



# **Understanding Perceived Risks in Proximity Mobile Payment Adoption in South Africa and the Mediating Effect of Perceived Value**

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**Received:** 13 August 2021

**Accepted:** 20 October 2021

**DOI:** <https://doi.org/10.32479/irmm.11814>

## **ABSTRACT**

The purpose of this study is to empirically test the relationship between perceived risk factors and adoption of proximity mobile payments, and to explore the mediating effect on perceived value. Using a descriptive research design, an online self-administered questionnaire was used to collect data from 297 users of proximity mobile payments in South Africa. Confirmatory factor analysis using Amos version 27 was used to analyse the data. The assessment of the path coefficients indicates a statistically significant relationship between psychological insecurity and adoption of proximity mobile payments. Further analysis indicated that perceived value fully mediates the relationship between psychological insecurity and adoption of proximity mobile payments. To the best knowledge of the author, this study is the first to provide empirical evidence of the mediating effect of perceived value on the relationship between perceived risk factors and adoption of proximity mobile payments in an emerging economy. Therefore, the study makes valuable contributions to academicians and practitioners in quest for safe proximity mobile payment apps.

**Keywords:** Perceived Risks Adoption Intention, Proximity Mobile Payments, Perceived Value Theory

**JEL Classifications:** M31, L81

## **1. INTRODUCTION**

The number of mobile payment services that have been introduced across the globe are unprecedented, in part due to exponential growth in the adoption of smartphones. According to Iman (2018), the number of mobile phones in use is greater than any other technical device that can be used to deliver products and services to consumers. Clearly, the mobile phone technology has brought about many opportunities for banks, mobile network operators (MNO) and software service providers to introduce financial transaction services including mobile payments. Although mobile phones are anticipated to become a common tool for initiating, authorizing and completing transactions, many mobile payment service efforts have failed (Dahlberg et al., 2015). For instance, M-Pesa, a mobile payment app that was developed by Vodacom in 2010,

was discontinued 6 years later due to slow uptake (Herholdt, 2016) despite the seemingly inviting conditions in the South African context.

Mobile payments can be categorised into remote and proximity mobile payments (O'Brien, 2018). With remote payments, consumers can complete a payment transaction without having to be physically present in the store (De Kerviler et al., 2016). For proximity mobile payments to occur, the consumer has to be physically present in the store. The common mode of purchases includes point-of-sale (POS) where consumers can scan a QR code to effect payment, or use near field communication (NFC) technology to make the transaction. This study focuses on proximity mobile payments largely touted by researchers as direct substitute for using cash or debit cards (De Kerviller et al., 2016; O'Brien, 2018).

Despite the many opportunities presented by mobile payments, they are not without risks. Extant literature indicates that the consumer's perception of risk is the most significant deterrent of the much-anticipated rise in the adoption of mobile payments (Taylor, 2016; Pelaez et al., 2017; Park et al., 2018; Killian and Kabanda, 2020). Analogous to these previous findings, of the 56 scientific articles reviewed by Liébana-Cabanillas et al (2017) between 2002 and 2016, 46.63% of them identified perceived risk as the main barrier to the adoption of mobile payments, yet understanding remain fragmented for several reasons. First, Pelaez et al. (2017) and Park et al. (2018) identify perceived risk as a unidimensional construct while Groß (2016) and Yang et al. (2016) consider it multi-dimensional to suggest inconsistencies in literature that require further research. Second, a literature review of various databases such as ProQuest, EBSCOHOST, Science Direct and Google Scholar indicate that several studies that investigated perceived risks in mobile payments were conducted outside the borders of South Africa (Yang et al., 2016, Park et al., 2018; Pelaez et al., 2017). The precise overview of perceived risks and their deterrent impact on the adoption of mobile payment apps is largely missing in the South African context.

Understanding the perception of risks associated with mobile payment adoption in the South African context would be of particular interest for several reasons. First, as reported by Joubert and van Belle (2013), South Africa has one of the most advanced telecommunication network infrastructures of the emerging markets. Therefore, it would be plausible to believe that the South African economic and social climate is conducive to mobile payments, yet in reality the mobile payment use is still in its infancy (Killian and Kabanda, 2017).

Second, as of 2018, South Africa had the highest prevalence of active mobile connections in Africa, whereby 90% adults owned a smartphone, compared to Ghana, Senegal, Nigeria and Kenya where only a third of adults owned a smartphone during the same period (Silver and Johnson, 2018). Despite South Africa's high mobile penetration rates, only 6.4 million people are predicted to be willing to use proximity mobile payments by 2023 (Statista, 2020). It suggests that mobile payments are still a long way to becoming a common method of paying for goods and services in South Africa. Third, given the widespread availability of 4G/5G network and access to WiFi hotspots across cities, and inviting regulatory framework (Killian and Kabanda, 2017), one would expect mobile payments to be a commonplace, yet the reality looks different and somewhat disappointing.

Fourth, incidences of robbery after withdrawing cash at an automated teller machine (ATM) increased by 53% in 2019 while cash losses increased by 102% during the same period (SABRIC, 2019). Other crimes include people being mugged in busy streets of the big cities of South Africa which witnessed an increase from 697,000 cases in 2015/16 to 1,1 million in 2019/20 (Statistics SA, 2020). Consequently, it would be reasonable to believe that consumers would be in favour of a cashless environment. Surprisingly, the number of people utilising mobile payments in South Africa is increasing at a snail's pace.

