons for recommending mobile payments. For example, one consumer indicated that they would “recommend this app to everyone ... most importantly because it is very much secure and safe.”

#### 4.1.5. Reliability

The reliability of a system encompasses the ability of the system to deliver services in a uniform manner that consistently meets the promised outcome (Kar, 2020). Moghavvemi et al. (2021) asserted merchants generally look for mobile payment systems that are reliable. The reviews examined in this study indicated that consumers are likely to recommend mobile payment apps because of their reliability. For example, some consumers indicated that “very reliable! Definitely highly recommended!” and “I recommend it to anyone who wants reliable apps”, thus emphasizing reliability as the core reason for recommending the payment systems. One consumer even compared the reliability with similar apps as follows “Superbly reliable, even better than rivals. Strongly recommend this app.”

#### 4.1.6. Satisfaction

Satisfaction depicts the extent to which a consumer is contented/pleased with a given technology and has been shown to influence user recommendation of mobile payment systems (Singh et al., 2020). Several consumers recommended mobile payments because they were satisfied with the technology. For example, some consumers remarked that “very much satisfied and highly recommended” and “very satisfied user. Highly recommended for many types of transactions.” Others showed their contentment by highlighting how great, excellent, and amazing the service is. For example, “overall great App, I would recommend it to my friends” and “this app is marvellous/awesome. I recommend to everyone use this app” are some of the expressions of satisfaction with a mobile payment app. One expressed their satisfaction with the cashback rewards as follows “A lot of great Cash Back Rewards programs with different merchants. Very satisfied. Highly recommend”.

#### 4.1.7. Transaction speed

Transaction speed encompasses the extent to which a consumer believes that a mobile payment system enhances the speed of transactions in the payment process (Teo et al., 2015; Yan et al., 2021). Consumer reviews of mobile payment apps suggest that transaction speed is an important factor that enhances their desire to recommend the technology. Some consumers indicated the following: “Works quick and hassle-free. Would recommend for anyone”, “Quick and simple to use. I recommend it” and “highly recommended app for quicker payments.” One consumer lauded the quick checkout process while another was happy about the quick setup and cash-out processes. Their remarks were as follows: “this app is very useful for quicker checkouts ... highly recommended” and “quick set up and quick cash out for emergency situations. I recommend it any day of the week.”

#### 4.1.8. Time-saving

One of the benefits of mobile payment systems is that it helps consumers and merchants to save time (Singh et al., 2020; Moghavvemi, 2021). Time-saving is one of the benefits that consumers noted which could explain their desire to recommend the technology. Some comments by consumers include: “It’s a very good app which saves my time ... so I will recommend you all to use this app”, “saves time, I pretty much recommend you install and start using it”, and “Saves me time ... I would definitely recommend using it.” One consumer indicated that he/she “recommends everybody to use this app” because it helps in “easily avoiding queues and save time.” Another consumer was specific that those looking for time savings should use his/her recommended app by stating “I highly recommend to anyone looking to save some time.”

#### 4.1.9. Customer support

Customer support refers to the processes/systems put in place by a business to address customer-related concerns, dissatisfaction and other queries from customers (Kim et al., 2015). Customer support emphasizes good aspects of technical (i.e. system and information quality) and relational (i.e. service quality) interactions between the service provider and the customers (Negash et al., 2003). When properly provided,

customer support is imperative for enhancing customer satisfaction and building lasting relationships with customers (Kim et al., 2015; Negash et al., 2003). Several reviews echoed the view that while customers faced some problems with mobile payments, customer support helped address the problems. Some of these reviews include: “Excellent app ... thanks to the team, after your help I don’t have any problems ... I will recommend to everyone to use this app”, “Best support team. They helped me a lot since I was having a problem in using my account. I would recommend using this app” and “had some problems but ... was very thorough and solved them. I would recommend them to anyone.” Other reviews were quite impressed with the speed with which the customer support team was able to address their problems. For example, some commented that: “I emailed them and I am very thankful they reply to me very fast. My problem is already solved because of their quick response. I recommend it to my friends” and “the technical support team is so fast they solve my problem in just one-day thumbs up ... I recommended it to my friends and family”. One customer was quite impressed with the professional manner of the customer support received. The customer stated that “after contacting the support team I received an email from ... She explained to me what happened asked for some information and just like that fixed the issue for me. I will continue to invite friends and family to use the app and definitely recommend this app.” All these point to the view that providing adequate customer support would encourage user recommendation of mobile payment systems.

#### 4.1.10. Output quality

Output quality reflects the perception an individual has regarding the extent to which a system performs the intended task well (Venkatesh and Bala, 2008). According to Faqih and Jaradat (2015), a system will have good quality when users experience no problems with the quality (i.e. product, service and information). Several consumer reviews indicated that consumers have never experienced any problems/issues with the system. Some of the examples include: “I’ve never had any issues with this app ... I highly recommend it”, “Would recommend. I’ve used this for at least two years and have never had a problem”, “I’ve never had a problem with it .... I would recommend it”, and “have never had a bad experience with PayPal. Highly recommend it.” Because some of the mobile payment apps were free of problems/issues, some consumers were even more specific on the group of people they recommended it to. For example, two reviews indicated that “Never had an issue with the app, ...would recommend for anyone who’s constantly on the move”, and “Never experienced any problems with using this app. Would recommend it even to those people like me that’s not overly confident with using the internet.”. As such, consumers are more generally inclined to recommend mobile payment apps that do not give problems to users.

### 4.2. Themes from negative reviews

A total of five themes emerged from negative reviews. A summary of these themes is presented in Table 3.

#### 4.2.1. Customer support

While good customer support can help enhance system recommendation as earlier indicated, poor customers can have an adverse effect. Customer reviews of mobile payment systems suggest that poor customer support might shape consumer decisions towards failure to recommend or provide a negative recommendation of a system. Some consumers commented as follows: “terrible customer service. Wouldn’t recommend using this app to my worst enemy”, “Horrible customer service their phone number just leaves a pre-recorded message ... I don’t recommend using this wallet” and “customer service 0, app support 0 ... will not recommend to anyone, do not use this”. Other customers highlighted the fact that customer support did not respond or took too long to respond. Examples include: “worse customer service ever! They

**Table 3**  
Themes from negative reviews.

Theme	Keywords	Reference frequency	Apps involved
Customer Support	service, customer, money, support, hold, help, transaction, bad, call, contact	986	11
Perceived cost	money, card, bad, account, never, pay, charge, payment, ever, receive	323	9
Lack of trust	account, cash, people, money, company, reason, send, give, tell, scam	446	10
Usability	open, info, error, right, update, real, worst, new, log, place	274	7
Perceived usefulness	person, deposit, useless, item, rate, verification, well, ill, high, point	182	8

just don't respond ... I would not recommend this app anymore", "customer service is non-existent with this company .... I won't recommend anyone get this app ever" and "The customer service is the worse in the business ... you have to wait on an email that comes 24–48 h later .... I wouldn't recommend this app to anyone." Some were particularly concerned about the poor handling of customer refunds. For example, some customers stated that: "not even going to recommend anyone to use this application ... I got a message that I will receive the amount in the next 3 to 10 working days but today it's almost more than 16 days my amount is not been refunded yet", "I do not recommend you to use this app because a transaction fails and it does not refund your money" and "I do not recommend using this app! If your transaction fails, it will take 7–9 days to return your money. In the meantime, you have to struggle to pay your bills". Consumers also desire consistency in customer support as one consumer indicated that "I had to call support multiple times to get it resolved. Each time I called I received a different answer (terrible service). I do not recommend this app and will be switching to a different payment app."

#### 4.2.2. Perceived cost

Perceived cost in the context of mobile payment encompasses the financial cost associated with using the technology such as transaction and communication fees (Chawla and Joshi, 2020) and can negatively affect user recommendation of mobile payment systems (Talwar et al., 2021). The consumer reviews suggest that when transaction fees are high, not transparent or perceived to be unfair, consumers are more inclined to speak negatively of the payment system. For example, some consumers stated that: "I wouldn't recommend using this service as the fees are expensive", "abusive fees ... 7% in fees just to withdraw ....not recommended", "the fees are too much. I highly recommend using a different app" and "I was charged two withdrawal fees out of nowhere, can't recommend it to anyone." Even those who were already recommending a payment system might stop when perceived cost increased. For example, some consumers stated that "I loved this app and told everyone about it, but I can't recommend it anymore now that it charges a fee to instantly cash out", and "2% service fee is too much! I've been using this for a year and recommended it to my friends, but now? NO!"