This study takes the view that the influence of perceived risks should be given due attention because of its propensity to negatively impact consumer decisions. As reported by Park et al. (2018), service providers can choose to ignore addressing these risk concerns at their own peril, as consumers would be reluctant to choose mobile payments as their preferred mode of payment if their perception of risk is high.

Hence, the study purports to make several contributions to theory and practice. Theoretically, the study aims to generate a discussion among scholars regarding the different types of potential risks and their impact on the adoption of mobile payments from an emerging market perspective through the lens of the perceived value theory. The use of the perceived value theory would add value to the study as recent review of proximity mobile payment adoption literature did not identify perceived value as the most frequently used theoretical design.

Furthermore, the study investigates the mediating role of perceived value in the relationship between perceived risks and the adoption of proximity mobile payments. The paper argues that risk propensity is inversely related to perceived value. Put differently, the impact of perceived risks could be lessened if consumers' perception of the value of proximity mobile payments is high compared to using cash, debit or credit cards when paying for goods and services. From the practical perspective, it is discernible that the findings of this study could provide invaluable insights to service providers (banks, mobile network operators and retailers) to formulate strategies that mitigate risks associated with proximity mobile payment use.

The primary objective of this study is to empirically explore the relationship between the seven dimensions of perceived risk (financial, security, time, product, psychological, performance, social, privacy) and adoption of mobile payments among adult consumers aged 18 years and older. These factors have been investigated in prior research but in other consumer behaviour contexts such as online purchase behaviour (Pelaez et al., 2017) and mobile commerce (Shaw and Sergueeva, 2019). More research is required to understand the impact of different types of risks on the adoption of proximity mobile payments in an emerging market with a view to providing insights to the development of safe mobile payment apps. Furthermore, understanding the significance of different risks would benefit researchers and academicians in advancing the theoretical literature.

## 2. LITERATURE REVIEW

Literature conceptualises mobile payments in different ways. According to Iman (2018), mobile payment systems offer payment capabilities for different kind of products and services as well as account payments by utilising the mobile phone to effect a payment transaction. Mobile payments can also be described as payments for which payment data and instructions are made via a mobile phone or other mobile devices such as tablets and personal digital assistants (PDA) (OCED, 2012). Despite these conceptualisations, at the center of it all is a mobile phone. Hence, scholars anticipate the rapid growth of smartphone adoption to be indicative of the

high adoption of mobile payments. Yet the anticipated growth in mobile payment services is still yet to be realised because less than 25% of adult smartphone consumers make use of all available smartphone services (Slade et al., 2013; Johnson et al., 2018).

## 2.1. Theoretical Background

The study is based on the perceived value theory, which posits that people make product or service purchase decisions based on the subjective value (Yang et al., 2015). Babin and Harris (2014 pp. 28) describe perceived value as “a personal assessment of the net worth a consumer obtains from an activity” while Cocosila and Trabelsi (2016) describe perceived value as a tradeoff between the gain that is enjoyed from using the product or activity and the cost (or sacrifice) of these. Thus, value is what consumers ultimately pursue for personal gratification.

Marketing literature suggests that products and services are purchased to satisfy both utilitarian and hedonic values (Hsiao et al., 2016; Molinillo et al. (2019). While hedonic values include emotional (fun and enjoyment), symbolic and subjective attributes, utilitarian values pertain to functional or economic aspects related to the use of the product or service (Hsiao et al., 2016). This study takes the view that utilitarian value is more crucial in relation to the acceptance and use of mobile payments. Put differently, consumers experience utility of using proximity mobile payments when task performance and efficiency are increased. As corroborated by Park et al. (2018), technology-enabled services are beneficial if they provide benefits and are preferable to alternative methods. In this study, perceived value emanates from various activities that involve interactions between the consumer and providers of the mobile payment app. Thus, this study assumes that the benefits of mobile payments such as convenience, comfort, and speed of payments would take precedence over the fun and enjoyment of using the apps.

## 2.2. Adoption of Mobile Payments

“Adoption” is defined by Kiwanuka (2015) as an inaugural use of a technology while Islam et al. (2011:82) describes it as a consumer’s intention to continue using a product. This study investigates the use of a mobile device to initiate and complete purchases, in which case the use of proximity mobile payment apps is considered the use of a new technology regardless of the associated risks. For the purposes of this study, adoption is described from the viewpoint of downloading the mobile payment app and using it to make purchases for goods and services.

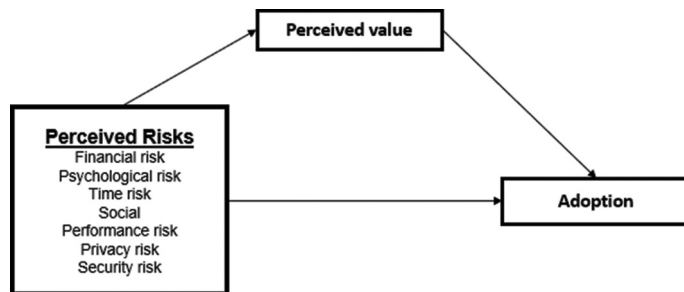
The following section discusses the perceived risks associated with mobile payments as depicted in Figure 1.