#### 4.2.3. Usability

The International Standard Organisation (ISO) defines usability as the "extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO, 2010). Nielsen (2012) highlights that usability depicts the methods for improving ease of use and comprise five components namely: learnability, efficiency, memorability, errors, and satisfaction. Some aspects of usability such as ease of use and satisfaction often commonly stand on their own in the mobile payments literature, however, little effort is paid to other dimensions such as efficiency (how quick can users complete the task) and errors (i.

e. number, severity and how easy to recover from errors). These usability components play a role in the recommendation of mobile payment systems. For example, users are likely to not recommend apps with poor efficiency. Two consumers state that: "I tried so many times to feed my info ... it just doesn't accept. Always shows an error. Won't recommend it to anyone" and ". I had to try about fifteen times to get it to even take my phone number, and now I've tried over and over to enter my bank info, but it won't work. Do not recommend". Some consumers found it difficult to even access mobile payment apps. For example "It was running okay till last few days. Now this app has become totally unresponsive. I do not recommend anyone to use this app", "I am unable to open the app, and after opening the app it is getting hang in home page ... I don't recommend this app to anyone" and "unable to log in from Android despite multiple installations and uninstalls. Do not recommend" are some of the customer reviews. Other consumers become unhappy when the app provides errors or when such errors provide limited information to help them recover from the task. For example, some reviews indicated that "The only error it shows is just "Something went wrong. Please check your connection" over and over and over again. I've tried uninstalling and reinstalling, restarting my phone, etc., and nothing works. Do not recommend" and "whenever I upload ..., it shows network error. I'm totally fed-up ... I won't recommend this anyone."

#### 4.2.4. Perceived usefulness

As previously indicated, consumers are most likely to recommend useful mobile payment systems. Likewise, the opposite is true when such payment systems are perceived to provide limited or no usefulness. In particular, consumers were likely to provide a negative recommendation when some specific features were considered not useful. For example, some reviews indicated that "The supercash is useless, as you cannot utilize more than 5% of the amount, also the supercash has an expiry date. Will definitely not recommend for download, unless ... changes these policies", "I would recommend this app to no one. Their supercash program is useless", "The supercash is useless. I cannot convert them in cash and can only use a small percentage to redeem. Eventually, the supercash will expire without using it. Very disappointed and surely not going to use ... ever and won't recommend to anyone either" and "totally useless .... they are giving ... just for advertising purposes .... I'll never recommend anyone to download this application."

#### 4.2.5. Lack of trust

Users are generally less likely to use mobile payments when there is a lack of trust due to the various risk (e.g. financial, privacy, security etc.) associated with their use. The reviews suggest that users were likely to not recommend a mobile payment system when they lacked trust either in the technology or the company. Consumers who lacked trust in the app indicated that "Scam! I don't recommend this app", "I wouldn't recommend this app to anyone. My money is stuck and I can't access it due to rejected verification for a month now ... this app is a scam stealing people's money and their identities", and "This app does not accept information from banking institutions ... it only wants your debit card info ... I do not recommend this app." Those who lacked trust in the company highlighted that "I recommend, don't use this app. I think their motive to scam innocent people ... also they sell customer data", "scam! Take my money after deposit then asking for a document to use the money and my account is locked. Definitely, I will not recommend this application". Some suggested that users should confirm their trust issues by consulting other reviews about the company. For example, one review states that "I would highly recommend avoiding this app at all costs. Just do your own research on issues people face with this so-called company."

#### 4.3. Summary of findings

According to Talwar et al. (2021), one can better understand the

factors affecting the recommendation of mobile payment systems by considering the enablers and inhibitors. Within this context, enablers are considered to be factors that facilitate user provision of positive recommendations while inhibitors facilitate the provision of negative recommendations (Fig. 1). This perspective is in line with advancements in the dual factor theory where there are sufficient discussions of the view that enablers and inhibitors can co-exist in user perceptions to facilitate both the positive and negative appraisals of a system (Najmul Islam et al., 2020). While some factors can be uniquely positive (enablers) or negative (inhibitors), the effect of some factors might be a consequence of their qualitative interpretation (Najmul Islam, 2014). For example, the findings from this study suggest that there are factors whose polarity determines how the user appraises a mobile payment system and thus determines whether they provide a positive or a negative recommendation. These factors have been characterized in Fig. 1 as mixed stimulators because their effect on recommendation is dependent on whether the factor is appraised in a positive or negative sense. Fig. 1 provides a simple framework summarizing the results of this study into enablers, inhibitors and mixed stimulators.

## 5. Discussion

Given the availability of a vast amount of publicly available user reviews of mobile payment applications, it is possible to explore user experiences with these technologies to generate insights regarding their mobile payment recommendation behaviors. As such, the purpose of this study was to use text-mining techniques to identify possible factors that could explain why users recommend mobile payments. Several factors were identified that either influence positive recommendation, negative recommendation or both. The results suggest that benefits resulting from the use of mobile payments are related to user positive recommendation of the technology. Some of the key benefits identified from the reviews include convenience, transaction speed and time-saving.

Researchers have often reported convenience, time-saving and transaction speed as some of the imminent benefits of mobile payments (Gupta and Arora, 2017; Kaur et al., 2020a; Talwar et al., 2021; Teo et al., 2015; Verkijika, 2020). Kaur et al. (2020a) showed that relative

advantage had a significant positive influence on user recommendation of mobile wallets while emphasizing convenience as a key component of this relative advantage. Likewise, Kaur et al. (2020b) showed that the usage barrier was negatively associated to recommend mobile payments. Their usage barrier construct is entirely based on the convenience that users might benefit from using mobile payments. Their findings suggest that if users face the barrier of achieving the convenience benefit of mobile payments, they will be less likely to recommend it. This further emphasizes the vital role played by the convenience benefit in enhancing user recommendation of mobile payments. Convenience is also vital for the continuance use of mobile payments (Mombeuil and Uhde, 2021), which is quite important as users who continue using a given technology will be most likely to recommend it to others (Verkijika, 2020).

Perceived transaction speed is generally linked to user intention to use mobile payments especially as it can significantly enhance the ease of using the technology (Teo et al., 2015; Yan et al., 2021). Likewise, Talwar et al. (2021) consider transaction speed as one of the core benefits of mobile payments that enhance the intentions to recommend the technology. Moreover, by using mobile payments, consumers can avoid queues thus saving time that can be used for other productive activities (Brakewood et al., 2020). Besides experiencing these benefits, consumers might also want others to benefit from such transaction speed and time savings and would therefore recommend mobile payments to others. This is in line with the suggestion by Ryu and Park (2020) that perceived benefits might encourage consumers to make positive recommendations about a technology as a result of the benefit-driven commitment towards the technology.

While suggesting that perceived benefits are important, it is imperative to acknowledge that the context of use of these mobile payment systems might play a vital role in what specific perceptions of benefits are important in shaping user behavior (Mallat, 2007). For example, providing a mobile payment service in settings where queues are not apparent might mean that the time-saving benefit of avoiding queues will not affect user behavior. Also, advancements in other technologies such as tap-and-go card payments are a significant competitor to the transaction speed of mobile payments. In some cases, users perceived

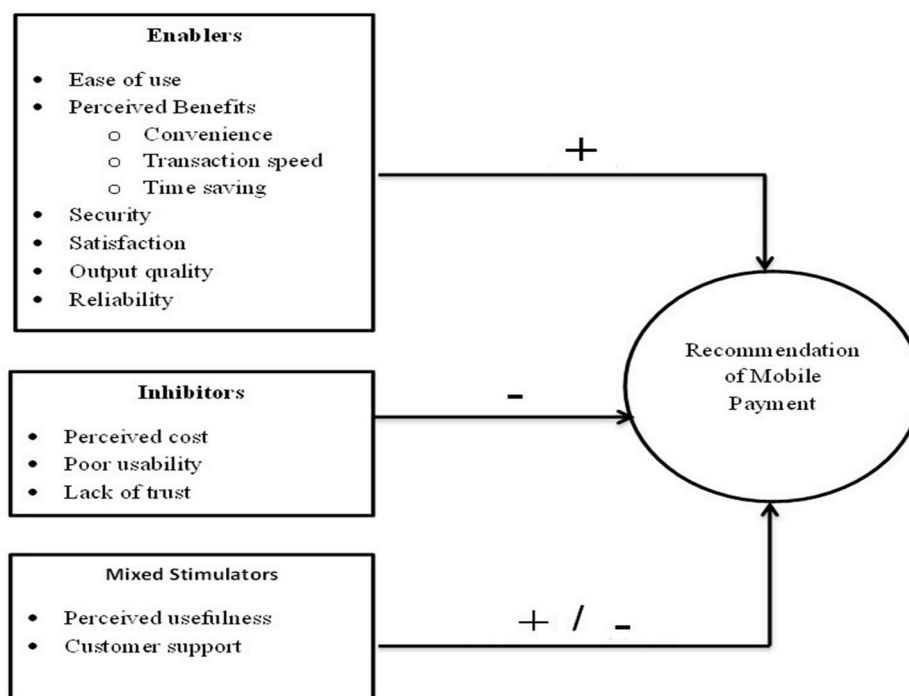


Fig. 1. Framework for recommendation of mobile payment apps.

mobile payments to be slower than alternatives (Semerikova, 2020). Therefore, mobile payments might not necessarily be the technology of choice when time pressures emphasize the need for speed. Thus, a careful evaluation of contextual factors is important to ensure that the provided mobile payment offering maximizes these perceived benefits.