## 2.3. Operationalisation of Constructs and Hypotheses Development

### 2.3.1. Perceived risk

As perceived risk can be operationally broken down into many indicators such as financial, product, social and security risk, to mention but a few (Pelaez et al., 2017), a dearth of research seems evident in emerging markets, and indeed in South Africa regarding which type of risks have the greatest effect on the adoption of proximity mobile payments. Understanding the impact of different

Figure 1: Research framework



types of perceived risks would provide significant benefits to all service providers in developing mobile payment apps with minimum risks.

### 2.3.2. Financial risk

Financial risk is one of the risks that has been widely acknowledged in marketing literature with a high potential to negatively impact the adoption of mobile payments (Yang et al., 2015; Yang et al., 2016). Financial risk could be viewed from the possible financial loss owing to fraud (Iqbal et al., 2021) or from monetary loss due to a product’s failure to perform to the customer’s expectations (Ariffin et al., 2019). Regardless of these viewpoints, there is a general agreement among scholars that financial risk negatively influences the adoption of mobile payments. Similarly, this study views perceived financial risk as the customers’ skepticism to sign up and use mobile payment apps due to their evaluation of potential surprising financial loss. Thus, it can be hypothesized that:

H1a: Financial risk is negatively associated with adoption of proximity mobile payments

### 2.3.3. Security risk

Researchers have described security risk from a technical point of view that ensures “integrity, confidentiality, authentication and non-recognition of relationships) (Thakur and Srivasta, 2014, pp. 373). Ariffin et al. (2019) describe security risk from the perspective of loss due to online hacking or fraud, while Azizi and Javidani (2010) link security risk with disclosure of financial information. Despite the several conceptualisations, researchers agree that security risk is a fundamental factor in studying potential inhibitors of mobile payment apps (Abdul-Hamid et al., 2019; Ariffin et al., 2018; Thakur and Srivasta, 2014). Researchers concur that consumers’ fears relate to potential identity theft, network and data transaction attacks, and potential unauthorised entry to an account by means of false authentication (Abdul-Hamid et al., 2019; Azizi and Javidani 2010). Hence it is proposed that:

H1b: Security risk is negatively associated with adoption of proximity mobile payments.

### 2.3.4. Performance risk

Performance risk, also described by Biucky and Harandi (2017) as functional risk, refers to the consumers’ assessment of potential problems related to malfunctioning and transaction processing errors (Yang et al., 2016). Consumers fear that virus attacks, Trojans and other malwares may result in a failing system which may jeopardise the transaction. This could be crucial particularly in South Africa where there are sporadic electricity supply disruptions commonly known as load shedding. According to Iqbal

et al. (2021), performance risk could also be viewed from human errors perspective where carefree data disposition and inaccurate submissions by the user can be experienced. Despite the different viewpoints, this study regards performance risk as the potential of a mobile payment app not performing as advertised, and when servers don't process the payments correctly. Thus, the following hypothesis is developed:

H1c: Performance risk is negatively associated with adoption of proximity mobile payments.

### 2.3.5. Social risk

Social risk is another risk dimension that is negatively associated with the adoption of mobile payments (Yang et al., 2016). Social risk can be described as the perception of potential loss to one's perceived status that can result from buying a product that may be disapproved by those in the social circles, such as friends, family or acquaintances (Yang et al., 2016). Based on Abdul-Hamid et al. (2019) report, the perception of social risk is dependable upon how mobile payments are viewed by the immediate social group, which may then enhance or diminish one's social status among the group. This is also echoed by Biucky and Harandi (2017) who reported that the less a social group trusts mobile payment apps, the more a group member shuns away from using the apps, especially if it results in one losing their social standing in the group. Thus, it can be hypothesized that:

H1d: Social risk is negatively associated with adoption of proximity mobile payments.

### 2.3.6. Time risk

One of the benefits of mobile payments is the speed with which a transaction can be completed (Ariffin et al., 2018), yet other scholars such as (Abdul-Hamid et al., 2019) believe that many potential users may also perceive this benefit as a risk. It is evident that perceived time risk is conceptualized from different angles including delays in getting products (Ariffin et al., 2018), delays in transferring money (Abdul-Hamid et al., 2019), wrong purchase decision, and time to search for products (Biucky and Harandi, 2017). Despite these different perceptions, researchers agree that time risk is negatively associated with mobile payments. Network failure is common in South Africa due to load shedding and that may cause unnecessary delays in completing mobile payment transactions. Based on the above, it can be hypothesized that:

H1e: Time risk is negatively associated with adoption of proximity mobile payments.

### 2.3.7. Psychological risk

Another risk dimension with the potential that has the potential to have a negative effect on the adoption of mobile payments is the perceived psychological risk. According to Abdul-Hamid et al. (2019), psychological risk is described from the viewpoint of the user experiencing negative emotions such as fear from using mobile payment apps. Marriott and Williams (2018) suggested that psychological risks are a concern to consumers who lack experience in using mobile payment apps, and can therefore be subjected to mental stress and discomfort. Consumer regrets and frustrations from making wrong purchase decisions may exert considerable mental pressure which may negatively affect consumers' future mobile payment initiatives (Ariffin et al., 2018).

Several studies reported that there is a negative relationship between psychological risk and mobile payment purchase intention (Abdul-Hamid et al., 2019; Yang et al., 2016). Thus, the following hypothesis is developed:

H1f: Psychological risk is negatively associated with adoption of proximity mobile payments.