Besides these widely known benefits of mobile payments, there are also several pragmatic qualities (i.e. output quality and usability) of the system that might influence users to recommend the technology. Concerning output quality, it is imperative to ensure that a given system performs its intended task extremely well as this will shape how users perceive its usefulness (Faqih and Jaradat, 2015). As such, by ensuring that a mobile payment system works well as expected, users will likely perceive it to be useful and this could explain why they would recommend the mobile payment system. Likewise, usability has been widely acknowledged (e.g. Baek and Yoo, 2018; Kokini et al., 2012; Ling and Salvendy, 2013; Mack and Sharples, 2009; Tan et al., 2020) as a key factor that determines the success of a product in many ways (e.g. continuance use, loyalty, customer engagement, competitive advantage, user performance etc.). Consequently, having poor usability can have dire consequences for the product owner. Without all the positive experience that users expect to gain from good usability, users will therefore tend to speak negatively about a system. This possibly explains why users had negative recommendations regarding mobile payment apps with poor usability as they warned others against using the app. As mobile payments advance, they also tend to require more technical capabilities of smartphones which could affect usability and output quality. For example, mobile payment apps like Samsung Pay allow users to use biometrics (e.g. fingerprint and iris scan) for payment. However, problems with the technical capabilities of biometrics can negatively affect the usability of the apps and this can lead to discontinuance use by some users (Semerikova, 2020). Thus, the technical capabilities of smartphones, in general, should also be considered when appraising the usability of mobile payment apps that depend on such capabilities (e.g. biometrics).

Also, the core technology acceptance model (TAM) factors (i.e. ease of use and perceived usefulness) are widely known for their positive influence on the acceptance of technologies including mobile payments (Singh et al., 2020) as well as the continuance use of technologies (Tam et al., 2020). However, little is often said regarding their ability to influence technology recommendation. The results suggest that both ease of use and usefulness are likely to have a positive effect on user recommendation of mobile payments. This adds to the evidence from Oliveira et al. (2016) which suggested that effort expectancy (synonymous with ease of use) and performance expectancy (synonymous with usefulness) had a significant positive indirect effect on the intention to recommend mobile payments. While usefulness is often linked with positive outcomes, perceptions of a lack of usefulness can also lead to negative outcomes. For example, the results in this study suggest that consumers might recommend for others not to adopt mobile payment systems that are considered not useful. While these Tam factors continue to be used in contemporary literature on mobile payments (e.g. Singh et al., 2020; Tam et al., 2020) it is imperative to note that there have also been circumstances where these factors have failed to influence user adoption of mobile payments (e.g. Yan et al., 2021). Also, to expand the literature in this domain, it is important to note that over-reliance on TAM could be detrimental for further knowledge development (Bagozzi, 2007; Benbasat and Barki, 2007) especially as the context of use of mobile payments keeps evolving. As such, like most contemporary studies in this domain, TAM features in the context of mobile payments should be used in combination with other theories for a more comprehensive understanding of user behavior.

Closely linked to TAM factors is user satisfaction, which is a widely studied factor in the post-adoption stage of most technologies. Satisfaction has been shown to significantly influence user intentions to speak positively about a technology-related product or service (Duarte et al., 2018; Meilatinova, 2021). This is generally because users of a

given technology are always keen to share their good experiences with others (Duarte et al., 2018). Consequently, it is not surprising to see that satisfaction is also instrumental in user recommendation of mobile payment systems as outlined in the user reviews. This is congruent with empirical evidence from Singh et al. (2020) confirming the positive effect of satisfaction on user intention to recommend a mobile payment system.

Security and trust are other factors that are widely studied in the mobile payments literature. Since mobile payment systems deal with sensitive financial and personal information, it is often posited that security and trust would be instrumental in user acceptance and continuance use of mobile payments systems (Oliveira et al., 2016; Shao et al., 2019; Shaw, 2014). The present study further suggests that security and trust could be instrumental in shaping recommendation intentions. Users who feel that a system provided adequate security will feel comfortable to continue using the system due to the minimal risk it poses and would therefore be more inclined to recommend it to others. This is in line with Oliveira et al. (2016) who found that perceived security had a significant indirect effect on recommendation intentions. Similarly, the findings in this study suggest that when consumers lack trust in a mobile payment system or its providers, they would tend to warn others against using the system. This could be a result of the increased perception of the risk associated with its use (Marriot and Williams, 2018) as Talwar et al. (2021) has shown that when the risk associated with a mobile payment system is perceived to be high, consumers would tend to provide negative recommendations of the system. With this said, it is also imperative to acknowledge that the security concerns of mobile payments go beyond the mobile payment app to encompass the whole mobile device security (Semerikova, 2020). Some users might generally feel insecure to store their financial information on a smartphone for fear of losing it which is a more general mobile security problem and not specific to the mobile payment app.

Similarly, consumers also require systems that are affordable to use. Perceived cost is one of the things that users will generally consider when adopting a new technology such that the adoption rate will be higher for systems with a low perceived cost. Consequently, when users perceive the cost to be high, they tend to warn others against adopting the system. This is in line with Talwar et al. (2021) who showed that perceived cost had a significant negative effect on the recommendation of mobile payments. The user reviews indicated the key role of perceived cost where even users who love the app stop recommending it when the cost becomes high while others will recommend against using the payment system when costs are considered to be high.

Lastly, it is imperative to ensure that the service quality of the mobile payment offering is impeccable. Some of the service quality dimensions outlined by Chang et al. (2005) that were observed to be vital in the present study are reliability and customer support. Concerning reliability, while it is suggested that merchants generally look for reliable mobile payment systems (Moghavvemi et al., 2021), it is also seen that from a customer perspective, reliability is important. As a core service quality dimension, reliability has been shown to have a positive effect on customer satisfaction (Jamal and Anastasiadou, 2009; Kim et al., 2019). Since satisfaction is a central component that positively affects the intention to recommend a technology, the positive effect of reliability on satisfaction could explain why users recommend mobile payment systems that are perceived to be reliable. With regards to customer support, the quality of support rendered by a mobile payment service provider determines how consumers respond to the service. Good customer support enhances customer satisfaction while poor support leads to customer dissatisfaction. Financial transactions are always sensitive as a consumer parts ways with their cash and can therefore feel a sense of loss if transactions fail and they cannot get back the money on time or gain access to what they wanted to purchase. As such, when such transactions have any issues, it is imperative to have a customer support team that addresses the issues and provide adequate guidance to customers. For example, Patil et al. (2020) found that consumers are more



inclined to use mobile payment systems when such systems have a well-structured and properly functioning grievance redressal system. As such, customers tend to recommend for others to adopt mobile payment systems with good support while also recommending against using those with poor or nonexistent customer support.

## 6. Conclusion

Mobile payment systems hold great potential for transforming the payments sector, however, the acceptance and use of the technology has been less than optimal (Kaur et al., 2020a). Consequently, there is still an increased need to understand user acceptance of mobile payments, as well as factors that foster consumer recommendation of the technology as positive recommendations by existing users, can play a fundamental role in attracting new users and increasing the diffusion of the technology to optimal levels of acceptance (Oliveira et al., 2016; Singh et al., 2020; Kaur et al., 2020a; Talwar et al., 2021). Also, negative recommendations are a call for concern as they can significantly impede user acceptance and use of the technology. Consequently, this study sought out to understand factors that contribute to either positive or negative recommendations of mobile payment systems. Using a total of 5955 reviews from 16 mobile payment apps, 13 factors were identified that could be influential in fostering users' positive and/or negative recommendations of mobile payment systems. The theoretical and practical implications of this study are outlined below.

### 6.1. Theoretical implications

The theoretical implications of the present study are threefold. Firstly, in recent years, there has been great interest in understanding factors that influence user recommendation of mobile payment systems. While these prior studies (e.g. Oliveira et al., 2016; Singh et al., 2020; Kaur et al., 2020a; Talwar et al., 2021; Verkijika, 2020) have provided insights on several factors influencing the recommendation of mobile payments, there is still room for exploring more factors. For example, albeit the TAM is widely used for understanding technology adoption, prior studies especially in the mobile payment's context have not examined how TAM influences user recommendation of the technology. This study suggests that TAM could be instrumental in explaining user recommendations of mobile payments. Additionally, it is imperative to recognize that while consumers might recommend the payment systems that are perceived to be useful; they are also inclined to provide negative recommendations when they perceived the mobile payment system as not useful. It is also imperative to consider the perceived usefulness of specific features of the mobile payment system as negative recommendations might occur as a result of some specific features being considered useless. Such detail is therefore necessary for future quantitative studies to consider to provide rich insights on specific useful or useless features of mobile payment systems that could influence the nature of the recommendation about the system made by consumers.