### 2.3.8. Privacy risk

The perception of privacy risk is reported in literature as a major consumer concern in mobile payment adoption (Yang et al., 2015; Biucky and Harandi, 2017). This concern is heightened by the protocols of making mobile payments in which not only phone numbers are required, but national identity numbers, pin code, credit and or debit card numbers are also needed in the mobile payment process (Yang et al., 2015). Giving away crucial personal information could potentially expose or compromise one's privacy. This study describes privacy risk as the potential loss of personal information when service providers collect, disclose, transmit or sell personal data without the consent of the consumer concerned (Biucky and Harandi, 2017). Hence, privacy risk can pose a huge challenge to mobile payment app adoption. Thus, it can be hypothesized that:

H1g: Privacy risk is negatively associated with adoption of proximity mobile payments.

### 2.3.9. Perceived value

Prior research posits that perceived value is a contrast between the benefits enjoyed when using the product or service with the associated costs (Babin and Harris, 2014). However, Cocosila and Trabelsi (2016) proposes that the concept of cost should be viewed from both monetary and non-monetary sacrifices such as time and physical effort to determine the true perceived value of the innovation. Consistent with Park et al. (2018), it may be prudent to evaluate perceived risk from the cost perspective in order to capture the broad consumers' sacrifice to adopt mobile payment apps beyond solely the non-monetary aspect. This approach may be particularly true for the proximity mobile payment apps that service providers argue are downloaded free of charge, yet consumers may see some negative consequences that may not immediately transfer into monetary costs (Cocosila and Trabelsi, 2016), such as security, information and performance risks. Thus, this study posits that the benefits of using proximity mobile payment apps outweighs the associated potential risks when a consumer's perception of value is high.

### 2.3.10. The role of perceived value as a mediator

This study takes the view that perceived value is an important mediating variable between the perception of risk and adoption of proximity mobile payments. Cocosila and Trabelsi (2016) argues that although the perception of value may be context specific, it drives peoples' attitudes and ultimate buying behaviour. These authors propose that if consumers perceive adoption of an innovation to be of high value to them (benefits outweigh costs), their perception of inherent risks will be lower and they will be inclined to adopting the innovation. Similarly, when consumers choose to use a proximity mobile payment app, chances are that perceived benefits such as speed, security and convenience could be greater than the potential risks (e.g., financial risk,



performance risk) associated with using the app. Thus, the higher the consumers' perception of value of the mobile payment app, the higher the propensity to adopt it, notwithstanding the potential risks (Biucky and Harandi, 2017). Hence, the study argues that the perception of risks would be mitigated by the perception of value that consumers place on proximity mobile payments. Several studies have confirmed a relationship between perceived value and adoption of mobile payments (Dastane et al., 2020; Park et al., 2018). Despite the emphasis of perceived value and its importance on mobile payment adoption in marketing literature, there seems to be limited studies that investigated the mediating role of perceived value, a knowledge gap that potentially exists. Thus, the following hypothesis is formulated:

H2: Perceived value mediates the relationship between perceived risk factors and adoption of mobile payment apps.

### 3. METHODS

#### 3.1. Sampling, Questionnaire Design and Data Collection

This study takes the quantitative approach and is descriptive in nature to investigate the relationships between the perceived risks and adoption of mobile payment apps. An online self-administered questionnaire was used to gather the data from a convenience sample of 257 respondents. The questionnaire was distributed via Qualtrics, an online survey platform targeting smartphone users aged 18 years and older in South Africa. A hyperlink to the Qualtrics questionnaire was sent via WhatsApp groups and posted to Facebook to solicit participation. Prior to distribution, the research instrument was calibrated after it was pretested among 20 participants from the study population to ensure language clarity, relevance and understanding of the questions by the participants. Realising that the pretesting was done from the target population, it became apparent that the common method bias could be present when the instrument is finally fielded for the larger scale study. Therefore, the definitions of unfamiliar concepts were provided and the item wording of the questions were improved.

The four scale items each measuring perceived psychological risk, perceived time risk and perceived privacy risk were taken from Yang et al. (2015). The four scale items measuring perceived social risk were adapted from Abdul-Hamid et al. (2019) while four scale items used to measure financial and performance risk were adapted from the scale items of Featherman and Pavlou (2003:470). The four scale items used to measure security risk were adapted from Pinchot et al. (2016:27) while scale items measuring adoption intention were taken from Liébana-Cabanillas et al. (2015). The study utilised a 7-point Likert response format in which 1 represented strongly disagree and 7 representing strongly agree to measure scale items used in the study.

### 4. RESULTS

#### 4.1. Sample Profile

In general, the demographic profile of respondents showed a skewed distribution. In terms of gender and race, the sample was

skewed towards females (64%) and white participants (75.9%) respectively. It is also fair to say that the sample composed of a well-educated cohort with more than half (54%) having a postgraduate qualification at the time of the survey. In terms of age, adult consumers aged between 20 and 40 years constituted the majority of the participants (69.7%) while those aged 40 years and older made up about 30% of the sample.

#### 4.2. Results of the Measurement Model

The confirmatory factor analysis (CFA) was used to test the measurement model before further analysis as suggested by Anderson and Gerbing (1988), using AMOS version 27. To assess the reliabilities, Cronbach's Alpha and composite reliability (CR) values were determined while the average variance extracted (AVE) values to determine convergent validity were also computed. Scale items with loadings of less than the threshold of 0.5 were deleted in order to enhance reliabilities and the AVE values of the constructs (Hair et al., 2016; Fornell and Larcker, 1981). Specifically, one item from financial risk (Fin\_4), psychological risk (Psch\_2), performance risk (Perfom\_2), time risk (Time\_1), and financial risk (Fin\_4) were deleted. The results indicated in Table 1 show that the threshold criteria for reliabilities were satisfied in which values that are 0.70 and above are recommended (Fornell and Larcker, 1981; Hair et al., 2016) except for time risk which showed reliability of 0.683 and 0.684 for Cronbach's Alpha coefficient and composite reliability respectively. However, time risk was retained for further analysis following Pallant (2016)'s suggestion in which reliabilities below 0.7 are common and acceptable when dealing with scales consisting of 10 items or less. An assessment of the measurement model indicates that the AVE values for all the constructs met the minimum threshold of 0.5 or greater to show convergence of the constructs (Fornell and Larcker, 1981).

As recommended by Hair et al. (2016), the CFA was retested after deleting items. The resultant CFA produced model fit indices normed  $\chi^2$  (369) = 1.548 ( $p = 0.000$ ), incremental fit index (IFI) = 0.966; comparative fit index (CFI) = 0.960; Tucker-Lewis Index (TLI) = 0.959; root mean square error of approximation (RMSEA) = 0.046; and standardised root mean square residual (SRMR) = 0.527 to indicate adequate model fit as recommended by Hooper et al. (2008) and Hu and Bentler (1999). Despite that values for the SRMR for well-fitting models are less than 0.05 as suggested by Diamantopoulos and Siguaw (2000), values as high as 0.08 are also acceptable (Hu and Bentler, 1999).

However, the results of the first measurement model showed a problem of multicollinearity between psychological risk and security risk factors ( $r = 0.836$ ). Therefore, a decision was made to merge the two factors after realising that the scale items for both factors all measure the risk relating to loss of esteem due to possible loss of information. Psychological risk is related to the negative effect on the consumer's mind in part due to lack of experience and fear of making wrong choices (Marriott and Williams, 2018) while security risk occurs when consumers are not confident with using the app (Ariffin et al., 2018). De Kerviler et al. (2016, p. 339) also merged perceived financial and privacy risks after determining that the two are linked to "potential monetary and psychological losses due to loss of control over personal

**Table 1: Summary results for the reliability and validity**

Construct	Indicator	Loading	Alpha	CR	AVE
Financial risk	Fin_1	0.936	0.859	0.869	0.693
	Fin_2	0.883			
	Fin_3	0.657			
Psychological Insecurity risk	Sec_1	0.867	0.922	0.922	0.631
	Sec_2	0.704			
	Sec_3	0.839			
	Sec_4	0.8			
	Psch_1	0.832			
	Psych_3	0.909			
	Psych_4	0.902			
Performance risk	Perf_1	0.832	0.843	0.848	0.653
	Perf_3	0.909			
	Perf_4	0.902			
Time risk	Time_2	0.709	0.681	0.683	0.518
	Time_4	0.71			
Social risk	Soc_1	0.713	0.737	0.768	0.525
	Soc_2	0.694			
	Soc_3	0.768			
Privacy risk	Priv_1	0.894	0.942	0.943	0.804
	Priv_2	0.895			
	Priv_3	0.877			
	Priv_4	0.93			
Value	Val_1	0.762	0.875	0.929	0.767
	Val_2	0.895			
	Val_3	0.9			
	Val_4	0.931			
Adoption	Adop_1	0.865	0.875	0.880	0.648
	Adop_2	0.811			
	Adop_3	0.704			
	Adop_4	0.827			

information, transaction errors or fraudulent use of personal information”. Similarly, psychological and security risk factors were merged and renamed ‘psychological insecurity’ as indicated in Table 1 to reflect consumers’ fear of psychological frustration or anxiety due to inherent potential loss of credit or debit card details in using proximity mobile payments.

To confirm construct validity of the merged constructs, an exploratory factor analysis (EFA) was performed. First, the data was suitable for factor analysis, as the KMO was above 0.6 (MSA = 0.905) and Bartlett’s test of sphericity was significant (P < 0.05) (Pallant, 2016:187). The resultant one factor solution emerged with eigenvalue greater than 1, explaining 68.1% of the variance. The new factor consisting of seven items meant adjusting H1b and H1f accordingly.

The results of the adjusted measurement model are shown in Table 1, and include the newly created psychological insecurity risk factor.

The next step involved the revised CFA. The resultant second CFA produced model fit indices normed  $\chi^2(278) = 2.069$  (P = 0.000), IFI = 0.937; CFI = 0.936; TLI = 0.925, RMSEA = 0.065, and SRMR = 0.057 to indicate adequate model fit based on the recommended thresholds indicated in Table 2.