Secondly, an important aspect that has been widely unexplored in the mobile payment's literature is the role played by customer support and key service quality dimensions like reliability. While Patil et al. (2020) found that grievance redressal was important for the use of mobile payments; little has been explored on the type of customer support that needs to be offered to customers. The important role of reliability established in this study suggests that service quality frameworks (e.g., SERVQUAL) could be useful in exploring user recommendations of mobile payment systems. Additionally, the outcomes associated with customer support brings new insights as prior mobile payment studies often ignore the customer support needed to drive the success of the product and mostly focus only on the technology and user characteristics.

Thirdly, while perceived benefits are known to influence the recommendation of mobile payment systems (Talwar et al., 2021) prior studies have not explored specific perceived benefits and the role each

one plays. The present study showed three perceived benefits that users commonly mentioned when recommending mobile payments. This is particularly important to help shape future studies that incorporate perceived benefits as such studies can properly frame the measurement of such benefits to include these three benefits. This is unlike prior studies (e.g., Talwar et al., 2021) that have touched only on one of these aspects or presents benefits in a broader sense that does not clearly outline specific benefits and their influences on mobile payment-related behaviors.

Lastly, prior research in the context of mobile payment systems has been dominated by questionnaire or interview driven studies. Researchers conducting such studies in the context of mobile payment recommendations have highlighted the constraints posed by the geographic setting of the study or the limited number of mobile payments systems included (Kaur et al., 2020a, 2020b). However, the present study has demonstrated that the use of online consumer reviews could transcend such limitations and allow researchers to contribute to the mobile payments literature using data that covers insights from users around the world with multiple mobile payments apps included in a single study. Moreover, the open-ended nature of customer reviews has made it possible to generate insights on a wide number of factors that could influence the positive and/or negative recommendation of a mobile payment system. With these findings, there is room for future empirical studies to depend on the narratives and discussions of this study to frame and test empirical hypotheses to further ascertain the significant role of these identified factors. Moreover, the reviews suggest that consumers can at times stop recommending or even provide negative recommendations for systems they had been recommending before. This suggests an important behavior that needs to be explored in mobile payments and related technology recommendations as this could have significant consequences for the systems.

### 6.2. Practical implications

The study revealed three implications for mobile payment service providers. Firstly, consumers are often likely to recommend mobile payment systems that provide them with significant benefits. As such, mobile payment service providers must capitalize on emphasizing the benefits of their systems (e.g., convenience, time-saving, and transaction speed) in their advertisements and also encourage their customers to share their experience of these benefits on online platforms. Besides these benefits, consumers are also concerned about the pragmatic qualities of the system (e.g., output quality and usability) and these qualities should be evaluated by service providers to ensure that users are satisfied with these qualities as this could increase their positive recommendations of the system.

Secondly, ensuring that the mobile payment systems are easy to use, useful and providing a satisfying user experience is fundamental for encouraging users to recommend the technology. Service providers should regularly evaluate these aspects to ensure that they are satisfactory. Thirdly, cost is a critical factor that should be monitored closely by service providers. Any changes in the fees or other costs that consumers incur should be carefully evaluated as the impact on the user recommendation could be dire. Customers will provide negative recommendations when costs are high or perceived to be unfair. Moreover, even those who have been providing positive recommendations could switch to negative recommendations if there is a sudden change in the perceived cost, especially when such costs are unexplained or perceived to be unfair. Consequently, before making any fee changes, service providers should seek consumer advice or benchmark with other similar providers to ensure their fees remain competitive.

Thirdly, customer support is critical but seems to be highly neglected by most mobile payment service providers. Consumers want the availability of support, reliable service support, appropriate grievance address system, fast response to consumer queries, adequate/understandable responses to consumers and professionalism of support staff

just to name a few. When the customer support is excellent, consumers will recommend the system, however, if customer support is poor, consumers will provide negative recommendations aimed at deterring potential and existing consumers from adopting or continuing to use the system. Consequently, service providers who are unable to provide adequate customer support should possibly outsource their customer support albeit with caution and proper analysis to ensure its effectiveness (Raassens et al., 2014). Additionally, the use of online live support is highly encouraged to increase the response time for customer queries (McClean and Wilson, 2016).

Lastly, this study has also demonstrated the value of customer reviews to mobile payment providers. Customer reviews are known to be a valuable source of feedback data for businesses to improve their product/service offerings (Hatamian et al., 2019; Jha and Mahmoud, 2019; Tavakoli et al., 2018). Providers of mobile payment apps are therefore encouraged to collect and analyze customer reviews for insights that can help in improving their product/service offering. Also, since customer reviews are publicly available, mobile payment providers can use such data to benchmark their product/service with that of competitors and market leaders.