**4.3. Discriminant Validity**

According to Shiu et al. (2011), a Chi-square difference test between the unconstrained and the constrained model could

**Table 2: Recommended thresholds for the Fit indices**

Fit indicators	Recommended thresholds	Recommending authors
$\chi^2/df$	≤5.00	Hooper et al., 2008
CFI	≥0.90	Hu & Bentler, 1999
IFI	≥0.90	Hu & Bentler, 1999
TLI	≥0.90	Hu & Bentler, 1999
RMSEA	≤0.08	Hu & Bentler, 1999
SRMR	≤0.08	Hu & Bentler, 1999

where  $\chi^2$  = Chi-square; DF = Degree of Freedom; CFI = comparative fit index; RMSEA = root mean squared error of approximation; TLI = Tucker-Lewis Index.

be used to show if discriminant validity exists between the constructs, in this case, between perceived risk factors and adoption. According to Shie et al. (2011), if a resultant chi-square difference value is greater than 3.84, with 1 degree of freedom, the null hypothesis can be rejected at the 5% significance level. The difference in the calculated Chi-square values are indicated in Table 3 was 13.9 (df = 1) (722.8-708.9 = 13.9 > 3.84) which is greater than the 3.84 threshold to suggest that the two constructs are distinct from each other.

**4.4. Results of the Structural Model and Hypotheses Testing**

After confirming convergent and discriminant validity, the first structural model was assessed to test the hypothesised paths. The results of the goodness of fit indices are depicted in Table 4 and show that the structural model meets the cut-off points to indicate adequate model fit.

**Table 3: Results of discriminant validity**

Factor	Unconstrained Chi-square Test	Constrained Chi-square Test	Chi-square difference	Result	Discriminant validity
Financial risk	575.2	585.9	10.7	>3.84	Yes
Psychological insecurity	575.2	583.7	8.5	>3.84	Yes
Performance risk	575.2	584.1	8.9	>3.84	Yes
Time risk	575.2	586.0	10.8	>3.84	Yes
Social risk	575.2	581.7	6.5	>3.84	Yes
Privacy risk	575.2	586.5	11.3	>3.84	Yes

**Table 4: Results of the structural model**

Fit indicators	Structural model
$\chi^2/df$	1.881
CFI	0.943
TLI	0.934
IFI	0.944
RMSEA	0.059
SRMR	0.553

Consistent with the objectives of this study, two sets of hypotheses were tested. Model 1 tested the direct effects of risk dimensions on the adoption of proximity mobile payments. The assessment of the path coefficients indicates only one statistically significant relationship between psychological insecurity and adoption of proximity mobile payments ( $B = -0.489$ ,  $P < 0.05$ ) to support adjusted H2b as indicated in Table 5. Other independent variables (financial, privacy, performance, time, social risk) were not statistically significant. Thus, H1a, H1c, H1d, H1 e and H1g were not supported.

After adding the mediating variable (perceived value) in Model 2, the relationship between the predictor variables and adoption were tested. Model 2 tested the indirect effect of perceived value on the proposed relationship between the various risk dimensions and the adoption of proximity mobile payments. According to Hair et al. (2016), a mediating effect occurs when the following conditions are satisfied: first, the relationship between the independent variable and the dependent variable should be significant excluding the mediator; second, the relationship between independent variable and the mediator should be significant; third, the relationship between the mediator variable and the dependent variable should be significant; and fourth, when the independent variable and the mediating variable are controlled, a relationship between the independent variable and the dependent variable should become insignificant or decrease significantly.

As previously shown, Model 1 confirms the negative and significant relationships between the mediating variable of perceived value and psychological insecurity,  $\beta = -0.355$ ,  $t = -3.245$ ,  $P < 0.001$ , as well as between perceived value and adoption ( $\beta = 1.238$ ,  $t = 11.754$ ,  $P < 0.001$ ).

Following the recommendation of Leth-Steensen and Galitto (2016), the indirect effect is examined employing bootstrapping as a non-parametric method for generating more robust inferences. The results are based on 200 bootstrap samples and a 95% bias-corrected confidence interval. The standardized indirect effect

was statistically significant ( $\beta = -0.435$ ;  $P = 0.13$ ) between psychological insecurity, value and adoption. This is also evident from the bias corrected 95% confidence intervals which do not include zero for problem solving ( $-0.783$ ,  $-0.119$ ). Perceived value was thus a mediator between psychological insecurity and adoption.

## 5. DISCUSSION AND IMPLICATIONS

The present study was motivated by the growing importance of mobile payments and by inadequate research on the potential impediments to proximity mobile payment adoption. The study was conducted in the context of a developing economy such as that of South Africa where mobile payments are still growing, in order to understand potential risk factors inhibiting user acceptance. Additionally, the study also aimed to understand the mediating effect of perceived value on the relationship between the perceived risk factors and adoption of proximity mobile payments.

Some interesting yet surprising findings emerged from the study. The findings of this study show the psychological insecurity risk factor as the only statistically significant factor in proximity mobile payment adoption to support adjusted H1b and H1f. Other risk factors (financial, performance, time, social and privacy risks) were not statistically significant. Therefore, the findings indicate that though the use of proximity mobile payments could have many potential benefits, consumers are unsure about how reliable and secure the payment system is, which leads to their concerns for psychological and security risks.

Psychological insecurity risk is a combination of psychological and security risks; therefore, the following discussion is based on the two perspectives. The findings of adjusted H1b and H1f aligns with previous research (Johnson et al., 2018; Marriott and Williams, 2018) in which both psychological and security risks were significant predictors of mobile payment adoption. From a psychological risk perspective, it seems as if consumers in South Africa particularly those who are not fully accustomed with using the new mode of proximity mobile payments, would feel uncomfortable in using them, which may also explain its low adoption in the country. The finding also suggests that consumers are concerned about whether they can use the mobile technology without bearing unwanted psychological discomfort possibly due to either Wi-Fi interruptions, possible flat mobile phone battery or cases where the user fails to scan displayed barcoded items as the concept is fairly new in the country.

**Table 5: Results of the hypotheses testing**

H	Hypothesised path	SRW	P-value	Decision
H1	Financial >>>Adoption	0.070	0.439	No support
H2	Psychological insecurity>>>Adoption	-0.480	0.006**	Supported
H3	Performance>>>Adoption	0.092	0.341	No support
H4	Time>>>>Adoption	-0.265	0.183	No support
H5	Social>>>Adoption	0.052	0.601	No Support
H6	Privacy>>>Adoption	-0.115	0.205	No Support

H: Hypothesis, SRW: Standardised regression weight. \*\*Significant at  $P < 0.05$

More importantly, the psychological risk associated with fears over contact with contaminated surfaces during the coronavirus pandemic can also take a toll on consumers' mental stress. The possibility of transaction processing errors is heightened by unstable internet connections in South Africa characterised by regular load shedding. Therefore, service providers could invest in Wi-Fi infrastructure to ensure stability and successful payment transactions with minimum interruptions.

From the security perspective, security risk is the top factor that determines trust with digital payments and chances are that the persisting effects of pandemic-related fraud will only escalate consumers' security concerns. Since proximity mobile payments are still in their infancy in South Africa (Africa.com, 2021), the extent of deceptive practices for monetary gain are still yet to be expounded. According to Taylor (2016), some of the ways through which the mobile channel can be used to defraud people include possible theft of account balances through employee involvement, situations where users are duped into installing malware apps, or due to fraudulent activities from individuals who are authorised operators of the point of sale (POS) system. To avert these security concerns, service providers should be certain that the apps have gone through the due diligence to the point that they are confident of their safety and water-tight security before rolling them out.

Although the result that financial risk emerged as a statistically insignificant predictor of proximity mobile payments may be anomalous to prior research (Ariffin et al., 2018; de Kerviller et al., 2016), the findings corroborate those of Liu et al. (2013). The results suggest that South African consumers have weak concerns about financial risks associated with proximity mobile payments. Since proximity mobile payment transactions are initiated and completed while the consumer is physically present in store, it suggests that South African consumers are confident in using the payment mode. Put differently, it appears that the technologies and processes that enables the use of proximity mobile payments in South Africa are trustworthy. The assumption is that any hiccups on the transaction while in store could be resolved immediately by management. More importantly, proximity mobile payments increase consumer autonomy and control, as the system allows them to correctly scan all items that one needs to purchase.

Another finding of this study indicating that social risk is not statistically significant seem to suggest that social risk is not related to proximity mobile payments. This might mean that South African consumers do not fear the possibility to be negatively judged by their family, friends or peers when making proximity mobile payments in store as the mode of payment is considered

an alternative to using cash. Another possible explanation could be that as the study targeted adult consumers, by virtue of their ages, they are mature to make own product choices without seeking approval from family or friends. Thus, using proximity mobile payments would not reduce the value of the consumer in front of colleagues. These findings are in tandem with reports by Ariffin et al. (2018) who also found social risk as an insignificant predictor of mobile purchase intention.

The finding that time risk has no effect on the adoption of proximity mobile payments is also contrary to Ariffin, et al. (2018) yet corroborated by Yang et al. (2015). This study show that time risk is not as relevant to proximity mobile payments as it might be to online payments. This implies that consumers have a positive attitude toward or predisposed to proximity mobile payments such that they do not think that using the payment mode would lead to time loss. Although the element of time risk may not be completely ruled out in mobile payments, South African consumers' adoption of proximity mobile payments is not influenced by time risk, perhaps because they believe that the time to be consumed in the process would be offset by the benefits to be derived from using the payment system. According to Ariffin et al. (2018), time risk is prevalent in online payments as it pertains to the amount of time to browse the product information and the time that consumers have to wait for the purchased product to be delivered. The situation is different with proximity mobile payments as consumers are physically present in the store to browse the products, and can collect the purchased product immediately. In the event of a need to return the product for any reason, the process is not as complicated as when the product was bought online. Despite these results, merchants should ensure that they have calibrated systems and reliable Wi-Fi connectivity to ensure smoother and quicker processing of transactions to avoid any inconvenience that may render time risk impactful.

Performance risk also emerged as a statistically insignificant predictor of proximity mobile payment adoption, at least from a South African perspective, which differs from previous research to a greater extent (Yang et al., 2015; Liu et al., 2013). Performance risk factor is associated with the possibility of the mobile payment system malfunctioning due to several factors such as those aforementioned (electricity supply disruptions and sometimes unstable network connections), yet the average consumer in South Africa seem not deterred by that. The anomalous result suggests that performance risk could be influential in remote payments than it is with proximity mobile payments (Marriott and Williams, 2018). Performance risk can also be explained from perspective of a product not performing as intended (Yang et



al., 2015). Consequently, the risk of a product performing below expectations are less of a deterrent possibility with proximity mobile payments than with remote payments, as consumers can make a full judgement of the product in store before purchase.