### 6.3. Limitations and future research areas

Notwithstanding the contributions of this study, it is imperative to highlight its limitations and how these can be addressed in future studies. First, while this study used LDA which is a well-known and respected text analytics model, this model also has some weaknesses. For example, the number of themes to be generated needs to be determined

beforehand and LDA does not produce correlations between the learned themes. This means that different researchers can arrive at a different number of themes from the same data. Likewise, factors that emerged such as ease of use and usefulness are known to be correlated, yet because LDA does not produce correlation, such interplay between themes was not covered in this study. Future research is therefore encouraged to use a similar approach and try a different number of themes as this could generate more insights and produce more factors that influence user recommendation of mobile payments. Also, to explore the correlation between factors for more insights, future studies should consider using correlated topic modelling techniques.

Second, while the preliminary analyses of the content of the neutral reviews suggested that they did not focus on expressing positive or negative recommendations of the mobile apps, another sample of different mobile payment apps or data at a different point in time might provide different results. As such, future studies are encouraged to evaluate neutral reviews for possible themes that explain user recommendations of mobile payments. Neutral reviews could have the benefit of providing insights into intermittent behaviors regarding the recommendation of mobile payment systems. Lastly, only 16 apps (Appendix A) were included in the present study. Even though the list contains some of the world-renowned mobile payment apps, the list is not exhaustive. Likewise, reviews of these apps were only obtained from the Google Play store. Future studies can overcome this limitation by including more apps in their sample and also extracting reviews from the Apple App Store for iOS versions of mobile payment apps. This would provide a more comprehensive evaluation of user recommendations of mobile payment apps.

## Appendix A. List of Apps

App Name	App URL
Cash App	<a href="https://play.google.com/store/apps/details?id=com.squareup.cash">https://play.google.com/store/apps/details?id=com.squareup.cash</a>
GCash	<a href="https://play.google.com/store/apps/details?id=com.globe.gcash.android">https://play.google.com/store/apps/details?id=com.globe.gcash.android</a>
Google Pay	<a href="https://play.google.com/store/apps/details?id=com.google.android.apps.wallemfrcel">https://play.google.com/store/apps/details?id=com.google.android.apps.wallemfrcel</a>
Mobikwik	<a href="https://play.google.com/store/apps/details?id=com.mobikwik_new">https://play.google.com/store/apps/details?id=com.mobikwik_new</a>
M-Pesa	<a href="https://play.google.com/store/apps/details?id=com.safaricom.mysafaricom">https://play.google.com/store/apps/details?id=com.safaricom.mysafaricom</a>
Paga	<a href="https://play.google.com/store/apps/details?id=com.mypaga.customer">https://play.google.com/store/apps/details?id=com.mypaga.customer</a>
PayPal	<a href="https://play.google.com/store/apps/details?id=com.paypal.android.p2pmobile">https://play.google.com/store/apps/details?id=com.paypal.android.p2pmobile</a>
Paytm	<a href="https://play.google.com/store/apps/details?id=net.one97.paytm">https://play.google.com/store/apps/details?id=net.one97.paytm</a>
Perfect Money	<a href="https://play.google.com/store/apps/details?id=com.touchin.perfectmoney">https://play.google.com/store/apps/details?id=com.touchin.perfectmoney</a>
Phonepe	<a href="https://play.google.com/store/apps/details?id=com.phonepe.app">https://play.google.com/store/apps/details?id=com.phonepe.app</a>
PocketMoni NG	<a href="https://play.google.com/store/apps/details?id=com.pocketmoni.ui">https://play.google.com/store/apps/details?id=com.pocketmoni.ui</a>
Samsung Pay	<a href="https://play.google.com/store/apps/details?id=com.samsung.android.spay">https://play.google.com/store/apps/details?id=com.samsung.android.spay</a>
Skrill	<a href="https://play.google.com/store/apps/details?id=com.moneybookers.skrillpayments">https://play.google.com/store/apps/details?id=com.moneybookers.skrillpayments</a>
SnapScan	<a href="https://play.google.com/store/apps/details?id=com.fireid.snapscan">https://play.google.com/store/apps/details?id=com.fireid.snapscan</a>
Venmo	<a href="https://play.google.com/store/apps/details?id=com.venmo">https://play.google.com/store/apps/details?id=com.venmo</a>
Zapper	<a href="https://play.google.com/store/apps/details?id=com.zapper.android">https://play.google.com/store/apps/details?id=com.zapper.android</a>

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