Based on the above, service providers in South Africa should strive to continue to provide mobile payment apps that are free from virus attacks, or any other malwares that can result in malfunctioning or software failures, and continuously upgrade their system servers to avoid interruption from the internet that may occur during mobile transactions.

It was also surprising to note that the perception of privacy risk was not statistically significant in the adoption of proximity mobile payments, especially given that information such as phone numbers, pin code, consumption records and even the national identification numbers are needed in the mobile payment transactions. Given the current economic situation in South Africa characterised by underdeveloped cyber systems, this finding could not be more surprising. This implies that South African consumers are less concerned with their personal information being exposed or maliciously used yet a previous research suggests a plethora of privacy risks in mobile environments (Biucky and Harandi, 2017; Yang et al., 2015). A plausible explanation could be that there have been no public reports on fraud due to proximity mobile payments in recent times, such that consumers are somehow ignorant of any possible privacy risks associated with the payment system. It could also mean that consumers are already accustomed to situations where their private information is sold or given to other service providers without their consent as evidenced by numerous unsolicited calls from different companies that consumers receive all the time. According to Thompson (2020), South African consumers receive an average of 11 spam calls per month, to suggest that people's information is willy-nilly distributed to other service providers without the concerned consumers' permission. To date, there has not been any evidence of litigation cases against solicitors. Therefore, South African consumers seem to care less about their privacy risk, particularly with reference to proximity mobile payments that are completed in their presence.

Despite this finding, consumer privacy protection should be prioritised by service providers. Remedial action should be taken in the event of a breach of consumer privacy over and above security protection. More importantly, service providers should work with government to ensure that thorough regulations are in place to avoid unintended breach of consumer privacy.

As put forward, perceived value fully mediates the relationship between psychological insecurity and adoption of proximity mobile payments. The result can be interpreted in several ways. First, the result mean that psychological insecurity affects adoption of proximity mobile payments through consumers' perception of value. It implies that perceived value help transfer the effects of psychological insecurity to adoption. Further, it is evident that psychological insecurity has a direct and indirect effect on the adoption of proximity mobile payments. The direct effect mean that psychological insecurity predicts adoption of proximity mobile payments directly while the indirect effect of psychological

insecurity means that it influences adoption indirectly through the mediating variable, which is perceived value in this study. In the context of this study, it could mean that the effects of psychological insecurity on the adoption of proximity mobile payments depend on consumers perception of value of the payment mode.

Perceived value represents how much proximity mobile payments are worth in the mind of the consumer. Thus, the more value consumers place on mobile payments, the less the effect of psychological insecurity, while the less value mean the more the impact that psychological insecurity would exert on the adoption. Second, the findings suggest that there is a relationship between perceived value and adoption of proximity mobile payments, to mean that perceived value is capable of influencing adoption directly. This implies that the value placed on proximity mobile payments will induce a corresponding effect on the adoption.

The findings from the mediation test provide practical implications to service providers. It should be a top priority of service providers to create and deliver value for customers through proximity mobile payments. Put differently, the benefits that the consumer seeks and expects from experiencing proximity mobile payments should be greater than their expectations (Dastane et al., 2020).

Regarding the strong negative effects of psychological insecurity risk on proximity mobile payment adoption, useful and pragmatic strategies should be developed that mitigate consumers' risk apprehension in order to encourage adoption. In the context of this study, service providers should take the necessary steps that put consumers at ease concerning reliability and security of the payment technology. It might be prudent for service providers to provide precise descriptions of the safety measures of the payment system and to assure consumers that their personal information, consumption habits or even shopping records would not maliciously used. As suggested by Yang et al. (2015), service providers can insure for any loss that may result from technological inefficiencies. South African service providers can follow the footsteps of Alipay wallet that cash back guarantees for any monetary loss that customers may incur in the process of effecting payments when using their payment platform (Yang et al., 2015). Such measures could go a long way in alleviating the perceptions of psychological insecurity risks to promote the value and ultimate adoption of proximity mobile payments for a mutual benefit for both consumers and service providers.

## 6. CONCLUSION

In the study, the perceived risk theory was contextualised and tested empirically to determine the effects of risk dimensions as well as the mediating role of perceived value on the adoption of proximity mobile payments. The findings provide further understanding of risks associated with the adoption of proximity mobile payments from an emerging market perspective. Specifically, the findings provide empirical evidence of the effect of psychological insecurity risk and the mediating role of perceived value on the adoption of proximity mobile payments to suggest both theoretical and practical implications to service providers in the South African context. Service providers can advertise their services by focusing

more on psychological insecurities particularly in terms of network and platform security, so that users feel safe to use proximity mobile payments.

## 7. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Although the present study presents several insights into the risk dimensions affecting adoption of proximity mobile payments in an emerging market, a few limitations are cautioned. First, the research explored users' risk dimensions and the mediating role on adoption of proximity mobile payments in South Africa, and the outcomes therefore might not be generalized to mobile users in other emerging markets, or to remote payments. For future studies, measuring different generational cohorts in other countries across both proximity and remote payments may shed more insight on the intricate associations among constructs.

Second, this single country context study was cross-sectional. It is prudent to not only investigate this topic over an extended period of time because individuals' usage behaviour changes over time, but to also extend the study to other countries so that comparisons can be made to ensure external validity.

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